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Analysis Of Umer Chapra Thought on Islamic Monetary Instruments in Indonesia: A Vector Autoregressive (VAR) And Vector Error Correction Model (VECM) Approach

Ahlis Fatoni[1], Adam Auwal Sa'ad[2], Nur Harena Redzua[3], Romzie Rosman[4]

Institute of Islamic Banking and Finance (IIiBF-IIUM), Malaysia,
[1]fatoni.ahlis@live.iium.edu.my, [2]auwal@iium.edu.my, [3]Harena@liium.edu.my,
[4]Romzie@liium.edu.my

ABSTRACT

Economic growth and exchange rate stability are each state's goals in the Islamic monetary system. Therefore, there is a need to develop effective instruments to support the achievement of the monetary objectives. This study aimed to determine the effect of Islamic monetary instruments variables proposed by Umer Chapra on economic growth and exchange rate stability in Indonesia, the amount of influence of each variable, and how significant the influence exerted by each variable. M. Umer Chapra is a Modern Muslim economist trying to popularise the Islamic economic system, including the Islamic monetary policy. The originality of the paper lies in its combination of various statistical tests and analyses to examine the relationships among the variables studied. Through utilising VAR/VECM approach, the results showed that deposit money has a negative impact on economic growth while M0 and SRR provide a positive impact. However, for the stability of the exchange rate, all variables (LNM0, LNDM and SRR) shows a negative trend towards exchange rate stability.

Keywords: *Economics, Exchange, Umer Chapra, VAR, VECM*

1.0 INTRODUCTION

1.1 Background

Monetary policy is an effort to control or direct the macroeconomy to the desired conditions, which are better conditions through regulation of the amount of money in circulation (Raharjda and Manurung, 2008). In essence, control of the money supply by the central bank is carried out by influencing the factors that cause changes in the money supply. The contributing factors include Net Foreign Assets (NFA) and Net Domestic Assets (NDA) (Pohan, 2008).

In line with the rapid development of financial products, where the money is not only limited to being used as a means of payment and arithmetic but also money resulted in an indication of decoupling between the financial sector and the real sector. These developments can reduce the effectiveness of monetary policy, and many countries use interest rates in their monetary policy operations, including Indonesia (Pohan, 2008).

Interest rates can be interpreted as the amount that can be received by the lender and is paid by the borrower in the form of a percentage of the loan amount (Pasaribu and Kowanda, 2014). Based on the above definition, interest in Islam is a form of riba. From the Shariah perspective, riba technically refers to the payment of "premiums" that must be paid by the borrower to the lender in addition to the principal repayment as a condition of borrowing or extension of the due date (Chapra, 2000).

Riba is a big problem that occurs in almost all Muslim countries today; that causes an

economic crisis marked by unemployment, decreased purchasing power, a striking gap between rich and poor, uneven distribution of products and natural resources, injustice in profit-sharing production yields, declining local currency exchange rates against foreign currency, and others (Chapra, 2000).

According to Chapra (2000), the main problem that is extraordinarily mandatory from this phenomenon is the use of Western economic model mechanisms in the economy of Muslim countries, including in solving the crisis that is being faced. The concept of Islamic economics has an appropriate formula as a solution to dealing with the crisis.

M. Umer Chapra is a Modern Muslim economist trying to popularise the Islamic economic system, including the Islamic monetary policy. That is why this research is essential. He believes that the elimination of riba is part of the values of Islamic economics. Still, the most important thing to do is not only to eliminate riba from the conventional system but how to introduce and implement a new system that is an Islamic economic and monetary system (Gultom, 2014; Taufik, 2005). Furthermore, Gultom (2014) tried to explore Umer Chapra's thought on Islamic monetary policy instruments which, based on descriptive analysis, among those instruments are (1) growth Target in M and M0, (2) the shares of a public rally against deposit (money giral), (3) the official mandatory Reserves, (4) credit restrictions, (5) the allocation of credit to the value-oriented, and (6) the dwarf the others. Taufik (2005), in Umer Chapra's perspective, to develop sufficient monetary growth and not "excessive", it needs to be carefully supported by three primary sources of monetary expansion.

In the case of Indonesia, which in conventional monetary policy as mentioned above, had experienced fluctuations in the exchange rate of the rupiah against the US dollar from January 2008 (IDR 9,267) to December 2008 (IDR 11,120) experienced a depreciation which resulted in the weakening of the rupiah against the US dollar. While in January 2013 (IDR 9,744) to December 2013 (IDR 12,173), the rupiah underwent depreciation which resulted in the weakening of the rupiah against the US Dollar; even in 2017 rupiah was performing worst in Asia with IDR 13,372 per dollar (Central Bank of Indonesia, 2019).

In brief, based on the above explanation, we would like to analyse the effect of Islamic monetary instruments in Indonesia by utilising Umer Chapra's thought on Islamic monetary instruments through the quantitative method as a differentiator to Gultom (2014) and Taufik (2005) that they only use descriptive analysis on the research. Chapra's instruments in Islamic monetary include M0 growth, demand deposits, statutory reserve requirement (SRR), and others, as well as the objectives of Islamic monetary, which he described as economic growth and exchange rate stability (Chapra, 2000).

1.2. Objective

This study aims to:

a. Explore various Monetary Instruments that can help achieve macroeconomic goals according to Umer Chapra.
b. Identify the influence and response of monetary instruments according to Umer Chapra to the macroeconomic goals to be achieved

1.3. Research Limitation

Because the general and broad discussion of Umer Chapra's monetary instruments and the macroeconomic objectives to be achieved, and also not all of Umer Chapra's thoughts on Islamic monetary instruments can be applied in Indonesia, because of legal, regulatory framework, and institutional capacity. This study is limited to analysing monetary instruments relating to and in the channel of money (money channel) which in theory and real has been applied and has a solid and significant influence in achieving macroeconomic goals in Indonesia.

2.0 LITERATURE REVIEW

2.1 Islam and Monetary Policy

Islamic monetary policy focuses more on maintaining the rotation of economic resources, which is the core of the Islamic economy in all forms of policies and provisions permitted by Sharia. Therefore, in Islam, regulators have to ensure the availability of economic businesses and/or Sharia products that can absorb the investment potential of the community or the provisions that encourage the preference for the use of potential investment in productive businesses occur. That way, the time holding money by each owner of funds will be reduced to a minimum, which will inhibit velocity. In other words, the provision of regulations in the form of business opportunities, Sharia financial products and other provisions relating to the flow of money in the community will further increase the velocity of the economy. Thus, the attention of monetary regulation is not focused on the concept of the money supply as adopted by conventional, but rather on economic velocity (Fauzi, 2010).

Fauzi (2010) explains the Islamic ban on riba will require Muslim countries to encourage and facilitate foreign capital investment. This is undoubtedly necessary because, as expected, investment capital has proven beneficial for countries by creating a supportive climate for investment.

According to Mannan (1970), the monetary objectives in Islam are the same as those of monetary policy in conventional economies: Maintaining money stability, economic prosperity, optimum economic growth, and improving justice for everyone.

In principle, the objectives of Islamic monetary policy are not different from the objectives of conventional monetary policy, namely maintaining the currency's stability (both internally and externally) so that equitable economic growth is expected to be achieved. Stability in the value of money is inseparable from the purpose of sincerity and openness in dealing with humans. This is mentioned in the Qur'an:

"…And give full measure and weight in justice. …" (Al-An'am: 152)

According to Ibnul Qayyim, the basis of the Sharia is the wisdom and benefit of human beings in the world and the hereafter. This benefit lies in perfect justice, grace, happiness, and wisdom. Anything that turns justice into oppression grace into trouble, prosperity becomes misery, and wisdom becomes ignorance has nothing to do with Sharia. Meanwhile, according to Imam Al-Ghazali, the primary purpose of the Sharia is to encourage human welfare, which lies in the protection of their faith, life, reason, ancestry and wealth. Whatever guarantees the protection of these five cases will meet the public interest and is desired (Chapra, 2000).

2.2 Islamic Monetary Operations in Indonesia

According to Bank Indonesia regulation article 2 No. 10/36/PBI/2008, it is explained that the objectives of Islamic monetary operations are:

1. Islamic Monetary Operations aims to achieve the operational targets of Islamic monetary control to support the achievement of Bank Indonesia's monetary policy ultimate goals.
2. The operational target, as referred to in paragraph (1), may be adequate Islamic banking liquidity or other variables determined by Bank Indonesia.

Adequacy of liquidity can be in the form of a base money target or its components consisting of a) currency in banks and the public and b) bank demand deposits in rupiah at Bank Indonesia. What is meant by "other variables" is variable I besides liquidity adequacy, which is determined as the operational target of Islamic monetary in the form of interbank money market reward rates based on Sharia principles?

Islamic banking regulations issued in 1998, which replaced the Islamic banking regulations in 1992, enabled the rapid

development of Sharia. Moreover, in 2008 a new Islamic banking law (UUPS) was passed, which replaced the UUPS in previous years. There is an increase in the number of branches of Islamic banks, both based on Sharia and conventional commercial bank Sharia divisions (Karim, 2011).

The increased ability to absorb public funds can be seen from the deposit funds listed on the balance sheet of Islamic banks. This requires Bank Indonesia, as a central bank with a monetary authority, to pay more attention and be more careful in carrying out its supervisory function on commercial banks without disrupting the growth momentum of the Islamic banks.

2.3 Islamic Monetary Instruments

Almost all monetary instruments implementing conventional monetary policies and underlying securities contain interest (riba). Therefore conventional instruments that contain interest elements (bank rates, discount rates, open market operations with interest securities specified in advance) cannot be used to implement Islamic-based monetary policy. However, according to several Islamic economists, some conventional monetary policy instruments can still be used to control money and credit, such as the Reserve Requirements, overall and selecting credit ceiling, moral suasion and change in the monetary base (Latifah, 2015).

Furthermore, Latifah (2015) explains that there is no interest system in Islamic economics, so the central bank cannot implement the discount rate policy. The Islamic Central Bank needs an interest-free instrument to control monetary economic policy in the Islamic economy. In this case, the central bank can use several interest-free instruments to increase or decrease the money supply. The abolition of the interest system does not prevent it from controlling the money supply in the economy.

There are several monetary policy instruments in the Islamic economy, including (Muhammad, 2002):

1. Reserve Ratio. A certain percentage of bank deposits must be held by the central bank, for example, 5%. If the central bank wants to control the money supply, it can raise the RR, for example, from 5 percent to 20%, the impact of which is the remaining money on commercial banks will be less, and vice versa.
2. Moral Suasion. The central bank can persuade banks to increase credit demand as their responsibility when the economy is in a state of depression. The impact is that credit is disbursed to pump money into the economy.
3. Lending Ratio. In Islamic economics, there is no lending term; the lending ratio, in this case, means Qardhul Hasan (good loan).
4. Refinance Ratio. Is a proportion of the interest-free loan. When the refinance ratio increases, the financing provided increases, and when the refinance ratio falls, commercial banks must be careful because they are not encouraged to provide loans.
5. Profit Sharing Ratio. The profit-sharing ratio must be determined before starting a business. The central bank can use the profit-sharing ratio as a monetary instrument, where when the central bank wants to increase the money supply, the profit ratio for customers will be increased.
6. Islamic Sukuk. It is a government bond, where when there is inflation, the government will issue more sukuk so that money will flow to the central bank and the money supply will be reduced. So sukuk can increase or decrease the money supply.
7. Government Investment Certificate. Treasury Bills are the sale or purchase of a

central bank certificate in a commercial framework. This instrument was issued by the Minister of Finance and sold by the central bank to brokers in large quantities, in the short term and at a small interest rate. These Treasury Bills cannot be accepted in Islam, so the government issued an interest-free replacement system called the GIC: Government Instrument Certificate.

8. Sharia Mutual Funds. Mutual funds are derived from the word "mutual", which means guard or maintain, and "fund", which means money. So mutual funds can be interpreted as a collection of maintained money. According to Law No. 8 of 1995 concerning the Capital Market, referred to as Mutual Funds is a container used to collect funds from the community of investors to be reinvested in a portfolio of securities by the investment manager. Sharia Mutual Funds contain meaning of Mutual Funds whose management and investment policies refer to Islamic law. Sharia mutual funds, for example, do not invest, or their products are contrary to Islamic law, such as building alcoholic beverages, raising pigs, etc.

2.4 Umer Chapra's Thought in Islamic Monetary Policy

According to Chapra (2000), the banking system and money, like other aspects of Islamic life, must be engineered to support achieving the main objectives of Islamic socio-economics. This system must also continue to carry out its primary functions related to its specific field, which, like other banking systems, functions. Some of them are most important for discussing the main characteristics of the Islamic money and banking system, including:

1. Expanded economic welfare with full employment opportunities and optimal economic growth rates.
2. Socioeconomic justice and equitable distribution of wealth and income.
3. The stability of the currency's value enables the exchange as a reliable unit, a fair standard for deferred payments, and a good store of value.
4. Mobilisation and investment savings for economic development in a fair manner so that the return on profits can be guaranteed for all parties concerned.
5. Provide all forms of effective service generally expected from the banking system.

Although there are many similarities with conventional ones, Umer Chapra's thought has significant differences in emphasis, which occur because of the spread of commitment to spiritual values, socioeconomic justice, and human brotherhood. Targets in Islam are an integral part of ideology and faith. Both are essential inputs for most legal outputs. Both contain sacredness and cannot be used as political and exploitative commodities. However, the strategy is fundamental to realise the goals, and this is where Islam has a unique contribution.

According to Chapra (2000), the monetary policy mechanism will not only help regulate the supply of money in tune with the actual demand for money but also help fulfil the need to finance a genuine government deficit and achieve the socio-economic goals of the Islamic community. The mechanism consists of five elements:

1. Growth Target M and M0

Every year the Central Bank must determine the growth of money supply (M) under national economic goals. The growth of M is closely related to the growth of M0 (high-powered money). The central bank must closely monitor the growth of Mo allocated to the government, commercial banks and financial institutions following the proportions determined based on economic conditions and targets in the Islamic economy. The central bank must use M0 provided for commercial banks, especially in mudharabah, as a qualitative

and quantitative instrument to control credit.

2. Public Share of Demand Deposit
   A certain amount of demand deposit for commercial banks (maximum 25%) must be submitted to the government to finance profitable social projects
3. Statutory Reserve Requirements
   Commercial banks must have certain mandatory reserves in the Central Bank. Statutory Reserve Requirements help provide guarantees for deposits and, at the same time, help provides adequate liquidity for banks. Instead, the Central Bank must reimburse the costs of mobilising funds these commercial banks incurred.
4. Credit Ceilings
   The policy sets a credit limit by commercial banks to guarantee that credit creation aligns with monetary targets and creates healthy competition between commercial banks.
5. Credit Allocation Based on Value
   The realisation of credit must improve public welfare. Credit allocation optimises the production and distribution of goods and services needed by most people. The benefits derived from credit financing are also intended for the benefit of the community. For this reason, it is necessary to have a credit guarantee agreed upon by the government and commercial banks to reduce the risks and costs that banks must bear.

2.5 Previous Studies

The role of the monetary system is necessary for modern economics. The monetary system, alongside fiscal management, resulted in a high level of sustainability in economic growth in line with price stability (Fauzi and Hapsari, 2019). Some of the most recent research on the Islamic Monetary instruments and Chapra's thoughts are summarised as follows.

A.F. Darrat (1998) in Ahmad (2000) researched "Monetary Stability in the Islamic Banking System". The banking system's stability is reflected in the development of the money supply (M1). According to Darrat, Islamic monetary instruments have a more stable influence on monetary stability than conventional banking instruments.

Rahman (2006) studied Chapra's thoughts on the values of the Islamic economic system, which included tauhid, khilafah and justice. His study begins by describing Chapra's concept of Islamic economics, the basic principles of the Islamic economic system and their implications, the legal basis of the value of the Islamic economic system, and the objectives of the Islamic economic system. In addition, Rahman examines the implications of Chapra's Islamic economic value thinking in economic activities in production, consumption and distribution. According to Rahman, the concept of Chapra's Islamic economic value departs from the modern economy.

Darliah (2002) discussed Chapra's ideas about the monetary system. Following Islamic teachings, she emphasised his interest-free social and economic justice study. According to her, the results of his research showed that to improve the economic welfare of the people, expand employment, optimise economic growth and realise economic justice for each individual. The stability of the value of the currency is needed.

Ascarya (2012), in his research 'The Flow of Transmission and Effectiveness of Double Monetary Policy in Indonesia', utilised Granger and VAR. The result is that monetary policy to "reduce inflation" with the Sharia pattern is more effective than the conventional pattern. Furthermore, Ascarya also did research in 2013 with the title' Monetary Policy Transmission Mechanism under Dual Financial System in Indonesia: Interest-Profit Channel' by utilised ECM, VECM, and ARDL resulted in SBIS Islamic policy interest rates are still largely unsatisfied results because it is based on juualah and benchmarked to conventional SBI rates policies, so that SBIS must be increased by using a mode (PLS) that reflects in the real sector, to provide macroeconomic impact and

stability price and sustainable economic growth. In addition, low and stable inflation and increased economic growth can be achieved under a dual financial system by increasing the share of the Islamic financial system, particularly Islamic banking.

Central Bank Islamic Monetary Instrument: a Theoretical Approach by Ismal (2011), and The Islamic gracious monetary instruments: a theoretical approach by Ismal (2013), concludes that based on values in Islam, Islamic monetary instruments can contribute to stabilising the economy, and the central bank can have an alternative in Islamic monetary instruments such as *qard hasan*, waqf, and *hibah* which it has potential to improve people's welfare, especially for people in need.

Furthermore, Bashir (2012), in his research 'The Welfare effects of inflation and financial innovation in a model of economic growth, an Islamic perspective', concluded that the model demonstrates that the fixed interest payment ban prohibits monetary policy in the Islamic economy to enhance and innovate alternative financial instruments that do not have a fixed nominal value and do not hold a fixed rate of return.

3.0 METHODOLOGY

3.1 Data

The data used in this analysis are secondary in the form of monthly data for the 2006-2017 period obtained from Bank Indonesia. The period taken includes pre and post-crisis in 2008, which affects IDR. While 2018 is not included in the data to avoid the weakening of IDR throughout the year. This study uses quantitative analysis with a VAR/VECM approach. The use of this method is to answer the problem of the influence of Islamic monetary instruments, according to Umer Chapra, in maintaining the stability of the rupiah value and the influence of Islamic monetary instruments in building economic growth. Variables, data, units and data sources used in this study are as follows:

TABLE I
Data Types and Sources

Data (Variable)	Variable	Period	Unit	Source
M0	LNM0	Monthly	Index	Bank Indonesia
Deposit Money	LNDM	Monthly	Index	Bank Indonesia
Statutory Reserve Requirements	SRR	Monthly	Index	Bank Indonesia
Economic Growth (IPI)	LNEG	Monthly	Percent	Bank Indonesia
Exchange Rate Stability (IDR)	LNEXC	Monthly	Index	Bank Indonesia

3.2 Method

VAR/VECM

The analytical method used in this research is the Vector Autoregressive (VAR) and Vector Error Correction Model (VECM) analysis methods. The use of VAR and VECM models in the paper allows for a comprehensive analysis of the relationships between monetary instruments and macroeconomic objectives in Indonesia, considering both short-run dynamics and long-term equilibrium, and providing insights for policy analysis and decision-making. Data analysis using the VAR and VECM model approaches includes two main analysis tools: Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD). Data processing is carried out in stages, before arriving at the VAR and VECM analysis, it is necessary to do some pre-estimation testing, namely, data stationarity test or unit root test, determination of optimum lag length and VAR stability test. Next, a Granger causality test, cointegration test, VECM, Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) will be carried out. The

use of VAR/VECM in the monetary system can be found in Ascarya (2013); and Ismal (2011; 2013), and Gaspar (2014).

A. Data Stationarity Test

Data stationary testing is done to overcome the problem of the root unit contained in the non-stationary time series data. Data stationarity tests can be carried out using unit root tests, most of the popular tests for the influence of unit root manifestations are performed using the Augmented Dickey-Fuller (ADF) test and the Philips-Perron (PP) test, for example, there are similarities:

$$\Delta Yt = A1 + A2t + A3Yt\text{-}1 + \mu t$$

The unit root hypothesis is the estimation of the regression equation above, where Ho = A3 = Yt-1 = 0, which means that the periodic series underlying it is not stationary. To test whether the estimated A3 value is zero, one can use an alternative test called the τ (tau) test or the Augmented Dickey-Fuller (ADF) test. If, in an application, the value of τ (tau) calculates the estimate of A3 is more significant (in its absolute value) than the critical τ (tau) value of Dickey-Fuller, higher (in its absolute value) than the value of τ (tau) of critical Dickey-Fuller, meaning reject the unit root hypothesis and conclude that the periodic series is stationary, on the other hand, if the value of τ (tau) count is smaller (in absolute value) than the critical τ (tau) value of Dickey-Fuller means it does not reject the unit root hypothesis (Gujarati, 2006).

B. Cointegration Test

A cointegration test is an econometric approach used to see the long-term relationship between variables, where cointegration refers to a linear combination of un stationary variables. There are three ways to test cointegration: the Engle-Granger cointegration test, the Curbegrating Regression Durbin Watson test and the Johannsen Cointegrating test. The cointegration test used in this study is based on the Johannsen Cointegrating test using the VAR analysis approach, if the data analysed is not stationary but is cointegrated, there is a long-term relationship or a balance between the two variables.

C. Correlation Test

Correlation testing was conducted to determine the correlation between variables used in the study. A correlation test is needed in ordering the variable. If the majority (more than 50%) of the correlation value between the variables is above 0.2, then the specification of the order of the variables follows economic theory. If, on the contrary, then the correct form does not need to be questioned (Arsana, 2004).

D. VAR Stability Test

This test is carried out to see whether or not the VAR model used is stable. VAR stability test is done by calculating the roots of the polynomial function or known as the roots of the characteristic polynomial, if all the roots of the polynomial function are inside the unit circle or if the absolute value is <1, then the VAR model is considered stable so that the Impulse Response Function (IRF)) and the resulting Forecast Error Variance Decomposition (FEVD) is deemed to be valid (Firdaus, 2011).

E. Lag Optimum Decision

An important step that must be taken in using the VAR model is determining the optimal number of lags used in the model. Testing the optimal lag length can utilise some information, namely by using the Akaike Information Criteria (AIC), Final Prediction Error (FPE), Hannan-Quinn Information (HQ) and Schwarz Information Criterion (SC) (Firdaus 2011).

The optimal length of variable lags is needed to capture the effect of each variable on other variables in the VAR system. The selection of the optimum lag length in the VAR model is to avoid the serial correlation between error terms and endogenous variables in the model that can cause the estimator to be inconsistent, in practice

estimation of lag (lag) is usually determined using AIC (Akaike Information Criterion) and SIC (Schwarz Information Criterion):

AIC = T log | Σ | + 2N

SBC = T log | Σ | + N log (T)

Information:

T = number of observations used

| Σ | = determinant of the variance/covariance matrix of the remainder

N = number of parameters estimated from all equations.

The lowest Akaike Information Criterion (AIC) value will be selected as the optimal lag length of the VAR model. This is because the smaller the value of AIC, the expected value generated by a model will be closer to reality (Widarjono, 2009).

F. Impulse Response Function (IRF)

Impulse Response Function (IRF) is a method used to determine the response of an endogenous variable to a particular shock. This is because the i_n variable shock, for example, does not only affect the i_n variable but is transmitted to all other endogenous variables through dynamic structure or lag structure in VAR, or in other words, the IRF measures the effect of a shock at a time on innovation endogenous variables at that time and in the future.

IRF aims to isolate shocks to be more specific, which means that a variable can be affected by specific shocks or shocks. If a variable cannot be affected by shock, then the particular shock cannot be known but rather a shock in general (Firdaus, 2011).

G. Forecast Error Variance Decomposition (FEVD)

The method that can be used to see how other variables influence changes in a variable shown by changes in error variance is FEVD. This method characterises a dynamic structure in the VAR model. In this method, it can be seen the strengths and weaknesses of each variable affecting the other variables over a long period.

FEVD details the variety of error forecasting into components that can be linked to each endogenous variable in the model. By calculating the percentage of k-stage error prediction for the future of a variable can be innovated in other variables, it can be seen how big the difference between error variance before and after the shock that originates from itself and other variables (Firdaus, 2011).

VAR/VECM Model

VECM is a form of restricted VAR. Restrictions are given because the data is not stationary but cointegrated. The VECM specification restores the long-term relationship of endogenous variables so that they converge into their cointegration relationship but still allow for short-term conditions. VECM is used because of the gradual correction through short-term adjustments to the long-run equilibrium model deviation (Juanda and Junaidi, 2012).

This study uses data to determine the effect of Umer Chapra's monetary instrument variables on the objectives of monetary economics he put forward. The variables in question are economic growth (yt), exchange rate stability (EXC), income distribution and wealth distribution (IDWD), M0, deposit money (DM), and statutory reserve requirements (SRR).

As for general VAR model can be written as follows (Enders,2004):

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-1} + \ldots + A_p Y_{t-p} + \varepsilon_t$$

Where:

P = Number of variables in the system of equations

Ao = Vector (nx1) containing n of each variable of VAR

Ai = Dimension coefficient matrices (n x n)

ε_t = Vector (nx1) of error term

While for the VECM model according can be written mathematically as follows (Enders, 2004):

$$\Delta X_t = \mu_t + \prod x_{t-1} \sum_{i-1}^{k-1} \Gamma_i \, \Delta Y_{t-1} + \varepsilon_t$$

Where:

X_k=is k selected endegenous variable, specific for each model

ε _k=interference or zero error value and variance-covariance constant

Thus, the specification of the VECM model formed is in the Economic Growth Model:

x_k = [Economic Growth (IPI), M0 (LNM0), Deposit Money (LNDM), Statutory Reserve Requirements (SRR)]

while, for the Exchange Rate Model:

xk = [Exchange Rate Stability (LNEXC), M0 (LNM0), Deposit Money (LNDM), Statutory Reserve Requirements (SRR)]

Vector Autoregressive (VAR) is a system of equations that shows each variable as a linear function of the constants and the lag value of the variable itself, and the lag value of other variables of the dependent variable in the equation. The analysis used in the VAR model is the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD).

4.0 RESULTS AND ANALYSIS

In this chapter, we will explain the results of data processing on the variables used in this study and the discussion as an effort to answer the research objective.

4.1 Data Stationary Test Results

The test method applied in the first stage of this research test (unit root test) is the Augmented Dickey-Fuller (ADF) test using a five percent real level. Suppose the ADF t-statistic value is smaller than the McKinnon critical value of five percent. In that case, it can be said that the data has a 95% confidence interval and is stationary because it does not contain unit roots. This test is carried out from the level of level to the level of the first difference, the results of which can be seen in table 3.

TABLE II
Data Stationary Test Results

Variable	Nilai ADF	
	Level	1st Difference
LNEG	1.996021	-11.95907
LNEXC	4.381723	-1.953504
LNM0	2.353041	-3.934641
LNDM	1.951829	-11.67048
SRR	-0.503645	-5.483353

In testing at the first difference level, the data of all the variables in this study were stationary at a real level of five percent (5%) or had a confidence interval of 95.

According to Ascarya (2008), if the data is not stationary at its level, it must be transformed (first difference) to get stationary data. This results in the loss of a long-term information relationship. So to keep getting a long-term relationship, the VAR model will be modified to a Vector Error Correction Model (VECM) error correction model, provided there is at least one cointegration in the model.

4.2 Cointegration Test Results

If the data is stationary at the first difference level, a cointegration test is done to see the possibility of cointegration between variables. In the testing process, the data used is changed first into the data level (Ascarya, 2009). Cointegrated variables indicate that these variables have a long-term relationship with a balanced relationship between them (Gujarati, 2004). Determination of the number of cointegration relationships between variables can be known according to the trace method, which can be seen from the value of trace statistics. The trace statistic value that exceeds the critical value indicates cointegration in the model used (Arsana, 2004). The results of the cointegration test between variables can be seen as follows. The cointegration test conducted by selecting option number 3 (three) on the Johansen Cointegration Test Specification has the following results:

TABLE III
Cointegration Test Results LNEG

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.389385	65.02337	47.85613	0.0006
At most 1 *	0.271486	30.98645	29.79707	0.0363
At most 2	0.121598	9.130830	15.49471	0.3534
At most 3	0.002676	0.184904	3.841466	0.6672

Note: An asterisk (*) indicates the amount of cointegration between variables

TABLE IV
Cointegration Test Results LNEXC

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.431377	82.62617	63.87610	0.0006
At most 1 *	0.311380	45.93121	42.91525	0.0242
At most 2	0.246549	21.68199	25.87211	0.1523
At most 3	0.049225	3.281076	12.51798	0.8416

Note: An asterisk (*) indicates the amount of cointegration between variables

Based on the cointegration test results above, it can be seen that there is cointegration between research variables. Thus, further research using the VECM model can be carried out. This shows that in addition to the short-term relationship, there is a long-term relationship between variables in the model.

4.3 Correlation Test Results

To find out the relationship between the variables used, it is necessary to do a correlation test. This test is carried out in the framework of ordering (sorting variables). The form of variable sequences that are in accordance with the causality test or economic theory will only be carried out if the correlation value between the variables in the majority exceeds 0.2. If the value of the correlation between the variables has a majority of values above 0.2, then the sequence of variables in accordance with economic theory needs to be done. However, if the correlation value between most variables is below 0.2, then the exact form of the sequence does not need to be questioned (Arsana, 2004). The results of the correlation test can be seen in the following table:

TABLE V
Correlation Test Results LNEG

	LNEG	LNDM	LNM0	LNSRR
LNEG	1	0.923303	0.907287	0.023906
LNDM	0.923303	1	0.935005	0.13361
LNM0	0.907287	0.935005	1	0.097476
LNSRR	0.023906	0.13361	0.097476	1

Based on the results in the picture above, a number that is above 0.2 exceeds 50%. Thus, researchers must sort variables (ordering) in accordance with existing economic theory. However, the ordering is based on the above values because the research discusses a theory. The sequences for the LNEG model are: LNDM, LNM0, and SRR.

TABLE VI
Correlation Test Results LNEXC

	LNEXC	LNM0	LNDM	LNSRR
LNEXC	1	0.977103	0.949983	0.11613
LNM0	0.977103	1	0.935005	0.097476
LNDM	0.949983	0.935005	1	0.13361
LNSRR	0.11613	0.097476	0.13361	1

Based on the results in the table above, numbers above 0.2 do not exceed 50%. Thus, researchers do not have to sort the variables (ordering) in accordance with existing economic theory.

This section consists of a critical discussion of the findings, an explanation of the novelty of the study results, justifications of the results, and discussions of how the results differ or equate to other related studies.

4.4 VAR Model Stability Test Result

The VAR Stability Test must be done before conducting further analysis because if the VAR estimation results are combined with an unstable error correction model, then the

Impulse Response Function and Variance Decomposition become invalid. In testing the stability of VAR, it is necessary to check the condition of VAR stability in the form of roots of characteristic polynomials. A VAR system is considered stable if all its roots have a modulus smaller than one (modulus value <1) (Ascarya: 2009). However, the IRF analysis results are declared invalid if the VAR model is unstable. Based on the results of the VAR stability test in the following table, it can be concluded that the VAR estimation to be used for IRF and FEVD analysis is stable. The results of the VAR stability test of the research model used are as follows:

TABLE VII
VAR Model Stability Test Result

Equation	Maximum Lag	Modulus Range
LNEG	11	0.270374 – 0.995061
LNEXC	7	0.584878 – 0.985100

4.5 Optimum Lag Test Results

Testing the optimal lag length is very useful to eliminate the autocorrelation problem in the VAR system so that autocorrelation problems are not expected to appear again with the optimal lag. The first step is to determine the maximum lag length of a stable VAR system. A VAR system is considered stable (stationary) if all its roots have a smaller modulus than one and all are located in the unit circle (Lutkepohl in Ascarya, 2010). The calculation results show a modulus range of 5 for the EG model and 6 for the EXC model, which is all in the unit circle. The second step is determining the optimal lag based on the shortest lag using Hannan-Quinnon Criterion (HQ) or Schwarz Information Criterion (SC) (Ascarya, 2010). The results show that the model has an optimal lag of one.

TABLE VIII
Optimum Lag Test Results LNEG

Lagjj	LogL	LR	FPE	AIC	SC	HQ
0	180.0239	NA	5.22e-08	-5.416120	-5.282312*	-5.363324
1	203.2429	42.86591	4.19e-08	-5.638244	-4.969202	-5.374264*
2	222.9844	34.01614	3.75e-08	-5.753368	-4.549092	-5.278203
3	245.6602	36.28120	3.10e-08	-5.958775	-4.219266	-5.272427
4	263.1961	25.89923	3.04e-08	-6.006035	-3.731291	-5.108503
5	284.7466	29.17602*	2.69e-08	-6.176819	-3.366841	-5.068103
6	304.6241	24.46461	2.56e-08	-6.296126*	-2.950915	-4.976226

TABLE IX
Optimum Lag Test Results LNEXC

Lagii	LogL	LR	FPE	AIC	SC	HQ
0	299.0287	NA	1.34e-09	-9.077807	-8.943998*	-9.025011
1	329.4853	56.22759	8.61e-10	-9.522625	-8.853583	-9.258645*
2	347.1830	30.49437	8.22e-10	-9.574860	-8.370584	-9.099696
3	368.3806	33.91627	7.11e-10	-9.734788	-7.995279	-9.048440
4	381.8248	19.85597	7.91e-10	-9.656147	-7.381403	-8.758615
5	399.0436	23.31171	7.98e-10	-9.693651	-6.883673	-8.584934
6	421.6636	27.83995*	6.99e-10*	-9.897342*	-6.552131	-8.577441

4.6. Summary of Cointegration Analysis on the VECM Model

The cointegration test analysis in the previous section shows that there is cointegration between variables that will be included in the research model so that VECM analysis can be done. But before proceeding to the IRF and FEVD stages, it is necessary to do a Summary of the Cointegration analysis to see which model will be used for the subsequent VECM analysis. This analysis will give us a Rank from the number of Cointegration and the best options suggested in Deterministic Trend Specification. The results of this analysis can be seen in the following table:

TABLE X
Johansen Cointegration Test Summary LNEG

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	231.5471	231.5471	240.1468	240.1468	240.2594
1	249.2681	249.2839	257.1652	257.3565	257.4491
2	260.0850	260.2210	268.0931	169.2800	269.3169
3	267.8839	268.9812	272.5660	278.6430	278.6798
4	269.7131	272.6585	272.6585	280.8587	280.8587
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-5.783975	-5.783975	-5.917298	-5.917298	-5.804621
1	-6.065741	-6.037214	-6.178703	-6.155261	-6.070989
2	-6.147391	-6.093362	-6.263567*	-6.240001	-6.183098
3	-6.141563	-6.086413	-6.161334	-6.250522	-6.222604
4	-5.962699	-5.932130	-5.932130	-6.053874	-6.053874
	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-4.747867	-4.747867	-4.751677	-4.751677	-4.509487
1	-4.770606*	-4.709701	-4.754055	-4.698235	-4.516828
2	-4.593230	-4.474445	-4.579892	-4.491570	-4.369910
3	-4.328375	-4.176090	-4.218633	-4.210686	-4.150389
4	-3.890484	-3.730401	-3.730401	-3.722633	-3.722633

The table above shows some suggested models from the Johansen Cointegration Test Summary results. The best model suggested based on the test is a model with an asterisk value. The model chosen by the author is the model of Akaike Information Criteria by Rank (rows) and Model (columns) with Number of Cointegrating 2 with the fourth assumption on the Deterministic Trend Specification option, namely Linear trend in data - Intercept and trend in CE - no trend in VAR. Furthermore, the lag that is used is lag one.

TABLE XI
Johansen Cointegration Test Summary LNEXC

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Log Likelihood by Rank (rows) and Model (columns)					
0	414.7638	414.7638	421.6636	421.6636	423.2092
1	430.1988	433.4773	439.9793	440.0111	441.4683
2	438.5077	443.2580	449.5801	452.1357	452.6339
3	444.3603	449.7811	452.0415	461.3362	461.8339
4	446.6439	452.0852	452.0852	462.9767	462.9767
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-9.808116	-9.808116	-9.897324	-9.897342	-9.821821
1	-10.03689	-10.10699	-10.21475	-10.18496	-10.13749
2	-10.04639	-10.13101	-10.26400	-10.28110	-10.23489
3	-9.980317	-10.05480	-10.09359	-10.28727*	-10.27181
4	-9.804426	-9.848775	-9.848774	-10.06082	-10.06082
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-6.596713	-6.596713	-6.552131	-6.552131	-6.342801
1	-6.557868	-6.594522	-6.601920*	-6.538676	-6.390849
2	-6.299755	-6.317474	-6.383558	-6.333749	-6.220636
3	-5.966064	-5.940193	-5.945524	-6.038848	-5.989941
4	-5.522556	-5.433096	-5.433096	-5.511334	-5.511334

The table above shows some suggested models from the Johansen Cointegration Test Summary results. The best model suggested based on the test is a model with an asterisk value. The model chosen by the author is the model of Akaike Information Criteria by Rank (rows) and Model (columns) with Number of Cointegrating 2 with the fourth assumption on the Deterministic Trend Specification option, namely Linear trend in data - Intercept and trend in CE - no trend in VAR Furthermore, the lag that is used is lag one.

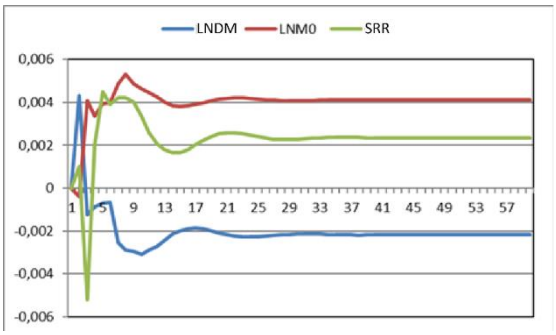

FIGURE I
LNEG Variable Response to LNDM, LNM0 and SRR

4.7. Analysis of Impulse Response Function (IRF)

A. Analysis of IRF and Forecast Error Variance Decomposition (FEVD) – LNEG

One of the primary forms of analysis on VECM is the Impulse Response Function (IRF), which aims to see a variable's current and future response traces to the shock of a particular variable (Ascarya, 2009). Below is a picture of the response of the LNEG model to the shocks of Umer Chapra monetary instruments:

After analysing dynamic behaviour through impulse response, the characteristics of the model will be seen through FEVD. FEVD is used to predict the contribution of the percentage of the variance of each variable to a change in a particular variable. The following will be presented as the results of the FEVD analysis.

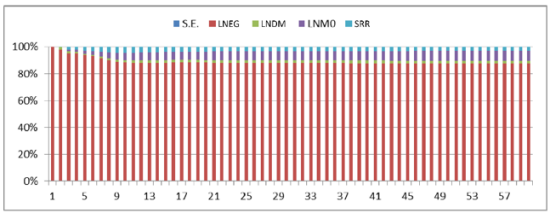

FIGURE II
FEVD of LNEG

The figure above shows that the economic growth variable (LNEG) responded positively to shocks on the LNDM variable in the initial period. Then respond negatively in the next period. And it started to be responded to negatively in the 14th period. This shows that when there is an increase in demand deposits, the initial period of economic growth will decline. And in the long run, the increase in demand deposits will result in declining economic growth figures because it responds negatively. This shows that demand deposits negatively influence Economic Growth (IPI) as a substitute variable for GDP, which shows the level of economic growth or the welfare of the general public.

This explains that Indonesia's mechanism for managing or regulating demand deposits still has several weaknesses that cause this negative effect. In his thoughts, Umer Chapra explained that demand deposits should have a positive impact or positive influence on economic growth as well as the welfare of the general public, also in line with Kar and Panechost (2000), Tajudeen (2012), and Ikenna (2012). Moreover, According to Chapra, demand deposits should be used to target productive public facilities in the form of performance deposits without the government being burdened with tax costs where the government must shoulder some of the costs of mobilisation costs and the cost of the deposit insurance scheme (Chapra: 2000).
The figure above shows that the economic growth variable (LNEG) responded positively to shocks on the LNM0 variable and began to stabilise in the 17th period. This shows that when there is an increase in M0, in the initial period of economic growth will increase. And in the long run, the increase in M0 will affect economic growth, which also experienced an increase because it responded positively, also according to the research by Das (2003) and Mishra (2010).

According to Umer Chapra's thought, M0 growth which is high-powered money has the potential to drive economic growth. Economic growth aims to meet social welfare-oriented community goals. Therefore, according to Chapra, part of M0 is given to the government to finance social interest projects, including; providing housing, health facilities, and education for the underprivileged. Some others are given and applied to commercial banks in the form of *mudharabah* and not containing discounts by the central bank. It aims as a quantitative and qualitative credit control tool (Chapra: 2000).

The figure above shows that the economic growth variable (LNEG) responded positively to shocks to the SRR variable in the initial period. Then responded positively in the next period. This shows that when there is an increase in the reserve requirement, the initial period of economic growth will decline not so long. And in the long run, the increase in the reserve requirement will increase economic growth because it responds positively, per Glocker and Towbin (2011).

This aligns with the reserve requirement's purpose and function to maintain monetary stability. According to Umer Chapra, there are times when banks need help from the central bank as a lender of last resort. The central bank can create a public pool to increase resources through a special reserve obligation or a diversion of a certain proportion of the total commercial reserves of the commercial bank. The primary function of this collection is to enable the central bank to function as a lender of last resort within agreed boundaries to avoid this facility incorrectly (Chapra: 2000).

Umer Chapra explained that stability in currencies must be the main objective of the Islamic reference framework because of the Islamic emphasis on being so strict with honesty and fairness in human interactions. Money functions as a measure of value. Therefore, any significant and continuous erosion in its real value is the same as doing damage on earth because of the adverse

effects of erosion on justice, social and general welfare.

Inflation implies that money cannot function as a fair and correct arithmetic unit. Inflation causes people to act unfairly against others by undermining the purchasing power of monetary assets in an unknown manner. It inflicts losses on productive activities and exacerbates inequality. Thus, inflation is a symptom of disequilibrium (imbalance) and is not in tune with the Islamic emphasis on equilibrium and equilibrium (Chapra: 2000).

Furthermore, FEVD results for economic growth indicate that the LNM0 variable provides the most significant contribution to economic growth in Indonesia by 7.25%. The following variable with the most contribution after LNM0 is SRR, with a contribution of 2.9%. And the last is the LNDM variable which contributed 2.13%.

B. Analysis of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) – LNEXC

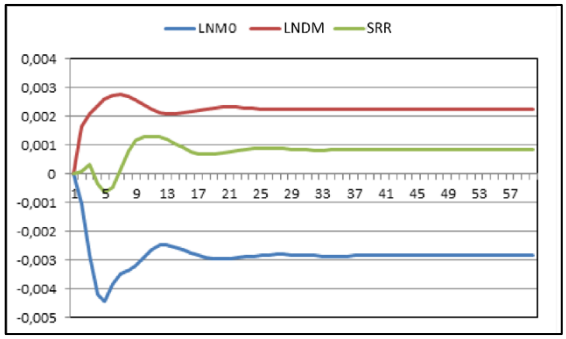

FIGURE III
LNEXC Variable Response to LNM0, LNDM and SRR

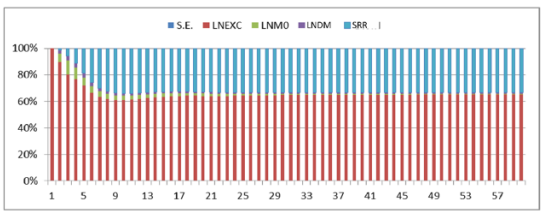

FIGURE IV
FEVD of LNEXC

The analysis results above show that the exchange rate variable (LNEXC) responds negatively to the shocks in the M0 (LNM0). This shows that when M0 has increased, in the long run, inflation will respond negatively, but not too significantly, the different results showed by Adeniji (2013) and Madesha et al. (2013) that M0 has a positive effect on the exchange rate.

The figure above shows that the exchange rate variable (LNEXC) responds positively to shocks in the variable deposit money (LNDM). This shows that when demand deposits increase, inflation will respond positively in the short and long term, in accordance with Kemisola (2016).

Besides, the results of the above analysis also show that the exchange rate variable (LNEXC) responds negatively to the shocks that occur in the SRR variable in period five, then responds positively to the 9th period and begins to stabilise to respond positively in the 25th period. This shows that inflation will respond negatively when the reserve requirement increases in the short or long term, according to Reihart et al. (1999).

Following the previous explanation, EG, representing economic growth, has a positive relationship with M0 as high-powered money shows that M0 is used in the productive and real sectors to support economic growth. This aligns with the figure above that M0 has a negative relationship with inflation, where inflation causes inequality and inhibits economic growth, as explained previously (Chapra: 2000).

Demand deposits and reserve requirements together make the *mudaraba* show as a distribution fund that aims to increase economic growth and overcome social inequality. When a country, in this case, Indonesia, experiences an increase in inflation, then the step that the government must take is to increase the demand for *mudaraba* performance and reserve requirements. As inflation causes inequality and inequality in social welfare, *mudaraba* becomes the most effective solution to overcome this towards a balanced economy (Chapra: 2000).

In addition, FEVD for the exchange rate shows that the SRR variable contributes the most to Indonesia's exchange rate stability by 33.5%. The following variable with the most contribution after the SRR is LNDM, with a

contribution of 0.8%. And the last is the LNM0 variable, which contributes as much as 0.6%.

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In conclusion, this study examines Umer Chapra's ideas on Islamic monetary instruments and their implications for economic growth and exchange rate stability in Indonesia. The analysis considers variables such as M0 growth, reserve requirements, and demand deposits.

The findings reveal that M0 growth positively influences economic growth, while an increase in demand deposits has a slight negative effect. Reserve requirements contribute positively to exchange rate stability. Regarding exchange rate stability, both demand deposits and M0 growth exhibit a negative impact, while reserve requirements have a detrimental effect.

In terms of contribution to economic growth, M0 growth has the most significant influence, followed by reserve requirements and demand deposits. For exchange rate stability, reserve requirements make the most significant contribution, followed by demand deposits and M0 growth.

This study emphasizes the importance of understanding the specific variables that drive economic growth and exchange rate stability in Indonesia when considering Islamic monetary instruments. The insights gained can guide policymakers in formulating effective strategies to achieve these macroeconomic objectives.

5.2 Recommendation

As for some of the recommendations that the author can give to the regulator, practitioners, and possible future research, namely:

Regulator

Regulators should begin to be more focused on accommodating Islamic monetary instruments in their policy. Still, they can utilise the current instrument but must avoid or decrease their policy's interest (*riba*) to develop an Islamic economic system in Indonesia.

Practitioners

As for the practitioners, we wish that more *mudharaba* based contracts would be practised among them as *mudaraba* effectively balances the economy.

Future Research

The VECM test in this study has weaknesses because the authors find it challenging to find a stable model to study. In addition, in subsequent studies, it is necessary to include other variables that theoretically affect Islamic banking financing in Indonesia, such as the CAR (Capital Adequacy Ratio) variable, Sukuk, Profit Sharing Ratio, etc.

The results of this study need to be reconfirmed with results using other methods such as ARDL, ECM or others. If the results are the same, this research is proportional and representative. But if it turns out to be different, then comparing to determine which research has better results is necessary.

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