

Endogenous Monetary Transmission in Islamic Financial Economics

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This paper is a continuation of the recent papers by Choudhury (2017), Choudhury (2015), and Choudhury and Hoque (2017) on the topic of endogenous nature of money (Choudhury, 1997) and monetary transmission as micro-money in Islamic financial economics. These papers have projected an Islamic economic theory of endogenous money that pursue the financing of projects in the real economy by bringing such project-specific spending to attain several much wanted goals of economic stability and performance. Among these is the 100 per cent circulation of bank-savings that banks otherwise hold back into the liquid form of spending. A 100 per cent Reserve Requirement Monetary System is maintained in Islamic monetary transmission and circulation with appropriate methodology and policies. Consequently, debt reduces to zero; the market transformation by the diversification of projects, the portfolio diversification of financing instruments to mobilize monetary units as micro-money into projects, and the increase in stakeholding altogether make the real output level statistically elastic. Thereby, prices stabilize in the absence of all forms of interest rates. The end result is the generalized inter-causality among the endogenous inter-variable relations.

Objective

This comprehensive picture is shown by the following sequence of effects: $S(r/i,y) = M(r/i,y)*v = p.y \Rightarrow$ 100 per cent conversion of bank-savings into money that is circulated fully via projects by financing instruments into the real economy. The symbols are defined as follows: S denotes bank-savings as deposits that are held by banks as liquidity that

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is not mobilized into the real economy. 'r' denotes rate of return in the real sector mobilization of savings and money circulating via financing instruments. 'i' denotes rate of interest. 'r' and 'i' may be in nominal or real terms. 'y' denotes real output. M denotes real quantity of money as a function of the real values of y and r/i (Cagan, 1989). 'p' denotes the price level. 'v' denotes the velocity of circulation of money. As the circulation of a quantity of money in the above-mentioned relations equates with bank-savings liquidated into real-economy financing (spending), then v tends to 1 as the signal of full mobilization of bank-savings into productive spending.

Micro-money formalism in Islamic 100 per cent reserve requirement monetary system

There are important social implications as endogenous ones linked with the economic ones of the above-mentioned relations. The fact of price stabilization with the perfectly elastic growth of the economy as a permanent phenomenon of the money, financing (spending), and real economy circular relations in respect of their endogenous inter-causal relations, means that the economic integration of this type has feedback with a life-fulfillment needs-economy and an increasingly privatizing economy. In the case of the macroeconomic general equilibrium system, this kind of adjustment is equivalent to an elastic form of non-inflationary economic growth and the complementary relations between aggregate demand with predominating spending (fiscal) stimulation and monetary policy induction (Friedman, 1953).

The project-specific expansion of monetary transmission complementing with the financing activity causes real output expansion. The results then are the market dominated transformation with public sector discursive coordination. Thereby, the real output expands along the intersection of the resulting aggregate demand and aggregate supply curves. Such a movement causes an elastic increase in productive employment and price-stability. In the Keynesian jargon (Mankiw, 1986) the full impact of the income multiplier is realized along such non-inflationary growth paths. Finally, price-stability as a result also causes simultaneously a stability in (r/i)-price relative.

Monetary transmission model of Islamic 100 per cent reserve requirement monetary system

In Islamic economic and real economy theory, the complementary coordination of money, finance, with the above-mentioned inner results in the variables causes reduction in 'i' even as the circulation of money, that is monetary transmission between banks and the real economy, enhances productive transformation. Figure 1 points out the nature of money and monetary transmission between the banks and the real economy in respect of liquidating the bank-savings into productive mobilization by spending. The well-known theory of Money (M)-Commodity (C)-Money (M) model (Heilbroner, 1986) is now extended to $\{(M-F-RE)_{\text{transmission 1}}-(M-F-RE)_{\text{transmission 2}} \text{ etc}\}(\theta)$.

Symbolizing the basic model of Tawhidi unity of knowledge and its conceptualization in money, finance, and real economy endogenous interrelationship

Symbol 'θ' denotes consciousness parameter of knowledge based on the episteme of unity of knowledge. In Islamic epistemological worldview, the derivation of 'θ' is discursively determined by way of the foundational reference to the Islamic primal ontology of oneness of God (Tawhid). This premise is explained by the precept of unity of knowledge in endogenously circular causal interrelations between the good choices identified by their multidimensional variables. Briefly we write this foundational knowledge-deriving epistemological methodology from the primal ontological roots as follows:

$\Omega \rightarrow_s \rightarrow \theta = \text{plim}\{\theta \text{ by discourse interactively with the learned ones}\}$
(Qur'an, 4:59).

Ω denotes the primal ontology as the Qur'an, emphasizing oneness of Allah represented as unity of knowledge by organic interrelations between the permissible choices while avoiding the impermissible ones (Qur'an, 36:36).

'S' denotes the transmission of the monotheistic knowledge in the Qur'an into worldly specifics denoted by 'θ'. 'S', called Sunnah, comprises the teachings of Prophet Muhammad, who Allah appointed by his Qur'anic

command as the chosen messenger of Allah for enlightening access to ‘everything’. The meaning of ‘everything’ could be noted in Barrow (1991).

$\theta = \text{plim}\{\theta\}$ is the consensual derivation of unity of knowledge. It can be ordinarily represented in the derived model of (M-F-RE)[θ] model by discourse in reference to the law of monotheism explained by the episteme of unity of knowledge as an organic process of knowing in the Qur’an and Sunnah.

The knowledge evolutionary discursive system of multidimensional evolutionary learning processes of diverse world-systems, all induced by knowledge arising from the episteme of unity of knowledge, and contrarily from the differentiated worldview of disjoint diversities not guided by $\Omega \rightarrow_s \rightarrow \theta$, both carry on inducing the generality and details of the specific world-systems under study. In this paper, the specific world-system under study under the ontological and epistemological determination by $\Omega \rightarrow_s \rightarrow \theta$ is the (M-F-RE-....)[θ] complementary problem under the guidance of 100 per cent reserve requirement monetary system.

The evaluation of the effectiveness of the organization and realization of the (M-F-RE-...)[θ], as explained above, is carried out by the wellbeing function, referred to in the methodology of $\Omega \rightarrow_s \rightarrow \theta = \text{plim}\{\theta\}$ as Maslaha. The evaluation is made by estimation and simulation of this function, subject to the system of endogenously related inter-variable equations of circular causation relations in the light of the episteme of unity of knowledge, and vice-versa as established in $\Omega \rightarrow_s \rightarrow \theta = \text{plim}\{\theta\}$. The Maslaha function as wellbeing objective criterion is denoted by $W(\text{M-F-RE}, \theta)[\theta]$ with the inner variables.

Monetary transmission in the 100 per cent reserve requirement monetary system

Central Bank intervention to create marginal gold stock to stabilize created stocks, $L_2, L_3,$

and thereby total monetary circulation by financial instruments in RE. $Y_{jus},$ finally, $v \approx 1$

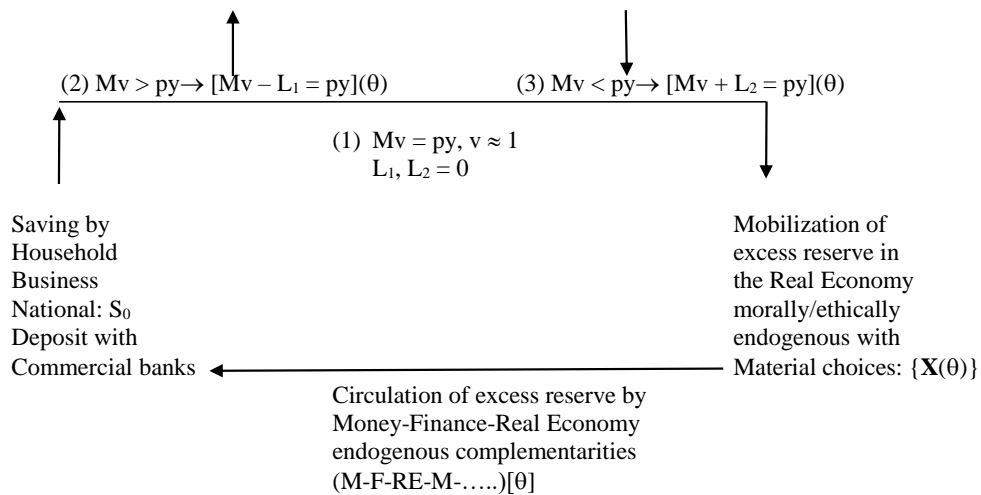


Figure 1: Monetary transmission in 100 per cent reserve requirement monetary system of $(M-F-RE)[\theta]$ endogenous complementary relations.

A brief explanation of monetary transmission circulating in the 100 per cent reserve requirement monetary system is as follows. The initiation of savings is by productive activity in the national income, by way of which savings S_0 are deposited in the commercial banks. In the 100 per cent reserve requirement system, the savings become deposits in banks ready to be circulated as money via financial instruments (F) into the real economy, RE. Now there are three different scenarios in such a circulation of money by financial instruments into the real economy. Firstly, the full amount of savings as deposits can circulate in the real economy by financing instruments aimed at specific projects. This kind of monetary circulation results in micro-money pursuing projects. Thereby, with the full mobilization of savings as deposits as money and financing is the feedback consequence of v tending to unity. The micro-money project-

specific circulation causes the otherwise case of fractional reserve requirement to withhold all the required deposits for the full circulatory purpose of spending by micro-money. The underlying episteme of unity of knowledge is thus implied to prevail in sustaining this complementary or participatory organic relationship between Money, Finance (Spending), and Real Economy [M-F-RE](θ).

This dynamic is represented by the parameterization of the unity of relations by θ -values (Choudhury, Pratiwi, Hossain, and Adenan in Toseef, forthcoming). The origin of such parameter-based inter-causal relations between the activities along with their inner variables is denoted by (M-F-RE)[θ]; and $M=py$, with interrelated $M = A * \prod_{i=1}^n M_i^{a_i}(\theta)$; [$p.y = \text{spending} = B * \prod_{i=1}^n (p.y)_i^{b_i}(\theta)$]. Both of these expressions apply in terms of project-specific micro-money and real-economy spending in them according to Islamic recommended choices (1 to n). Thus the context of θ -induction appears.

The other cases of monetary transmission shown in Figure 1 are firstly, of excess quantity of money adjusted by a withdrawal of L_1 of quantity of money to restore the equation of exchange: ($Mv > py \rightarrow [Mv - L_1 = py](\theta)$). The other case is of excess demand for money with adjustment thereby with injection of loanable fund by the Central Bank of L_1 . In every case, the adjusted equation of quantity theory of money and spending is restored. The result then is identical to the 100 per cent mobilization of money into the real economy via financial instruments and banking institutions. The central bank applies a marginal quantity of gold as numeraire to stabilize the currency value of all monies in circulation, including L_1 , L_2 and the rest.³

³ The dynamics of monetary transmission under 100 per cent reserve requirement monetary system imply that there is an inverse relationship between creation of gold (G) and trade (py). Thereby, gold creation comes to end as the adjustments in limiting amounts of L_1 and L_2 restore the 100 per cent mobilization in (M-F-RE)[θ]. We write: $L_1 - L_2 = \Delta M = \Delta py = G$. We rewrite this expression as, $\Delta py/py = G/M$. That is, currency value of money in circulation, py, equals G/M . Now as monetary transmission increases, M increases in quantity, G declines in volume. Thereby, $G/M = a$, as a declining parameter. Change in currency value, $g(py)$ is therefore stabilized around 'a' the total amount of money in circulation. That is $G = a * M$, with G declining asymptotically, as 'a' and M movement establish a rectangular hyperbola.

The complementary dynamics of [M-F-RE](θ) prevails always. The result in monetary transmission then is 100 per cent reserve with commercial bank to match monetary flow through financial instruments with real economy activity. This is the meaning of 100 per cent reserve requirement monetary system. The central bank thereby ceases to have monetary governance on monetary transmission. Only marginally there exist the management of L_1 and L_2 , and the overseeing and guidance of the states and policies of the economy with micro-money. In such money-finance-real economy interrelations the central bank establishes a discursive environment of consultation and policy guidance with commercial banks (Islamic banks), financial institutions, the real economy agencies, and all participants in economic activity.

A focused review of the literature

100 per cent reserve requirement monetary transmission of the [M-F-RE](θ) type appears in the seminal works of Maritain (1985). Maritain's contribution on a nature of money recommends unlimited tokens representing money for circulation in the real economy, so that all individuals and households would benefit from these tokens by exchange of goods and services. Monetary control by the central bank, commercial banks, and other monetary authorities would disappear. In 100 per cent reserve requirement monetary system with the gold standard as a stable numeraire the circulation of micro-money is similarly recommended to be unlimited so as to be circularly related with real exchange in goods and services. Thereby, the wellbeing effect will be optimized and asset-backing by gold would be minimal in volume. Gold would be required by the central bank only to stabilize the circulatory currency value and the residual amount of excess reserves in the central bank (Fig. 1).

The praise for expansionary monetary supply for meeting the demand for spending in goods and services in the real economy was also proposed by the Austrian School of Economists (Yeager, 1997; Hayek, 1999). The unit of micro-money was named as Unit. It was thus the numeraire to match up with a unit value of spending in goods and services in the real economy. On the side of the wellbeing contribution of such micro-money Schumpeter's (1961) entrepreneurial growth model is an example of micro-money being in high supply to finance sustainable microentrepreneurial projects.

In recent times, it is surmised by hind sight that the monetarism of an easy rather than a counter-cyclical contraction in the quantity of money into the real economy could have stemmed the tide of the Great Depression. In a growing economy, the complementarities between fiscal and monetary policies can be best fitted for non-inflationary economic growth.

In all such states of [M-F-RE](θ) model within the regime of 100 per cent reserve requirement monetary system, there remains the consistency of the effect of declining interest rates on the complementarities between money, finance, and real economy. Furthermore, the expanded release of monetary supply to endogenously support entrepreneurship, sustainability of non-inflationary economic growth, and thereby wellbeing. The early work of Friedman (1960) pointed out the possibility of such a holistic possibility of monetary arrangement.

The [M-F-RE](θ) model along with its early prototypes in the history of money, monetary policy, and institutional control over quantity of money for the real economy suggest that this model is consistent with the state of a productive and ethically sustainable economic regime with wellbeing as monetary and financial resources increased to complement with the real economy. Thereby a circular causation exists between the dynamics of money, finance, and real economy interrelations and the phasing out of all forms of interest rates causing release of resources for sustaining the holistic consequences of the wellbeing criterion. This yields the situation whereby a dynamic evolutionary learning by endogenous interrelations between the inner variable of [M-F-RE](θ) type monetary transmission model is attained (Hayek, 1990).

Economic stability by means of the relationship between [M-F-RE](θ) and the wellbeing function

Economic stability caused by the [M-F-RE](θ) is explained in the case of the theory of monotheistic unity of knowledge in Islamic economics and finance by evaluation of the wellbeing function called the maslaha. Maslaha as wellbeing function parameterizes and explains the degree of pervasive positive complementarities that ought to exist between the variables denoting the good things of life and avoiding the negative complementarities with the respective variables signifying the undesired

things. The maslaha objective function also has the properties of inter-variable complementarities of the two kinds. It is continuously differentiable because of the same nature of the learning parameter derived from the ontological and epistemological foundations of unity of knowledge of the monotheistic methodology. That is, $\theta = \text{plim}\{\theta\} \leftarrow (\Omega, S)$. Due to the properties of interactive, integrative, and evolutionary learning of θ in the maslaha function (Choudhury, 2013), the maslaha function has non-optimal and non-steady state properties. Only evolutionary equilibriums caused by the force of ' θ ' in generating estimated and simulated complementarities apply.

The ontological-epistemological (Spencer, 2000) origin of ' θ '-induced maslaha function also gives rise to endogenous circular causation relations between the maslaha variables. Thereby, the maslaha function is evaluated by estimation and simulation of coefficients in the 'as is' and 'as it ought to be' states of the problems under study in the light of pervasive complementarities between variables subject to the system of circular causation relations in evaluating the maslaha function.

Summarizing the properties

One vector of selected variables in the [M-F-RE](θ) complementary problem in 100 per cent reserve requirement monetary system: $\mathbf{x}(\theta) = \{m, y, \mathbf{f}, p, e, r/I, \theta\}[\theta]$, with induction of all variables by ' θ '. The variables are, 'm' as real money, 'y' as real output, ' \mathbf{f} ' as vector of financial instruments conducive of M-F-RE complementary relations in the circular flow of goods and finances, 'p' as output price signifying level stability, 'e' as employment, 'r/i' as relative between rate of return and interest rate, ' θ ' as knowledge parameter inducing all these variables in terms of their inter-causal complementarities.

The conceptual maslaha function, subject to circular causation relations between the variables is $W(\theta, \mathbf{x}(\theta))$.

The circular causation relations between the variables are, $x_i(\theta) = A + \sum a_j(\theta) \cdot \ln x_j(\theta) + a(\theta) \cdot \ln(\theta)$;

$i, j = 1, 2, \dots, n; i \neq j$. Except for the last term, the θ -inductions of the variables and coefficients signify the sequential data of the variables corresponding to the θ -variables.

The quantitative form of the wellbeing function that can be evaluated (estimated in 'as is' state; and simulation in 'as it ought to be') is, $\theta = B + \sum a_i(\theta) * \ln x_i(\theta)$. This equation provides the sequence of $\mathbf{x}(\theta)$ -variables that are estimated (simulated) as predictor variables from the circular causation estimated (simulated) results in the variables.

The full description of the evaluation system of the maslaha function is given by,

$$\text{Evaluate } W(\theta, \mathbf{x}(\theta)) = \text{Const.} \prod x_i^{\alpha_i} * \theta^\beta.$$

$$\text{This is converted to natural logarithmic form, } \ln W(\theta, \mathbf{x}(\theta)) = \text{Const.} \sum \alpha_i * \ln x_i + \beta * \ln \theta \quad (1)$$

$$\text{subject to the circular causation equations in natural logarithmic form, } \ln x_i(\theta) = A + \sum a_j(\theta) * \ln x_j(\theta) + a(\theta) * \ln(\theta). \quad (2)$$

The quantitative form of the maslaha function to evaluate is,

$$\theta = B + \sum a_i(\theta) * \ln x_i(\theta) \quad (3)$$

$$i, j = 1, 2, \dots, n; i \neq j$$

Economic stability attained by the model of unity of knowledge generated by pervasive complementarities between the inner variables of [M-F-RE](θ) endogenous circular flow interrelations is explained further as follows. By some amount of simplification of expression (1) in mathematical differentiation form we write in the form of rate of change, $g(\cdot)$ with respect to ' θ ' in view of degrees of inter-variable complementarities:

$$g(W) = \sum_i \alpha_i * g(x_i) + \beta * g(\theta) > 0 \quad (4)$$

Now because every variable is positively complementary with θ -value, therefore, economic stability in the midst of ethically induced variables of the [M-F-RE](θ) model is implied.

The explanation of economic stability is made by the ontology, epistemology, and phenomenology of Tawhid as law in respect of the Qur'anic meaning of monotheism and its methodological representation in terms of unity of knowledge between recommended complementary variables. Yet this result is not true of the shari'ah based framework of Islamic economics and finance. Two examples are given here to establish the inability of shari'ah, fiqh, and fatwa misguided claim of economic stability.

Firstly, we take the case of the absence of ijara-type pricing, such as rental in ijara (assets acquired by deferred payments), premiums (as of takaful), deferred payments (as of mark-up pricing by murabaha), risk and return pricing on credit sale (as in the case of twarruq, innah, istisna). There are also the many cases that are daily conjured up by so-called 'shari'ah-compliance' legitimization of Islamic financial instruments.

All such deferred rental kinds of rates as prices on financial instruments, and thereby their pricing relations with goods and services in market exchange, are indeterminate. This problem is true at the initial point of a mutual contract, unless such prices are forward-looking prices that can be realized only 'nearest' to the point of exchange transactions. Forward-looking pricing is tantamount to interest rate (riba), for it remains undetermined at the present time of a contract. Thereby, real economic transactions remain equally undetermined in valuation. On the other hand, if goodwill of donations is used to form financial capital, this is not feasible under continued conditions of uncertainty and financial limitations of groups and individuals as donors for free-ridership. Feasibility and sustainability demand organized forms of pricing for risk, return, and transactions in the intertemporal sense. No formula has been derived according to shari'ah to resolve this critical outstanding problem of forward-looking ijara type pricing. There is no evidence of shari'ah instruments regarding their stability role in financing during global financial crises, as otherwise claimed. The only other way how this could happen is by relying upon large inflow of rich shareholders' funds. Such a case was implied in the greater than unit value of (Finance/Deposit)-ratio in shareholding of Islamic banks during the financial crises.

Twarruq as an example of micro-money in Islamic financial mobilization

One of the kinds of micro-money that has been debated by shari'ah-compliance institutional financial innovations in recent times is called twarruq. Twarruq is a short-selling financial credit arrangement. The buyer of an asset buys on credit without paying now. Upon financial need, the buyer sells the credited asset at a lower price to raise the needed funds. In the light of the Tawhidi law of unity of knowledge derived from the monotheistic origin of Islamic worldview, twarruq is both ridiculous and unlawful and inefficient mode of financing. Thereby, the use of such a fund is contrary to achieving economic stability. How and Why? The principle of relational unity between Money (M), Finance (F), Real Economy (RE), and thereby such sustained continuity by the [M-F-RE-M](θ) symbiotic relationship is foregone. The ijara-type pricing problem of intertemporal interest rate, as mentioned above, reappears and remains unresolved.

It can be explained that twarruq causes devaluation of assets by lowering the effective prices in short-selling of assets. There also appears a smaller available financial need to meet the increasing asset transaction demand. The economy thereby comes to have two adverse effects. Lesser amounts of funds into the economy by asset devaluation cause a less productive economy with lower funds-flow into the real economy. The explanation of such marginal substitution between credited assets and their short-selling at lower price follows a neoclassical approach.⁴

⁴ A 'marginal substitution' form of the neoclassical production possibility curve between credited assets (superior, A) and cheaply sold same asset to raise cash (inferior, A') can be shown along the shifting production possibility curves with resource allocation increasingly into A'. The respective prices being are p and p'. We note the marginalist formula of 'optimal' resource allocation along the shifting production possibility curve caused by optimal resource allocation along the inferior asset curve, A'-trajectory: $-(\Delta A/\Delta A')\downarrow = (p'/p)\downarrow$, as $\Delta A\downarrow$ and $\Delta A'\uparrow$. Thereby, $(p'/p)\downarrow$. Twarruq allocation of resources abides in this case of marginalism along the inferior goods trajectory for the credited item by the short-selling items. The (M-F-RE)-circular relations in continuity are annulled. The truly Islamic epistemological inference of unity of knowledge between these variables is annulled in the cantankerous shari'ah approach. All the implications of social and economic stability arising from the wellbeing objective criterion are annulled.

All the tenets of [M-F-RE](θ) are thus lost. The Tawhidi Law of relational unity superseding the legitimacy given to the differentiated ways of shari'ah, is violated. The shari'ah, fiqh, and fatawa (jurisprudence, opinionated religious verdicts) in all such various cases of pricing and asset valuation and dynamic resource allocation by inter-causal learning between the critical variables are untenable.⁵

Empirical results of Islamic monetary transmission model for Bank Indonesia

A monetary transition model for the Bank of Indonesia defined as the degree of effectiveness of mobilizing depositors' funds as bank-savings into productive transformation of the real economy, has been estimated and statistical results derived. The real economy is further disaggregated for the Primary Sector, Secondary Sector, and Tertiary Sector. The variants of such a model are given below (NirDukita, 2018). In terms of the [M-F-RE](θ), the Tawhidi methodological tenets of continuity in respect of the Tawhidi episteme of unity of knowledge is satisfied if there are sustained complementarities in the suggested model between their inner variables. The vector of variables would comprise socioeconomic variables, financial instruments of resource mobilization, and epistemic value parameters denoted by ' θ '. The specific methods to evaluate the resulting statistical models of [M-F-RE](θ) with their inner endogenously interactive, integrative, and evolutionary learning variables as adduced in

⁵ On the contrary, the neoclassical result is negated in the precept of unity of knowledge with interactive, integrative, and evolutionary learning dynamics. Now ' θ ' as knowledge inducing parameter of complementarities between A and A' causes both of these to increase continuously along with the increase in resource allocation by learning. Thereby, $(p'/p)[\theta] > 0$, also causes $(\Delta A/\Delta A')[\theta] > 0$, along the continuously increasing resource allocation with θ -induction increasing in the neighbourhood of probabilistic occurrence of complementary inter-variables relations of (M-F-RE)[θ]. The neoclassical results of optimal resource allocation and marginal rate of substitution (opportunity cost) are annulled in the Tawhidi dynamics of unity of knowledge along all continuums of complementary allocation of resources between the selected variables. Twarruq type allocation is dispelled from acceptance in the Tawhidi methodological worldview by the epistemological dynamics of θ -induction of complementarities in the (M-F-RE)[θ] circular causation relations of the wellbeing objective criterion. Thereby, economic and social stability is attained, as explained in the text.

the wellbeing function of inter-variable complementarities signifying Tawhidi episteme of monotheistic unity of knowledge, are tried out. The endogenous inter-variable equations form the circular causation models signifying degrees of interactive integration attained by the force of evolutionary learning. Finally, the wellbeing function for $[M-F-RE](\theta)$ for the three real economy sectors are determined. Thus all the phenomenological attributes of Tawhidi methodological worldview are activated for a critical examination of the $[M-F-RE](\theta)$ model, followed by its recommendations in the monetary transmission model tested for Bank Indonesia.

Description of variables (symbols) in the monetary transition model:

1. PS (Primary Sector) denotes the total of sectoral GDPs for the following sectors -- agriculture, mining, processing industry, electricity, gas and construction.
2. Y (real GDP) is based on constant prices of 2010.
3. PS/Y denotes the ratio of Primary Sector GDP to Real GDP (real output).
4. SS (Secondary Sector) denotes the total of GDPs of the trade, transportation, and business services obtained by summing up the GDPs for the trade, hotel and restaurant; transport and communication; finance, real estate and business services sectors.
5. SS/Y denotes the ratio of Secondary Sector to Real GDP (real output)
6. TS (Tertiary Sector) denotes the total of GDPs for services (Government and private services).
7. TS/Y denotes the ratio of Tertiary Sector to Real GDP (real output)
8. Fin/M denotes the ratio of total financing by Shari'ah banks in Indonesia to total money supply (M_0+M_1)
9. SIMA denotes Interbank Mudarabah Investment
10. SIMA/TotFin denotes the ratio of SIMA to total financing by shari'ah banking in Indonesia interpreted as portion of liquid funds in money market.
11. Theta ' θ ' denotes the knowledge variables. ' θ ' is obtained by determining the parametric weight of data for the variables. The weight of each of the different variables is based on an understanding of the highest rank say 10 assigned for the best data values in the light of Tawhidi methodology (Choudhury & Rahim, 2016). The formula for calculating values in each column is:

$\theta = (10 / \text{corresponding observation value. } \theta = 10 \text{ for best value of the variable}) * (\text{observed variable values in the column})$. After getting all computations of such weights from each column variables, they are averaged across columns by rows to obtain the average ‘ θ ’ of all variables.

Results of Data Analysis

Simultaneous Ordinary Least Square (OLS)

Hereinafter, the prerequisite test results presented from the entire regression model are as follows:

(i) Normality test

The results obtained from the test of the normality assumption with the Jarque-Bera normality test for transmission model model data show that the error follows the normal distribution with p -value values of 0.378; which is greater than $\alpha = 0.01$. This means that with a 99% confidence level it can be said that the error term is normally distributed.

(ii) Multicollinearity Test

Results of tests on the assumption of absence of multicollinearity showed that in the monetary transmission mechanism model no presence of multicollinearity is noted. This is indicated by the correlation coefficient between each independent variable in each model being smaller than 0.8.

(iii) Heteroscedasticity Test

Homoscedasticity test results with white heteroscedasticity in the transmission mechanism model showed p value square of 0.2863, greater than $\alpha = 0.01$. It can be concluded that no heteroscedasticity exists in the regression model with a 99% confidence level.

(iv) Autocorrelation Test

The results obtained from the tests on the assumption of the absence of autocorrelation with the Breusch-Godfrey Serial Correlation LM Test showed that the regression model contained autocorrelation. The value of

ρ -value in the data of transmission model is 0.0000, which less than $\alpha = 0.01$, meaning that there is autocorrelation in the regression model.

The monetary transmission model is further estimated by the VAR method to accommodate lag effect, especially by the use of VAR Granger Causality to get the next picture from the transmission mechanism path.

Vector Autoregressive (VAR)

The VAR stability test is required to determine the stability of VAR estimation. The results of the VAR stability test in the following models show that a stable VAR model is shown by the modulus value, being less than one. (Gujarati, 2010)

Discussion of the monetary transmission model of [M-F-RE](θ)

The [M-F-RE](θ) monetary transmission model uses an Islamic methodology approach with a view of the unity of divine knowledge (Choudhury, 2010). A model that is always anchored in the Tawhid methodology based on the Quran and the Sunnah. The Qur'an was revealed to the Prophet to bring grace and welfare to all the universes (Qur'an, 21:107). The Qur'an presents a model of development within the framework of wellbeing system with the spirit of participation, paired in a process of circular causation. (Qur'an: 42:38). The strong base is circular causation in the evaluation of wellbeing (maslaha) according to the Tawhidi episteme of unity of knowledge. The relations of circular causation result in sustainability explained by simulations along the Tawhidi String Relation (TSR) up to the Hereafter. In a saying of Prophet Muhammad (PBUH), it is declared that the search and discovery of the sources of the Qur'an and the Sunnah will prevail until the end of time. The Qur'an provides a conceptual basis of analysis involving the inherent morality in economics, society, and government (Qur'an 2: 261-83). In its implementation, the complementary participatory concept between the variables of each model is accommodated by including the parameter θ in each of the monetary transmission model. The θ value of each estimated relation is the average of the weighted index θ inducing each variable in the [M-F-RE](θ) monetary transmission model.

Furthermore, the discussion of the results according to this Islamic framework follows the stages of analysis given here:

1. Using Ordinary Least Square Analysis Methods for Effectiveness Analysis, the estimation result of monetary transmission mechanism model refers to the mainstream econometric concept, which does not involve ' θ ' as an indicator of the degree of complementarities, which symbolizes learning between the variables in the model. The [M-F-RE](θ) monetary transmission mechanism model includes θ to represent the presence of the learning process of each economic agent (represented by each variable) in the model. The first evaluation method used is the simultaneous OLS method, firstly without and next by entering the ' θ '-effect to give comparison between these two aspects of the monetary transmission model, firstly without and then with learning process.

2. Next the Vector Auto Regressive (VAR) with Granger Causality method is used to get a transmission mechanism path. This model is a dynamic model of quantitative behavioral type.

Empirical analysis of the monetary transmission model without ‘ θ ’-parameter

The estimation result of the monetary sector linkage model to the real economy by three sectors is carried out without learning parameter ‘ θ ’. Statistical software Eviews 9 yields the following regression estimation in natural loglinear form:

Primary Sector:

$$\text{LNPS_Y} = 0.99444 - 0.08993*\text{LNFIN_M} - 0.00216*\text{LNSIMA_FIN} - 0.00017*\text{RSBIS} + 1.43272e-05*\text{INF}$$

$$\text{t-stat: } (632.8512)^{***} \quad (-28.1313)^{***} \quad (-2.9518)^{**} \quad (-6.4277)^{***} \quad (0.1528)$$

$$R^2 = 0.924073; \text{DW} = 0.284522 \quad (5)$$

$$\text{LNFIN_M} = 9.66382 - 9.65612*\text{LNPS_Y} - 0.03158*\text{LNSIMA_FIN} - 0.00129*\text{RSBIS} - 0.00037*\text{INF}$$

$$\text{t-stat: } (29.5546)^{***} \quad (-28.1313)^{***} \quad (-4.3202)^{**} \quad (-4.2606)^{***} \quad (-0.3791)^{***}$$

$$R^2 = 0.916643; \text{DW} = 0.263233 \quad (6)$$

$$\text{LNSIMA_FIN} = 32.38641 - 31.32116*\text{LNPS_Y} - 4.26216*\text{LNFIN_M} - 0.01621*\text{RSBIS} - 0.02004*\text{INF}$$

$$\text{t-stat: } (3.0778)^{***} \quad (-2.9518)^{***} \quad (-4.3202)^{**} \quad (-4.6535)^{***} \quad (-1.7992)^*$$

$$R^2 = 0.390041; \text{DW} = 0.454567 \quad (7)$$

$$\text{RSBIS} = 1455.45599 - 1469.08676*\text{LNPS_Y} - 101.54637*\text{LNFIN_M} - 9.42822*\text{LNSIMA_FIN} - 0.18678*\text{INF}$$

$$\text{t-stat: } (6.3942)^{***} \quad (-6.4277)^{***} \quad (-4.2606)^{**} \quad (-4.6535)^{***} \quad (-0.6877)$$

$$R^2 = 0.510917; \text{DW} = 0.335029 \quad (8)$$

$$\text{INF} = -10.17250 + 13.58620*\text{LNPS_Y} - 3.250919*\text{LNFIN_M} - 1.31103*\text{LNSIMA_FIN} - 0.02102*\text{RSBIS}$$

$$\text{t-stat: } (0.1151) \quad (0.1528) \quad (-0.3791) \quad (-1.7992)^* \quad (-0.6877)$$

$$R^2 = 0.041533; \text{DW} = 1.183478 \quad (9)$$

Note: *** denotes significance at 99% confidence level
 ** denotes significance at 95% confidence level
 *denotes significance at 90% confidence level
 No asterisk (*) denotes not significant

The coefficients of each equation show the magnitude of elasticity in relation to the endogenous dependent variable in circular causation. The above equations can be rewritten in the Cobb-Douglas form:

$$\text{PS_Y} = 4,199\text{Fin_M}^{-0.0899}\text{Sima_Fin}^{-0.0022}\text{rSBIS}^{-0.0002}\text{Inf}^{0.00001} \quad (10)$$

$$\text{Fin_M} = 15737,47\text{PS_Y}^{-9,6561}\text{Sima_Fin}^{-0.03158}\text{rSBIS}^{-0.0013}\text{Inf}^{0.0004} \quad (11)$$

$$\text{Sima_Fin} = 1,16\text{E}+14 \text{PS_Y}^{-31,3212} \text{Fin_M}^{-4,2621} \text{rSBIS}^{-0,02} \text{Inf}^{0,02} \quad (12)$$

$$\text{rSBIS} = \text{PS_Y}^{-1469,08} \text{Fin_M}^{-101,54} \text{Sima_Fin}^{-9,428} \text{Inf}^{0,1867} \quad (13)$$

$$\text{INF} = 3,38\text{E}-05 \text{PS_Y}^{13,58} \text{Fin_M}^{-3,251} \text{Sima_Fin}^{-1,311} \text{rSBIS}^{-0,02} \quad (14)$$

Secondary Sector:

$$\begin{aligned} \text{LNSS_Y} &= 0.81899 + 0.23129*\text{LNFIN_M} + 0.00236*\text{LNSIMA_FIN} + 0.000366*\text{RSBIS} - 7.815456\text{e-} \\ &06*\text{INF} \\ \text{t-stat:} & (276.3376)*** (38.3602)*** (1.7053)* (7.0387)*** (-0.0442) \\ \text{R}^2 &= 0.957741; \text{DW}=0.247737 \end{aligned} \quad (15)$$

$$\begin{aligned} \text{LNFIN_M} &= -3.23895 + 3.99779*\text{LNSS_Y} - 0.01555*\text{LNSIMA_FIN} - 0.00122*\text{RSBIS} - 0.00026*\text{INF} \\ \text{t-stat:} & (-33.5036)*** (38.3602)*** (-2.7595)*** (-5.3563)*** (-0.3522) \\ \text{R}^2 &= 0.952266; \text{DW}=0.238512 \end{aligned} \quad (16)$$

$$\begin{aligned} \text{LNSIMA_FIN} &= -6.93076 + 10.04756*\text{LNSS_Y} - 3.8376*\text{LNFIN_M} - 0.01488*\text{RSBIS} - 0.02137*\text{INF} \\ \text{t-stat:} & (-1.4301) (1.7053)*** (-2.7595)*** (-3.9869)*** (-1.8779)* \\ \text{R}^2 &= 0.361234; \text{DW}=0.435553 \end{aligned} \quad (17)$$

$$\begin{aligned} \text{RSBIS} &= -669.8449 + 811.5558*\text{LNSS_Y} - 158.615988*\text{LNFIN_M} - 7.86099*\text{LNSIMA_FIN} - \\ &0.1914*\text{INF} \\ \text{t-stat:} & (-7.1088)*** (7.0387)*** (-5.3563)*** (-3.9869)*** (-0.7227) \\ \text{R}^2 &= 0.534652; \text{DW}=0.347672 \end{aligned} \quad (18)$$

$$\begin{aligned} \text{INF} &= 5.04529 - 2.08377*\text{LNSS_Y} - 3.9915*\text{LNFIN_M} - 1.3357*\text{LNSIMA_FIN} - 0.02264*\text{RSBIS} \\ \text{t-stat:} & (0.1306) (-0.0442) (-0.3522) (-1.8779)* (-0.7227) \\ \text{R}^2 &= 0.41362; \text{DW}=0.183129 \end{aligned} \quad (19)$$

The Cobb-Douglass form is written as:

$$\text{SS_Y} = 2,265 \text{Fin_M}^{0,231} \text{Sima_Fin}^{0,002} \text{rSBIS}^{0,0003} \text{Inf}^{-0,000007} \quad (20)$$

$$\text{Fin_M} = 0,039 \text{SS_Y}^{3,997} \text{Sima_Fin}^{-0,015} \text{rSBIS}^{-0,0012} \text{Inf}^{0,0003} \quad (21)$$

$$\text{Sima_Fin} = 0,0009 \text{SS_Y}^{10,047} \text{Fin_M}^{-3,837} \text{rSBIS}^{-0,0148} \text{Inf}^{0,021} \quad (22)$$

$$\text{rSBIS} = 1,2\text{E}-291 \text{SS_Y}^{881,55} \text{Fin_M}^{-158,615} \text{Sima_Fin}^{-7,860} \text{Inf}^{-0,191} \quad (23)$$

$$\text{INF} = 155,244 \text{SS_Y}^{-2,083} \text{Fin_M}^{-3,991} \text{Sima_Fin}^{-1,335} \text{rSBIS}^{-0,0226} \quad (24)$$

Tertiary Sector:

$$\begin{aligned} \text{LNSS_Y} &= 0.7825 + 0.0818*\text{LNFIN_M} + 0.0086*\text{LNSIMA_FIN} - 1.1412\text{e-}05*\text{RSBIS} + \\ &0.0005*\text{INF} \\ \text{t-stat:} & (59.6468)**** (3.0629)*** (1.4107) (-0.0504) (-0.5797) \\ \text{R}^2 &= 0.081240; \text{DW}=0.136003 \end{aligned} \quad (25)$$

$$\begin{aligned} \text{LNFIN_M} &= -0.2614 + 0.88700*\text{LNSS_Y} - 0.0831*\text{LNSIMA_FIN} + 0.0028*\text{RSBIS} - \\ &0.0040*\text{INF} \\ \text{t-stat:} & (-1.0982) (3.0629)*** (-4.4124)*** (3.9203)*** (-1.5508) \\ \text{R}^2 &= 0.412828; \text{DW}=0.085567 \end{aligned} \quad (26)$$

$$\begin{aligned} \text{LNSIMA_FIN} &= -0.1725 + 1.8917*\text{LN}\text{TS_Y} - 1.6799*\text{LN}\text{FIN_M} - 0.0113*\text{RSBIS} - \\ &0.0225*\text{INF} \\ \text{t-stat:} & \quad (0.1604) \quad (1.4107) \quad (-4.4124)^{***} \quad (-3.5495)^{***} \quad (-1.9659)^* \\ \text{R}^2 &= 0.356427; \text{DW}=0.398679 \end{aligned} \quad (27)$$

$$\begin{aligned} \text{RSBIS} &= -5.8859 - 1.8544*\text{LN}\text{TS_Y} + 41.2349*\text{LN}\text{FIN_M} - 8.3899*\text{LNSIMA_FIN} - \\ &0.2786*\text{INF} \\ \text{t-stat:} & (-0.2011) \quad (-0.0504) \quad (3.9203)^{***} \quad (-3.5495)^{***} \quad (-0.8846) \\ \text{R}^2 &= 0.342542; \text{DW}=0.219064 \end{aligned} \quad (28)$$

$$\begin{aligned} \text{INF} &= -1.4131 + 6.0608*\text{LN}\text{TS_Y} - 4.9569*\text{LN}\text{FIN_M} - 1.3893*\text{LNSIMA_FIN} - \\ &0.0233*\text{RSBIS} \\ \text{t-stat:} & (-0.1670) \quad (0.5797) \quad (-1.5508) \quad (-1.9659)^* \quad (-0.8846) \\ \text{R}^2 &= 0.043942; \text{DW}=1.183592 \end{aligned} \quad (29)$$

The Cobb-Douglass form is:

$$\text{TS_Y} = 2,186\text{Fin_M}^{0,082}\text{Sima_Fin}^{0,008}\text{rSBIS}^{-1,141e-05}\text{Inf}^{0,0005} \quad (30)$$

$$\text{Sima_Fin} = 0,841 \text{TS_Y}^{1,891}\text{Fin_M}^{-1,679}\text{rSBIS}^{-0,011}\text{Inf}^{-0,023} \quad (31)$$

$$\text{rSBIS} = 0,0027\text{TS_Y}^{-1,854}\text{Fin_M}^{41,23}\text{Sima_Fin}^{-8,389}\text{Inf}^{-0,278} \quad (32)$$

$$\text{INF} = 0,2434\text{TS_Y}^{6,06}\text{Fin_M}^{-4,9561}\text{Sima_Fin}^{-1,389}\text{rSBIS}^{-0,023} \quad (33)$$

Monetary transmission model as linkage model of the monetary sector with the three-sector real economy with θ -parameterization

The estimation results of the monetary sector linkage model to the sectoral domestic product processed using Eviews 9 using ' θ '-parameterization yields the following regression equations:

Primary Sector:

$$\text{LNPS_Y} = 0.9615 - 0.0474*\text{LNFIN_M} - 0.0062*\text{LNSIMA_FIN} + 0.0004*\text{RSBIS} + 0.0008*\text{INF} + 0.0033*\theta_1$$

$$\text{t-stat: } (332.4868)^{***} (-11.6095)^{***} (-10.4715)^{***} (8.1853)^{***} (8.6713)^{***} (12.2111)^{***}$$

$$R^2 = 0.953301; \text{DW}=0.403580 \quad (34)$$

$$\text{LNFIN_M} = 11.0913 - 11.1985*\text{LNPS_Y} - 0.04747*\text{LNSIMA_FIN} + 0.00037*\text{RSBIS} + 0.0020*\text{INF} + 0.0105*\theta_1$$

$$\text{t-stat: } (12.3785)^{***} (-11.6095)^{***} (-4.0258)^{***} (0.3614) (1.1947) (1.7090)^*$$

$$R^2 = 0.918640; \text{DW}=0.275288 \quad (35)$$

$$\text{LNSIMA_FIN} = 73.7758 - 77.6088*\text{LNPS_Y} - 2.5250*\text{LNFIN_M} + 0.0540*\text{RSBIS} + 0.0809*\text{INF} + 0.3894*\theta_1$$

$$\text{t-stat: } (10.2359)^{***} (-10.4715)^{***} (-4.0258)^{***} (9.7632)^{***} (8.02519)^{***} (13.7971)^{***}$$

$$R^2 = 0.765370; \text{DW}=0.418890 \quad (36)$$

$$\text{RSBIS} = -768.1288 + 830.0516*\text{LNPS_Y} + 2.9799*\text{LNFIN_M} + 8.2299*\text{LNSIMA_FIN} - 1.3407*\text{INF} - 5.8088*\theta_1$$

$$\text{t-stat: } (-7.7128)^{***} (8.1853)^{***} (0.3614) (9.7632)^{***} (-14.3349)^{***} (-32.5914)^{***}$$

$$R^2 = 0.950723; \text{DW}=0.391352 \quad (37)$$

$$\text{INF} = -476.9551 + 510.8124*\text{LNPS_Y} + 5.8161*\text{LNFIN_M} + 4.3406*\text{LNSIMA_FIN} - 0.47235*\text{RSBIS} - 3.0083*\theta_1$$

$$\text{t-stat: } (-8.2657)^{***} (8.6713)^{***} (1.1947) (8.02519)^{***} (-14.3349)^{***} (-16.0713)^{***}$$

$$R^2 = 0.697690; \text{DW}=0.788236 \quad (38)$$

Note: *** denotes significance at 99% confidence level

** denotes significance at 95% confidence level

*denotes significance at 90% confidence level

No asterisk (*): not significant

The Cobb-Douglass form is:

$$\text{PS_Y} = 2,6156\text{Fin_M}^{-0.047}\text{Sima_Fin}^{-0.006}\text{rSBIS}^{0.0004}\text{Inf}^{0.0008}\theta_1^{0.003} \quad (39)$$

$$\text{Fin_M} = 65597,96\text{PS_Y}^{-11,199}\text{Sima_Fin}^{0.047}\text{rSBIS}^{-0.0003}\text{Inf}^{0.002}\theta_1^{0.01} \quad (40)$$

$$\text{Sima_Fin} = 1,09\text{E}+32\text{PS_Y}^{-77,608}\text{Fin_M}^{-2,525}\text{rSBIS}^{-0,054}\text{Inf}^{0,08}\theta_1^{0,389} \quad (41)$$

$$\text{rSBIS} = \text{PS_Y}^{380,052}\text{Fin_M}^{2,979}\text{Sima_Fin}^{8,229}\text{Inf}^{1,341}\theta_1^{-5,808} \quad (42)$$

$$\text{INF} = 7,29\text{E}-208\text{PS_Y}^{510,81}\text{Fin_M}^{5,82}\text{Sima_Fin}^{4,34}\text{rSBIS}^{-0,472}\theta_1^{-3,008} \quad (43)$$

Secondary Sector:

$$\begin{aligned} \text{LNSS_Y} &= 0.8367 + 0.13657*\text{LNFIN_M} - 0.0075*\text{LNSIMA_FIN} + 0.00112*\text{RSBIS} + \\ &0.0013*\text{INF} + 0.0057*\theta_1 \\ \text{t-stat: } &(231.7306)^{***} (9.2824)^{***} (-4.0491)^{***} (9.4165)^{***} (5.3583)^{***} (6.8668)^{***} \\ R^2 &= 0.969734; \text{DW}=0.238579 \end{aligned} \quad (44)$$

$$\begin{aligned} \text{LNFIN_M} &= -2.4447 + 3.0751*\text{LNSS_Y} - 0.0357*\text{LNSIMA_FIN} + 0.0009*\text{RSBIS} + \\ &0.0028*\text{INF} + 0.0132*\theta_1 \\ \text{t-stat: } &(-8.5087)^{***} (9.2824)^{***} (-4.0590)^{***} (1.1541) (2.2031)^{**} (2.92445)^{***} \\ R^2 &= 0.955467; \text{DW}=0.283460 \end{aligned} \quad (45)$$

$$\begin{aligned} \text{LNSIMA_FIN} &= 14.9043 - 16.1188*\text{LNSS_Y} - 3.4042*\text{LNFIN_M} + 0.0547*\text{RSBIS} + \\ &0.0831*\text{INF} + 0.3988*\theta_1 \\ \text{t-stat: } &(4.5383)^{***} (-4.0491)^{***} (-4.0590)^{***} (10.3436)^{***} (8.3636)^{***} (14.5386)^{***} \\ R^2 &= 0.769916; \text{DW}=0.447484 \end{aligned} \quad (46)$$

$$\begin{aligned} \text{RSBIS} &= -330.7727 + 380.7830*\text{LNSS_Y} + 12.9198*\text{LNFIN_M} + 8.656*\text{LNSIMA_FIN} - \\ &1.369*\text{INF} - 5.9243*\theta_1 \\ \text{t-stat: } &(-10.0512)^{***} (9.4166)^{***} (1.1541) (10.3436)^{***} (-14.3983)^{***} (-31.3656)^{***} \\ R^2 &= 0.949786; \text{DW}=0.395021 \end{aligned} \quad (47)$$

$$\begin{aligned} \text{INF} &= -130.8673 + 149.5695*\text{LNSS_Y} + 14.153*\text{LNFIN_M} + 4.456*\text{LNSIMA_FIN} - \\ &0.4640*\text{RSBIS} - 3.0351*\theta_1 \\ \text{t-stat: } &(-5.6593)^{***} (5.3583)^{***} (2.2031)^{**} (8.3636)^{***} (-14.3983)^{***} (-16.306)^{***} \\ R^2 &= 0.703628; \text{DW}=0.812723 \end{aligned} \quad (48)$$

The Cobb-Douglass form is,

$$\text{SS_Y} = 2,308\text{Fin_M}^{0.136}\text{Sima_Fin}^{-0.007}\text{rSBIS}^{0.0011}\text{Inf}^{0.0013}\theta_1^{0.005} \quad (49)$$

$$\text{Fin_M} = 0,086\text{SS_Y}^{3.075}\text{Sima_Fin}^{-0.0357}\text{rSBIS}^{-0.0009}\text{Inf}^{0.0028}\theta_1^{0.013} \quad (50)$$

$$\text{Sima_Fin} = 2970676 \text{SS_Y}^{-16.11}\text{Fin_M}^{-3.404}\text{rSBIS}^{0.054}\text{Inf}^{0.083}\theta_1^{0.389} \quad (51)$$

$$\text{rSBIS} = 2,2\text{E}-144\text{SS_Y}^{380.7}\text{Fin_M}^{12.91}\text{Sima_Fin}^{8.65}\text{Inf}^{1.36}\theta_1^{-5.92} \quad (52)$$

$$\text{INF} = 1,4\text{E}-57 \text{SS_Y}^{149.56}\text{Fin_M}^{14.15}\text{Sima_Fin}^{4.45}\text{rSBIS}^{-0.464}\theta_1^{-3.035} \quad (53)$$

Tertiary Sector:

$$\begin{aligned} \text{LN}_{\text{TS_Y}} &= 0.7646 - 0.0228*\text{LN}_{\text{FIN_M}} - 0.0247*\text{LN}_{\text{SIMA_FIN}} + 0.0025*\text{RSBIS} + \\ & 0.0038*\text{INF} + 0.0163*\theta_1 \\ \text{t-stat: } & (186.1819)^{***} \quad (-2.5758)^{***} \quad (-11.5462)^{***} \quad (24.5238)^{***} \quad (14.3573)^{***} \\ & (33.5673)^{***} \\ R^2 &= 0.912237; \text{DW}=0.404019 \end{aligned} \quad (54)$$

$$\begin{aligned} \text{LN}_{\text{FIN_M}} &= 2.138 - 2.3168*\text{LN}_{\text{TS_Y}} - 0.1622*\text{LN}_{\text{SIMA_FIN}} + 0.0112*\text{RSBIS} + \\ & 0.0093*\text{INF} + 0.0562*\theta_1 \\ \text{t-stat: } & (3.1441)^{***} \quad (-2.5758)^{***} \quad (-5.8563)^{***} \quad (4.7581)^{***} \quad (2.1588)^{**} \quad (3.7412)^{***} \\ R^2 &= 0.474624; \text{DW}=0.096971 \end{aligned} \quad (55)$$

$$\begin{aligned} \text{LN}_{\text{SIMA_FIN}} &= 16.7742 - 21.3661*\text{LN}_{\text{TS_Y}} - 1.3791*\text{LN}_{\text{FIN_M}} + 0.0577*\text{RSBIS} + \\ & 0.0824*\text{INF} + 0.3986*\theta_1 \\ \text{t-stat: } & (12.1860)^{***} \quad (-11.5462)^{***} \quad (-5.8563)^{***} \quad (10.9016)^{***} \quad (8.03239)^{***} \\ & (14.0453)^{***} \\ R^2 &= 0.757849; \text{DW}=0.380576 \end{aligned} \quad (56)$$

$$\begin{aligned} \text{RSBIS} &= -251.4946 + 329.0075*\text{LN}_{\text{TS_Y}} + 14.2799*\text{LN}_{\text{FIN_M}} + 8.6595*\text{LN}_{\text{SIMA_FIN}} \\ & - 1.3759*\text{INF} - 5.9434*\theta_1 \\ \text{t-stat: } & (-24.2346)^{***} \quad (24.5238)^{***} \quad (4.7581)^{***} \quad (10.9016)^{***} \quad (-14.9623)^{***} \\ & (-37.977)^{***} \\ R^2 &= 0.949888; \text{DW}=0.399031 \end{aligned} \quad (57)$$

$$\begin{aligned} \text{INF} &= -127.4214 + 168.3883*\text{LN}_{\text{TS_Y}} + 4.0723*\text{LN}_{\text{FIN_M}} + 4.2659*\text{LN}_{\text{SIMA_FIN}} - \\ & 0.4746*\text{RSBIS} - 3.0061*\theta_1 \\ \text{t-stat: } & (-13.8999)^{***} \quad (14.3573)^{***} \quad (2.1588)^{***} \quad (8.03239)^{***} \quad (-14.9623)^{***} \\ & (-16.0924)^{***} \\ R^2 &= 0.698992; \text{DW}=0.788969 \end{aligned} \quad (58)$$

The Cobb-Douglas form is:

$$\text{TS_Y} = 2,148\text{Fin_M}^{-0,0228}\text{Sima_Fin}^{-0,024}\text{rSBIS}^{0,0034}\text{Inf}^{0,004} \theta_1^{0,0163} \quad (59)$$

$$\text{Fin_M} = 8,48\text{TS_Y}^{-2,316}\text{Sima_Fin}^{-0,162}\text{rSBIS}^{0,011}\text{Inf}^{0,009} \theta_1^{0,056} \quad (60)$$

$$\text{Sima_Fin} = 19191922\text{TS_Y}^{21,36}\text{Fin_M}^{-1,37}\text{rSBIS}^{0,057}\text{Inf}^{0,082} \theta_1^{0,398} \quad (61)$$

$$\text{rSBIS} = 6,6\text{E-}110\text{TS_Y}^{329,00}\text{Fin_M}^{14,279}\text{Sima_Fin}^{8,659}\text{Inf}^{1,375} \theta_1^{-5,943} \quad (62)$$

$$\text{INF} = 4,59\text{E-}56 \text{TS_Y}^{168,38}\text{Fin_M}^{4,072}\text{Sima_Fin}^{4,072}\text{rSBIS}^{-0,475} \theta_1^{-3,006} \quad (63)$$

Wellbeing Function

Primary Sector:

$$\begin{aligned} \Theta_1 = & -157.4784 + 168.3749*\text{LNPS}_Y + 2.2742*\text{LNFIN}_M + 1.5803*\text{LNSIMA}_\text{FIN} - \\ & 0.1548*\text{RSBIS} - 0.2276*\text{INF} \\ \text{t-stat: } & (-11.4830)^{***} (12.2111)^{***} (1.7090)^* (13.7971)^{***} (-32.5914)^{***} (-16.0713)^{***} \\ R^2 = & 0.984777; \text{DW}=0.422095 \end{aligned} \quad (64)$$

Secondary Sector:

$$\begin{aligned} \Theta_2 = & -43.6322 + 49.4925*\text{LNSS}_Y + 5.0699*\text{LNFIN}_M + 1.6043*\text{LNSIMA}_\text{FIN} - \\ & 0.1506*\text{RSBIS} - 0.2276*\text{INF} \\ \text{t-stat: } & (-7.3859)^{***} (6.8668)^{***} (2.92445)^{***} (14.5386)^{***} (-31.3656)^{***} (-16.306)^{***} \\ R^2 = & 0.953019; \text{DW}=0.450415 \end{aligned} \quad (65)$$

Tertiary Sector:

$$\begin{aligned} \Theta_3 = & -42.2396 + 55.3807*\text{LNST}_Y + 1.8738*\text{LNFIN}_M + 1.5646*\text{LNSIMA}_\text{FIN} - \\ & 0.1554*\text{RSBIS} - 0.2279*\text{INF} \\ \text{t-stat: } & (-32.1785)^{***} (33.5673)^{***} (3.7412)^{***} (14.0453)^{***} (-37.977)^{***} (-16.0924)^{***} \\ R^2 = & 0.972389; \text{DW}=0.422267 \end{aligned} \quad (66)$$

Statistical Analysis: Results

Primary Sector

From the above estimation results, the rank of each endogenous variable is the value of their inter-elasticity. In the primary sector equation without ‘ θ ’ parameterization the magnitude of elasticity of all variables i.e. financing (Fin_M), SIMA, SBIS rate and inflation is less than one. This means that the response of primary sector change is inelastic to the change in every independent endogenous variable. Among the overall determinants of the primary sector results, financing is the largest contributor relative to the primary sector, compared to other variables that negatively affect. This is indicated by the greatest number of powers.

The financing elasticity of -0.0899 means that, every 1% increase in shari’ah financing will decrease primary sector yield by 0.0899 of 1%, and vice versa, ceteris paribus. Meanwhile, the variables of monetary instrument and macro-inflation variable are inelastic and have little effect on the primary sector. The role of Islamic monetary instruments, the rate of Bank Indonesia Syariah Certificates (rSBIS) is negatively influenced by the primary sector variables. That is, if the primary sector declines, it

will cause rSBIS to increase and vice versa, *ceteris paribus*. In fact, one of the objectives of Bank Indonesia intervention regulated by Law no. 3 year 2004 Article 7 with monetary instruments held is for stabilization of rupiah value, including inflation. In the event of inflation, Bank Indonesia will tend to withdraw the money supply. Meanwhile, if we look at the role of rSBIS to inflation, we find that rSBIS is inelastic to inflation. This shows that the transmission mechanism is differentiated between the monetary sector and the real sector, especially noted for the primary sector.

In the estimation results in the secondary sector, the complementary results are found for transportation and trade, showing the secondary sector result is positively influenced significantly by the financing. This is in contrast to the primary sectors that are negatively affected by shari'ah financing. The role of monetary instrument, rSBIS is inelastic with a relatively small coefficient value on secondary sector outcomes. Although legally monetary instruments are intended for the purpose of stabilizing inflation, the estimates show that rSBIS does not significantly affect inflation. The strong effect of financing in the secondary sector is also shown by the value of the coefficients of secondary sector being greater than one. The significant positive effect is elastic with Islamic bank financing, while correlated negatively in the primary sector. This implies that, Islamic bank financing has not been aligned to the industry as otherwise would be expected. This result indicates that there is an imbalance between the primary sector and the secondary sector. It can be caused by three financing factors in the profit orientation of the sectors: (i) murabaha; (2) short term; and (iii) high turnover. In the secondary sector however, the positive impact of shari'ah financing in the secondary sector is shown by positive and elastic influence of Interbank Mudarabah Investment (SIMA) and rSBIS.

Tertiary Sector

Furthermore, in the tertiary sector, the monetary instrument of rSBIS also has no significant effect on inflation. The increase in tertiary sector output is supported positively by shari'ah financing, although it is inelastic. So it can be said that, the effectiveness of shari'ah monetary instrument is relatively low. There is lack of circular causation linkage between the monetary and real sectors, even though with the monetary instruments of shari'ah.

Wellbeing Models

Primary sector

The monetary transmission model for all three sectors of the real economy gives better result by accommodating ‘ θ ’ in the circular causation equations. This is seen from the overall R²-value being higher. The role of knowledge, the learning process of a participatory attitude implied by ‘ θ ’ showed more responsiveness of the endogenous dependent variables to changes in almost all the explanatory variables in every model equation.

The Cobb-Douglas forms of the three-sector estimated wellbeing models result in Cobb Douglas forms:

$$\theta = \log(-157.4784)PS_Y^{168.37}Fin_M^{2.27}Sima_Fin^{1.58}rSBIS^{-0.155}INF^{-0.22} \quad (67)$$

$$\theta = \log(-43.6322)SS_Y^{49.49}Fin_M^{5.06}Sima_Fin^{1.604}rSBIS^{-0.150}INF^{-0.227} \quad (68)$$

$$\theta = \log(-42.2396)TS_Y^{55.38}Fin_M^{1.874}Sima_Fin^{1.564}rSBIS^{-0.155}INF^{-0.22} \quad (69)$$

In Cobb Douglas form, the sum of the variable-specific elasticity coefficients of the wellbeing function gives the indicator of economies of scale of wellbeing. This total elasticity value of each variable to wellbeing provides the measure interpreting whether economic activity is sustainable by complementarities and stable in the long run or not. Overall, the sum of the coefficients in θ -parameterized equations (estimated wellbeing functions) of all sectors shows a positive magnitude, greater than one.

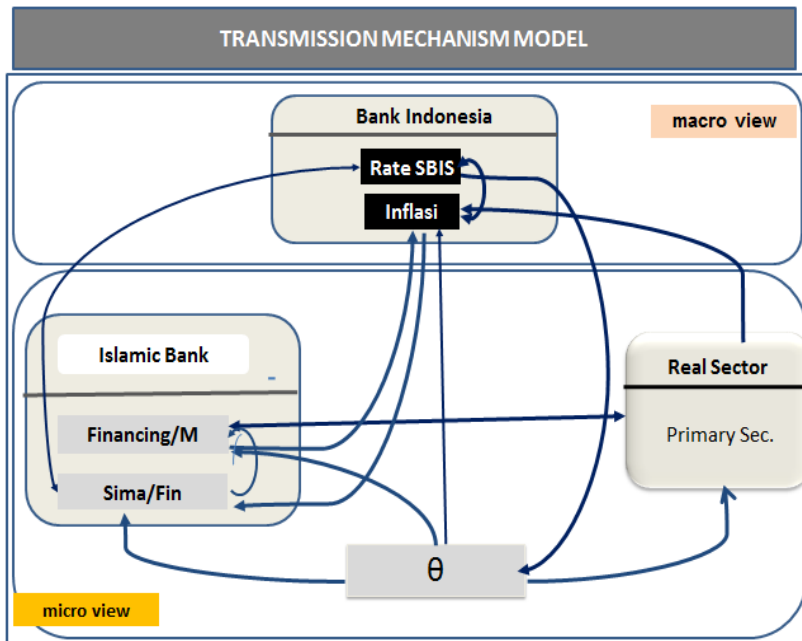


Figure 2: The Relationship of the Monetary Sector to the Primary Sector

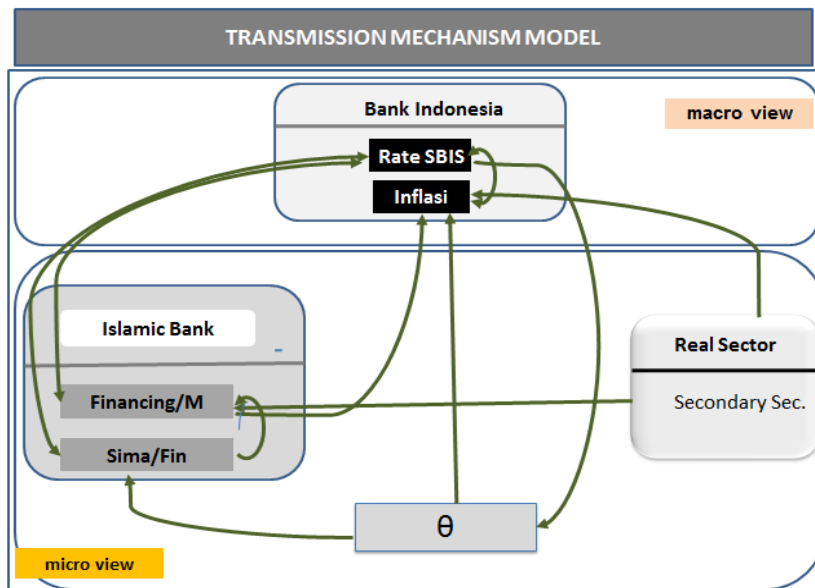


Figure 3: The Relationship of the Monetary Sector to the Secondary Sector

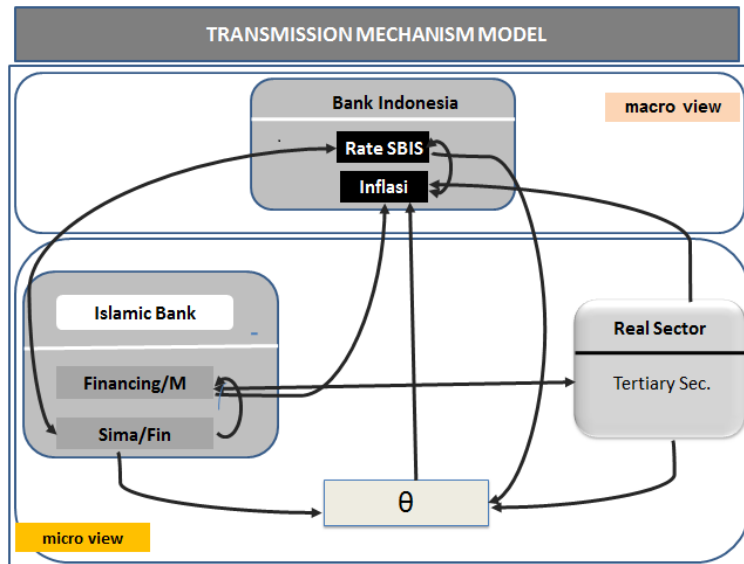


Figure 4: The Relationship of the Monetary Sector to the Tertiary Sector

In the monetary transmission mechanism model it appears that, the pattern of relationship between the monetary sector and the real sector is unclear. Figures 2-4 show the flow of influence of monetary instrument to SIMA for the three economic sectors. However, the next process cannot be seen in the structure of interaction in banking and then to the real sector.

The real sector activity is shown by the influence of financing and inflation and vice-a-versa. This pathway reinforces the proof that, the role of monetary instruments is not yet effective in driving the real sector. The disjoint relationship between the monetary and real sectors is still visible for all the three sectors, as shown in Figures 2-4. This result also indicates a weak level of participation and complementarities among activities in the transmission mechanism system. It takes effort to get a path that shows the direction of circular causation of each activity. The simulation of the circular causation equations should be structured according to the participatory process of the activities. In this case, the role of regulator becomes quite important.

For that reason, confirmation of the results of this estimation has been made with the suggested improvement by conducting an interview with the regulator of Bank Indonesia. Several remarks can be made regarding the estimation result and the idea given that, (i) unresponsive relationship

between rSBIS in shari'ah bank and finally to real sector indicates that shari'ah monetary policy is relatively small to the real sector. The idea is the need to change the monetary instruments of shari'ah into instruments directly related to the development of the real sector. (ii) the relatively inelastic role of financing to the real sector, especially the primary sector (productive sector) shows that in fact, shari'ah banking has not supported the industry. This happens because Islamic banks take advantage of only three financing instruments, namely, (1) murabaha; (2) short term; (3). high turnover.

Conclusion

This paper is among the first of its kind, sparing the contributions by Professor Choudhury (1997, 2015, 2017a, 2017b) and Choudhury, Hossain & Mohammad (forthcoming 2018) to address the critical theme of how to stabilize the economy by the use of endogenous relationship involving abstracto-empirical methodological approach. This paper brings out the elegantly brief definition of the nature of money and the role Islamic banking institution in monetary transmission for real economy stabilization and attaining of wellbeing (maslaha).

What then is money in Islam? This paper has shown that, money identifies with the mobilization of bank-savings as deposits into spending in the good things of life and the avoidance of the socially unwanted choices. Thus the quantitative policy-theoretic formulation and analysis of the [M-F-RE](θ) in evaluating the wellbeing objective criterion of unity of knowledge between the inner variables of this model and their complementary interrelationships to theorize and recommend economic stability constitutes the centrally most focused objective of Islamic methodological worldview.

From the empirical work in this paper we can learn about the affirmation and the corrective for change into [M-F-RE](θ) based on factual case study of Bank Indonesia. Thereby, the potentiality of the [M-F-RE](θ) model and its recommendations in Islamic monetary transmission from Money to Real Economy via the mobilization of Depositor bank-savings is established. This abstracto-empirical gateway towards monetary transmission within 100 per cent reserve ratio monetary system transformation comprises the great Islamic transformation and its evolutionary learning centered Tawhidi methodological worldview.

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