

Review

The *Qur'anic* universe in knowledge, time and space with a reference to matrix game in Islamic behavioural financial decision-making

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The paper is a *Qur'anic* socio-philosophical rarity on the theme of learning model. Such a model is derived from the *Tawhidi* (monotheistic oneness) foundation of knowledge (epistemology). It is shown to construct a moral-social world-system of consciousness (phenomenology). The specific problem of Islamic behavioural economics and finance is shown to respond to such a learning model of *Tawhidi* unity of knowledge, its analysis, and application. The place of consciousness as the central note to Islamic behavioural dynamics in decision-making is shown to be located within the dimensions of knowledge, time and space. The analysis thus extends beyond the horizons of space-time structure. In so doing the paper is a contribution on the expanded and all-comprehensive worldview of the relations between God, Man and the universe embedded in the causal structure of the *Qur'anic* mind (*res cogitans*)-matter (*res extensa*) relations.

Key words: *Qur'anic*, *res extensa*, epistemology, decision-making, horizons.

INTRODUCTION

Discussions on the following questions can be found in the study of Choudhury (2009):

- 1) What is the Universe?
- 2) What is the nature of the dimensions of knowledge, time and space?

Having already been elaborated, these discussions are not re-opened here, instead, the objective of this paper is to combine and summarize the answers to the two preceding questions and to provide a *Qur'anic* exegesis on the nature of the universe as explained by the episteme of unity of divine knowledge. This episteme is referred to as *Tawhid* (meaning oneness of God and of the Divine Law, monotheism) in its relationship to the learning and unifying world-system. Thereby, the universe's structure of knowledge, time and space is studied in relation to opposites: Truth (*haqq*) is weighted against Falsehood (*batil*). These are nonetheless both

signs of God (*ayat-Allah*). An extract of the generalized cosmic representation of the problem of phenomenology of unity of knowledge and the world-system is studied here in reference to individual and social preference maps. These are treated in the contrasting order of good preferences and bad preferences as determined by human consciousness within the model of unity of knowledge. Such a divine phenomenon is referred to as the relationship between *Tawhid* (divine oneness in the *Qur'an*) and the world-system. Embedded in such a phenomenological relationship lays the behavioural economics and finance of the conscious decision-maker.

Objective

The objective of this paper is to formalize the structure of the universe comprising the entirety of the world-systems driven by the epistemology of *Tawhidi* unity of

knowledge. The extension to the dimensions of knowledge beyond only time and space results in a substantive formalism. It implicates the critical theory of how ethics by learning can be endogenously integrated in social financial decision-making. The matrix game as an example given in this paper brings out the intricate behavioural implications of moral-social economic and financial choice. This topic of behavioural social economics embedded in consciousness of relationships between God, Man and the world-system, although most important for the moral actualization of Islamic choices, has not been studied either by mainstream or Islamic economics and finance.

THE UNIVERSAL KNOWLEDGE, TIME AND SPACE CURVATURE IN TERMS OF HAQQ AND BATIL

The universe is the creative continuous domain of signs of God (*ayat Allah*). Those who observe and reflect on the *ayat* are the true believers; whereas those who reject the *ayat* are referred to as disbelievers.¹ Yet none can altogether sidestep the observation of the *ayat*. The universal domain is thus strictly divided between H (*haqq=Truth*) and B (*batil=Falsehood*) in terms of the positive and negative treatment of the *ayat*, respectively.²

The degrees of comprehension and rejection of the *ayat* by Truth and Falsehood, respectively, are progressively changing from lesser to higher levels of human consciousness. Consciousness is the sure characterization of intrinsic knowledge, which is ontologically premised on divine oneness.

We denote the intrinsic knowledge by θ , which is derived from the stock of complete, absolute and perfect knowledge (denoted by Ω). The domain of Ω comprises the divine law of oneness. It is represented mathematically as the super-cardinal topology, by virtue of its non-configurative property of absoluteness, yet fully determining what we refer to as 'everything' (Barrow, 1991). But the matrix of derived worldly knowledge-flows from Ω via the presence of the *Qur'an* and the *Sunnah* (S = Prophetic guidance), and denoted by $\{\theta\}$ -values derived from (Ω, S) , is revealed in the order of unity by organic complementarities between things of the world-system, as they are conceptualized, observed and reflected upon. This combination of formalism and observations is thus induced by the episteme of divine unity of knowledge (*Tawhid*). The derived knowledge-flows denoted by θ as the discursively limiting value of $\{\theta\} \in (\Omega, S)$ therefore belong to the consciousness of the unified world-system.

¹ *Qur'an* (6:39): "Those who reject our Signs are deaf and dumb, -- in the midst of darkness profound: whom God wills He leaves to wander: whom He wills, He places on the Way that is Straight."

² *Qur'an* (53: 19-20): "Have you seen Lat, and Uzza, and another, the third (goddess), Manat?" These are negative signs. Signs of God are pervasive:

Qur'an (41:53): "Soon will We show them Our Signs in the (farthest) regions (of the earth), and in their own souls, until it becomes manifest to them that this is the Truth. Is it not enough that your Lord does witness all things?"

Formalism in the pure ontological universe of divine oneness

$H(\theta)$ denotes the domain of positive *ayats*, but B has no independent power of its own.³ B exists as mathematical opposite of $H(\theta)$. Therefore, such so-called 'negative' *ayats* are determined by the converse of $H(\theta)$. The existence of any of the two (H,B) requires the reflection and observation of the other.

In other words, there exists a feedback mapping (f, f^{-1} in relation to \leftrightarrow) denoted by $(H \leftrightarrow B)$, such that, $B = f(H(\theta))$, f being the functional relationship of $H \rightarrow B$. Therefore, $B = B(\theta)$, though in the negative sense of the *ayat* that is, $dB(\theta)/d\theta < 0$, as $\theta \uparrow, B(\theta) \downarrow$. Besides, for each f there exists a well-defined f^{-1} in relation to each θ -value, such that $f \circ f^{-1} = I$, identity mapping. But such a relationship is of human determination of Truth as being *perfectly* differentiated from Falsehood.

According to these perfectly differentiated states of Truth versus Falsehood, we define the degree of comprehension of truth (and thereby, falsehood) in the human population as follows:

$$C = H/B = H(\theta)/B(\theta) = (H/B)[\theta] = (H=\alpha \text{ percentage of the total population of believers}) / (B=\beta \text{ percentage of the total population of disbelievers}) \text{ [as defined earlier]} \quad (1)$$

$$C(\theta) > 0.$$

$$dC(\theta)/d\theta > 0; dH(\theta)/d\theta > 0; dB(\theta)/d\theta < 0, \text{ as } \theta \uparrow. \quad (2)$$

The $[\theta]$ denotes common functional dependence of all the inner variables in $(.)$.

In the case of increasing consciousness of the universe with the observers of divine oneness increasing, we obtain: $dC/d\theta > 0$.

THE LARGE-SCALE UNIVERSE IN KNOWLEDGE, TIME AND SPACE DIMENSIONS

Ultimately, the degree of consciousness of the universe is gained from $\{\theta \in (\Omega, S)\}$ by an intermediate well-defining mapping denoted by S . We now write the well-defined meanings of H,B in terms of the worldly realized configuration of $\{\theta\}$ as follows:

For every $\theta \in (\Omega, S)$ explained in the ontological sense of the purity of (Ω, S) , the mapping $S \equiv f$.⁴ Affirmation of the

³ *Qur'an* (2:38-39) declares that Satan (Falsehood) has no independent power of its own.

⁴ S is the *ontological mapping* of Ω , the divine law, onto the world-system through the *functional* ontology of derived knowledge of oneness in its pure and phenomenological sense of relating to the events of world-system. S is referred to as the *Sunnah*, the guidance of the Prophet Muhammad. The core as the purpose and objective of the *shari'ah*, known as *maqasid ash-shari'ah*, is thus the topological bundle of knowledge and the world-system denoted as follows:

ayats implies acceptance of $\theta \in (\Omega, S)$, as this knowledge-flows reflect themselves in the world-system of diversity and continuity of potentiality, observation, entities and their relations. We now denote such worldly observed categories by $H(\theta \in (\Omega, S))$. In the epistemic sense of worldly observations there also exist the co-determined reverse mappings ($H \leftrightarrow B$). But now the reverse mappings are not perfect categories, as previously characterized to yield the identity map I .

We write the resulting *imperfectly comprehended* and observed reverse mappings ($H \leftrightarrow B$) as, $f \bullet g = \delta > 0$. The implication here is this: Man is not perfect in knowledge to understand and observe the perfectly true reality. Thus, Man is not utterly and hopelessly damned in the living world when he errs in the face of the divine hope. Yet the mind progressively rises to the conscious self-actualization of the divine truth of oneness in the evolutionary knowledge domain of $\theta \in (\Omega, S)$. Only in the pure ontological sense, that is in the ultimate decision of God (Hereafter), it is possible for the final state to be established by the representation denoted by $f \bullet g = \delta = I$.

With the above transformations of the pure ontological category into its worldly epistemic meaning of unity of knowledge, we re-write expressions (1) and (2) as:

$$C(\theta \in (\Omega, S)) = (H/B)[\theta \in (\Omega, S)] = f \bullet g = \delta > 0, \text{ such that (3a)}$$

$$dC(\theta)/d\theta > 0; dH(\theta)/d\theta > 0; dB(\theta)/d\theta < 0., \text{ for each } \theta \uparrow \in (\Omega, S). \quad (3b)$$

THE KNOWLEDGE-INDUCED CONSCIOUS LEARNING RELATIONSHIP OF THE WORLD-SYSTEM

Consciousness and the consequential world-system rise and fall conjointly, as $\{\theta \in (\Omega, S)\}$ increases or falls, respectively. The result is reflected in the increasing or decreasing values of C . We write the sequences of such complex evolutions by:

$$C_i = \delta_i > 0, \quad (4)$$

$\{\Omega \rightarrow_S \{\theta\}\} \rightarrow_x \theta \rightarrow_w W(\theta, x(\theta)) \rightarrow$ recursive continuity in knowledge, time and space until the Hereafter).

The functional meaning of the *shari'ah* also involves human agency of textual interpretation and exegesis, say an extended functional mapping:

$\{\Omega \rightarrow_S \{\theta\}\} = (\Omega, S) \rightarrow_r \{\theta\} \rightarrow_f \{\theta^*\} \rightarrow_x \theta^* \rightarrow_w W(\theta^*, x(\theta^*)) \rightarrow$ recursive continuity by discourse in knowledge, space, time until the Hereafter}.

The idea of discourse is taken up in two meanings, namely, discourse as consultative agency called the *shura* (*Qur'an*, 42:38), and intrinsic organic complementarities and unifying interrelations between 'everything' called God-consciousness (also worship), that is '*tasbih*' (*Qur'an*, 42:49-53). The two meanings and functions exist in inexorable complex organic ontology. Together they form the phenomenological model of the universe.

While, $\{\Omega \rightarrow_S \{\theta\}\} = (\Omega, S) \rightarrow_r \{\theta\}$ as the core of the *shari'ah* forms the *maqasid ash-shari'ah*; the organic form of the *shari'ah* being $\{\Omega \rightarrow_S \{\theta\}\} = (\Omega, S) \rightarrow_r \{\theta\} \rightarrow_f \{\theta^*\} \rightarrow_x \theta^* \rightarrow_w W(\theta^*, x(\theta^*)) \rightarrow$ recursive continuity by discourse in knowledge, space, time until the Hereafter}; the wellbeing function, *maslaha*, is denoted by $W(\theta, x(\theta))$.

$i = 1, 2, \dots$ in the discrete case, or $i \in \mathfrak{R}$, real space in the continuous sense.

But there is a limiting value of all such categories. This takes place in the penultimate⁵ structure of the universe, the event of the hereafter.⁶ That is, as the complex accumulation of $(\theta \in (\Omega, S))$ converges to the ontological state of completeness of knowledge in oneness denoted by Ω , then $H(\Omega) = H^*$; in the ontological pure state of the completed universe in its knowledge, time and space dimensions. H^* is therefore understood in the super-cardinal sense. Now, $B(\Omega) = B^*$, as negative entropy in the super-cardinal sense. But since H^* and Ω cannot be two different super-cardinal states of the same penultimate universe, therefore, $H^* = \Omega$, in the sense of the completed universe in knowledge, time and space. Also, $C(\Omega) = \delta^*$, $dC(\Omega)/d\theta = \{\text{ZEROS}\}$ (Leon, 2002)⁷ of all functional relations of the completed universe in the super-cardinal sense.

The super-cardinality here means that the completed structure of the final universe is *not exactly* commensurate in form (Rucker, 1983). Still, from such a large scale (entropic and de-entropic) universal domain it is possible to derive relational meanings for the world-system (Choudhury, 2006, chap. 2). An example of the super-entropic state of the physical universe, for which no space-time structure exists, is the 'negative' energy quanta, as of the inside of the Black Hole (Wald, 1992).

The implication here is that, as the learning universe move towards the consciousness of divine oneness, the idea of Falsehood disappears. Falsehood is destroyed by the reversal of entropy in the pure ontologically completed universe of divine oneness. The universe then attains its net worth. This is the quality of Pure Truth. In it, Falsehood is destroyed as an entropic complement of truth: $H \uparrow$ to its super-cardinality dimension; and $B \downarrow$ to its entropic zeros of relations. Consequently, $(H/B) \uparrow$ to super-cardinality, as $H \rightarrow H^* = \Omega$, and the identity I -map is established in its pure form, as shown above in the case of ontological purity.

CONTINUOUS TRANSFORMATION OF DISCRETE EVOLUTION OF THE CONSCIOUS WORLD-SYSTEM

In the continuous case of learning by $\{\theta \in (\Omega, S)\}$, the learning universe moves inexorably towards its ultimate

⁵ The universe's destiny in the Hereafter may be referred to as both ultimate and penultimate. This is because the Hereafter is not itself an end, but a perpetual continuum within God's optimal blessings, which are of no end.

⁶ *Qur'an* (78:1-5): "Concerning what are they disputing? Concerning the Great Event (News), about which they cannot agree. Verily, they shall soon (come to) know! Verily, verily they shall soon (come to) know!"

⁷ The theorem can be stated as follows: If the functional $p(x) \in S$, where S denotes the set of polynomials less than degree 'n' with the property that $p(0) = 0$, then S is non-empty, since it contains the zero polynomial. S is then a non-empty subspace of p_n , with, $\{a.p(0)\} = \{a.0\} = \{0\}$. Thereby, $(p_1 + p_2 + \dots + p_n)[0] = p_1(0) + p_2(0) + \dots + p_n(0) = 0 + 0 + \dots + 0 = \{0\}$, set of zeros of the polynomials in S .

goal of the hereafter. Continuity of the learning universe here rests primordially on knowledge-flows, $\{\theta \in (\Omega, S)\}$. This in turn determines the space and time structure (*ayat* of a positive nature). The heightened consciousness and its annulment of falsehood over the pervasively evolutionary complementing world-system across knowledge, time and space dimensions causes the δ -trajectory to learn and evolve from the point of pure ontological super-cardinal origin of (Ω, S) to the world-system of *ayats* existing in evolutionary knowledge, time and space dimensions, finally moving towards the ultimate convergence in the super-cardinal universe of the Hereafter.

Such an evolutionary learning trajectory of rising universal consciousness towards the attainment of truth and the evanescence of falsehood is denoted by the continuous dynamic movement of the consciousness trajectory over the expanse of the knowledge, space and time dimensions.

The evolutionary result combining the pure ontological Beginning, the World-System, and the pure ontological equivalence of the Hereafter is formalized as follows:

$$C((\theta, \mathbf{x}(\theta)) \in \text{relational order of unity of knowledge denoted by } \{(\Omega, S) \rightarrow \text{world-system} \rightarrow (\Omega, S)\} = \delta(\theta) \quad (5)$$

Such that, $\mathbf{x}(\theta) = (\text{space } x_i, i = 1, 2, \dots; \text{time } t, \text{ all as entities induced by knowledge flows } \theta \text{ of divine oneness} \equiv \textit{ayat})$;

$$dC(\theta, \mathbf{x}(\theta))/d\theta = \sum_i [(dC/dx_i) \cdot (dx_i/d\theta)] \quad (6)$$

$$dH(\theta, \mathbf{x}(\theta))/d\theta > 0; \quad dB(\theta, \mathbf{x}(\theta))/d\theta < 0.$$

Note in the above expressions that we have generalized the forms by introducing $\{(\theta, \mathbf{x}(\theta))\}$. This is due to the phenomenological context of expression (7) and its details that are projected on H, B, C when related to the world-system. The properties of topological learning (knowledge), continuity (time) and pervasiveness (space) conveyed by expression (7) is also carried over and extended in the most generalized system of organic relations. All these are uniquely premised on the episteme of unity of knowledge in relation to the world-system. This episteme is the *Tawhidi* origin and completeness. It is recreated in the Hereafter, and is used to simulate the intermediating world-system of 'everything', namely $\{(\theta, \mathbf{x}(\theta))\}$. The elements in such a vector, matrix and tensor representation enter the simulation of the wellbeing function, $W(\{(\theta, \mathbf{x}(\theta))\})$. The simulation is done by circular causation between the $\{(\theta, \mathbf{x}(\theta))\}$ -variables *ad infinitum*. Figure 1 summarizes such properties across the knowledge, space and time dimensions of evolutionary learning processes.

Figure 1 shows the movement of degrees of the self-actualizing universe in the midst of divine oneness as it is projected in the pure ontological sense and in terms of its

relationship with the world-system:⁸

AN APPLICATION OF THE TAWHIDI PHENOMENOLOGICAL MODEL: BEHAVIORAL ECONOMICS AND FINANCE ISLAMIC

An example of a worldly relation derived from the phenomenological explanation of the unity of divine knowledge can be found in Islamic economics, finance and world-system studies. This field of intellection is filled with many examples of which we will examine one here.

Consider two kinds of preferences (consumer, community, wellbeing and social choice, principal-agent, and firm-specific). One set of preferences is ethically induced by the understanding of the world-system as an organic unity caused by the good things of life that are all induced by the episteme of unity of knowledge. This set of preference maps denotes $H(\theta)$.

The second set of preferences is a hedonic one, styled by self-interest, competition and individualism. These two sets of preferences opposes each other. However, since the knowledge that flows of our experiences bear no perfection, learning in conscious oneness must always and everywhere remain evolutionary. Such preference maps, particularly characterized in neoclassical economics and also transferred to the marginalist foundation of macroeconomics (Dasgupta, 1987) are denoted by $B(\theta)$.

The above-mentioned model of universal consciousness of divine oneness is now described by the expressions (1)-(6). The example of the premise denoted by $\theta \in (\Omega, S)$ is the divine law, called the *shari'ah* (Islamic Law). The *shari'ah* is thus taken to be the core of the *Qur'anic* Law rather than a humanly developed (*fiqh*) Islamic Law (Ghazzali trans. Zidan, 1997). The *shari'ah* has its objectives and purposes called the *maqasid ash-shari'ah* (Masud, 1984). In our model, the *maqasid ash-shari'ah* are denoted by the increase in the epistemic knowledge of divine oneness and its induced world-system with particulars denoted by,

$$(\theta, \mathbf{x}(\theta)) \in \{(\Omega, S) \rightarrow \text{World-System} \rightarrow (\Omega, S)\} \quad (7)$$

The *maqasid ash-shari'ah* thus defined are evaluated by means of their criterion of meeting the wellbeing objective, termed *maslah* (Masud, op cit). In our model, *maslah* is defined by $C(\theta, \mathbf{x}(\theta))$. This is also denoted by

⁸ Points like a,b,c,... along the Interactive, Integrative and Evolutionary (IIE)-trajectory are evolutionary equilibrium points of learning processes along the knowledge, time and space dimensions. Thereby, the families of C-curves form perturbation surfaces. So also the TT trajectory and the (H/B)[θ] relations in respect of entropic and de-entropic universes are characterized by incomplete learning. Only discursive behavior marks these learning processes. Here discursive behavior is experienced both by human agency as well as inanimate entities. In both cases discursive behavior in reference to the *Tawhidi* episteme is signified equivalently by unity of knowledge, participation and pervasive complementarities all existing in continuous perpetuity in 'everything' across the knowledge, space and time dimensions.

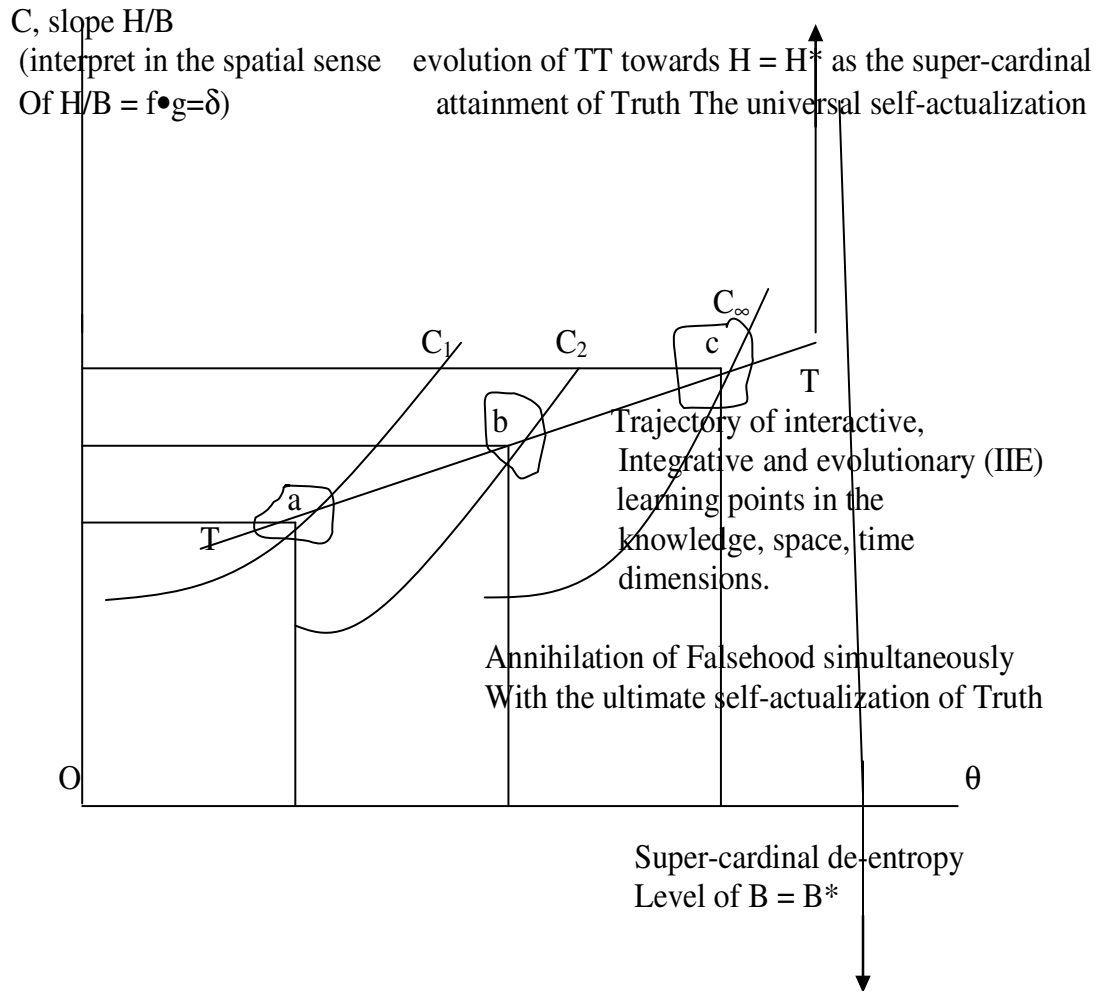


Figure 1. Dynamics of the 'Tawhid→World-System→Tawhid = Hereafter' relation

$W((\theta, \mathbf{x}(\theta)))$. The certainty property of *maslaha* with the underlying functions of ethical preference induction and its effects on market transformation, institutional structuring, policy-making and human resource development is denoted by the functions, $dC(\theta, \mathbf{x}(\theta))/d\theta > 0$, $dH(\theta)/d\theta > 0$; $dB(\theta)/d\theta < 0$, as $\{\theta \in \Omega, S\}$ increases. The end goal of the *maqasid ash-shari'ah* and of *maslaha* is actualization of the divine bliss in the Hereafter. It also has the goal of translating the relations of the laws and consequences of this divine bliss into the preferences of a good society. The measure of this worldly bliss is the attainment of self and society under the episteme of unity of knowledge. This kind of causality equivalently arises from the ontology of the oneness of God (*Tawhid*) and from the epistemology of organic unity of the world-system and 'everything' therein in light of the *shari'ah*. The *shari'ah* thus defines the functional ontology, which is reflected and observed in learning towards unified preferences of self, community, society, institutions, diverse markets, and the nature of policies and social choices.

As explained by Figure 1, the super-cardinal relations

between Truth and Falsehood lead to the inevitable destruction of Falsehood. In this manner, the accomplishment of Man in relation to the universe rises to the net worth of universal consciousness. Within this universal attainment, preferences attain patterns emanating from the evolutionary learning universes that are never optimal in nature. The optimum exists in the relational concept of super-cardinality at the End Event of the Hereafter and in the Originary Event of *Tawhid* as the pure ontology.⁹

There is still another instance where optimality exists. This is the instantaneous happening at the core of the unknown. But this *hidden core* called *ghayb* in the *Qur'an* is not unraveled to the universe and its agents. It is in the custody of God alone.¹⁰

In the mundane world, the above phenomenological facts are demonstrated by the futile impossibility of socio-

⁹ *Qur'an* (92:13): "And verily unto Us (belong) the End and the Beginning."

¹⁰ *Qur'an* (39:63): "To Him belong the keys of the heavens and the earth....."

scientific models to attain exact forecasts and predictions to which they endeavor (Mach, 2008; Soros, 1998). In our phenomenological case of the learning world-system in unity of knowledge, complexity replaces the outmoded linear models of scientific conceptions (Bertuglia and Vaio, 2005). Indeed, today science has become a study of the process of change (Hull, 1988). Evolutionary cybernetic and system-views have replaced the orthodoxy of optimality (Johannessen, 1998; Shakun, 1988; Campbell, 1987).

According to the phenomenological model of unity of knowledge (*Tawhid*), the various curves of Figure 1 are described by simulative perturbations, as learning proceeds towards the Hereafter through the medium of learning relations of the world-system. This learning continuity is implied by expression (7).

Individual preferences and social choices, and consequently, their impact on markets, exchangeables, society and institutions attain similar transformations. Consequently, the *maslaha* (wellbeing) functions are now denoted by the learning criterion,

$$\text{Simulate } C(\theta, \mathbf{x}(\theta)) \quad (8)$$

subject to iterations by circular causation between the variables, $(\theta, \mathbf{x}(\theta)) \in \{(\Omega, S) \rightarrow \text{world-system} \rightarrow (\Omega, S)\}$:

$$x_i = f_i(\theta, \mathbf{x}_i(\theta)), \quad i \neq j = 1, 2, \dots, n \text{ (number of variables in the } \mathbf{x}(\theta)\text{-vector.)} \quad (9)$$

$$\theta = g(\mathbf{x}(\theta)), \text{ which in the end is a monotonic positive representation of } C(\theta, \mathbf{x}(\theta)). \quad (10)$$

$C(\theta, \mathbf{x}(\theta))$ now denotes the system of preference maps in ethical and social choices, subject to the progressive actualization of unity of knowledge, that is complementarities, between the knowledge-induced variables. This unifying experience is realized by circular causation dynamics of the relations in expression (9). Expression (10) implies that the *maslaha* is estimable. Therefore, policies and institutional changes and revisions of structures are possible in $C(\theta, \mathbf{x}(\theta))$. $C(\theta, \mathbf{x}(\theta))$ is synonymous with the function, $\theta = g(\mathbf{x}(\theta))$. In empirical works to estimate expression (10), a combination of structural multiple regression analysis along with Spatial Domain Analysis have been used for the complete simulation exercise of expressions (8)-(10) (Choudhury and Hossain, 2006).

An example of transformational inter-reversibility between Truth ($H(\theta)$) and falsehood ($B(\theta)$)

The transitional form of the $(H, B)[\theta]$ relationship in Figure 1 and as implied by expression (7) implies that it is possible for either H and B to change sides. A false entity has scope to reject itself and revert to a good entity.

Likewise, a good entity can demise into a false entity. These reversals can continue on in cycles, but with an ultimate convergence in respect of the discursively limiting derived values of $\{\theta \in (\Omega, S)\}$, as in expression (7).

An example of such transformational reversals is the reverse entropy caused by mankind's return to a sustainable and conscious consumption, production and resource mobilization, ownership and equitable distributional patterns in socioeconomic development (Hossain et al., 1998). Such return to sustainability carries along with it transformational reversals in all possible entities, institutions, and individual and social preferences. Thus $B(\theta) \rightarrow H(\theta)$. For such a transformation we assign a payoff of 1 to $B(\theta)$. The payoff to $H(\theta)$ too is 1. Hence we have a matrix payoff of (1,1) for such a transformational reversal.

Likewise, it is possible to have a reversal of the type $H(\theta) \rightarrow B(\theta)$. In such a case, the matrix payoff is given by (0,0). An example of such a case is the good planet earth turned into ecological disaster.

The matrix payoff (1,0) stands for perpetuation of $(H, B)[\theta]$ across the usual Good, Bad combination. An example here is of the good earth perpetuating into a productive one in perpetuity; while the bad earth perpetuates into degraded earth.

The matrix payoff (0,1) stands for the reversal of a $H(\theta)$ situation into $B(\theta)$, as of Good entities becoming Bad ones; while a Bad situation reverts to a Good one. An example here is of the good earth being degraded into barren one; and a barren earth being reverted into productive one.

In respect to the above explanation of transformational reversals, Figure 2 gives the various matrix payoffs.

The payoffs associated with a_{ij} , $i, j = G, F$ are interrelated across nexus of relationships and no independence is allowed for the organic sense of systemic relationship. This is the implication of simulation of wellbeing subject to circular causation between the variables (*ayat*) underlying expressions (8)-(10).

Consequently, the usual meanings of game-theoretic solutions by minimax and maximin games are untenable (Osborne and Rubinstein, 1994). The Nash-solution for steady-state equilibrium in the payoff matrix is likewise untenable (Shubik, 1989). In the Prisoners' Dilemma game applied to the problem of transformational reversibility, coefficients a_{GG} and a_{GF} are acceptable, but relational causality exists. Therefore, a_{FF} is unacceptable in the sense of transformational reversibility.

The results obtained have important implications in non-optimal games that essentially explain the relational learning consequences of knowledge-induced coefficients of payoffs (Osborne and Rubinstein, 1994). The analytical result also implies that the circular causation equations of expression (9)-(10) must be taken in their structural econometric forms. Reduced forms cannot be well-defined.

These are significant results for quantitative policy analysis. They also define the domain of institutional

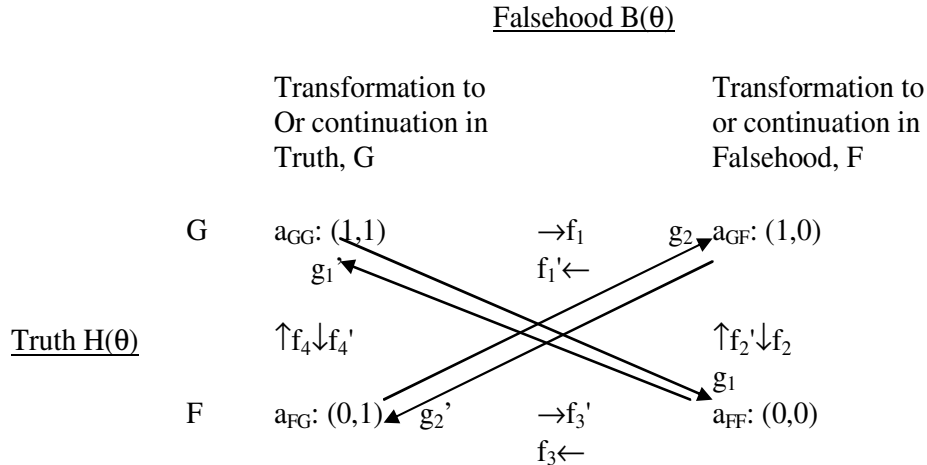


Figure 2. Matrix payoffs for transformational reversals between (H,B)[θ] combinations over good and bad states of nature.

political economy involving the Islamic epistemic foundation to problems of economics, finance, society and science (Choudhury, 2007). The findings derived apply to the problem of preference maps and to wider problems of decision-making under learning processes.

The following are the payoffs against each of the matrix entries with conditional probabilities (Hogg and Craig, 1965):

$$\text{Payoff}(a_{GG}) = p_1(G|G)*1 + p_2(G|F)*1; \text{ where } p_i(x|y) \text{ denotes the conditionality probabilities for the two contingencies } G|G \text{ and } G|F, \text{ respectively} \quad (11)$$

$$\text{Payoff}(a_{GF}) = p_1(G|F)*1 + p_2(F|G)*0; \text{ where the conditional probabilities have similar meanings as above for the cases as shown.} \quad (12)$$

$$\text{Payoff}(a_{FG}) = p_1(F|G)*0 + p_2(G|F)*1, \text{ with similar meanings for the conditional probabilities for the cases shown.} \quad (13)$$

$$\text{Payoff}(a_{FF}) = p_1(F|G)*0 + p_2(F|F)*0, \text{ with similar meanings for the conditional probabilities for the cases shown.} \quad (14)$$

The above payoffs refer to the cross causality as shown in Figure 2. This suggests that payoffs according to different possible transformational reversibility are functionally related. This allows for reconstructions of preferences at all levels by circular causation, while allowing for adverse possibilities in prevalent states of contingency.

As an example, consider the following result; the rest can be worked out:

$$g_1 = f_2 \cdot f_1 \Rightarrow \text{Prob}(g_1) = \text{Prob}(f_2|f_1) \cdot \text{Prob}(f_1) = [\text{Prob}[(a_{FF})|a_{GF}] +$$

$$\text{Prob}(a_{GF}|a_{GG})] \cdot \text{Prob}(a_{GG}) \quad (15)$$

The *Qur'an*¹¹ characterizes states of variations between highs and lows of moral achievement representing human possibilities affecting the reversibility of preferences and their artifacts in the world-systems. Conditional probabilities and their payoffs are associated with such diverse possibilities defining transformational reversibility.

CONCLUSION

The socio-scientific world-system in which are embedded the economy, finance and society manifests an interactively integrated and evolutionary domain that is graduated by circular causality between sub-systems and their entities via learning and unification. Consequently, the extended and evolutionary form of the C(θ,x(θ))-function occurs across diverse sub-systems. These include the hardcore sciences, as in the case of developing technology, and the social sciences as in the case of choices of institutional structures. The latter comprises the area of policy-making, decision-systems, etc. The preference maps denoted by simulated values of C(θ,x(θ))-curves in Figure 1 show simulative perturbations. Thereby, the interactively integrated and evolutionary (IIE) learning relations in unity of knowledge across complementary sub-systems attain curvatures with simulative perturbations.

Therefore, the learning and unifying socio-scientific universe in knowledge, time and space dimensions has no steady-state curvature, as otherwise described by relativity physics and the non-process representation of physical and social sciences.

¹¹ *Qur'an* (95:1-8)

Rather, the *Qur'an* (13:1-5) explains the conscious universe as an interactively integrated and evolutionary (IIE) nexus, whose IIE-learning experience is gained through the process of learning in unity of knowledge. Such a process marks the phenomenology of unity between the divine law, *Tawhid*, and the world-system.

This kind of learning dynamics is marked by the realization of $H(\theta)$ moving inexorably towards H^* , as shown in Figure 1. The *Qur'an* characterizes the opposite of this worldview by $B(\theta)$, which dissolves into disorder in the face of $H(\theta)$. $B(\theta)$ thus moves perpetually and continuously towards its entropic end-state in B^* at the Event of the Hereafter. Thus, *Tawhid* and the Hereafter as equivalent super-cardinal ontologies of perfection of purely unified knowledge are the Great Events of Reality¹².

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¹² *Qur'an* (78:1)