

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

VI

FINANCIAL ENGINEERING: AN ISLAMIC PERSPECTIVE

The term “financial engineering” has many connotations, and might have different meanings in different contexts (Marshall and Bansal, 1992). In conventional financing, it relates mostly to derivatives. But the term is broader than that. For Islamic finance, the concept takes a special importance, as we shall see.

Definition and Concept

According to Finnerty (1988, 1994), financial engineering involves the “design, development and implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance.” The objectives of financial engineering are to lower transaction costs and achieve better returns (Merton, 1992).

Innovation by nature is unpredictable. If it were, it is no longer innovative. Thus, attention should be directed towards tools and techniques that facilitate innovation and creativity. Financial engineering therefore can be better described as: *principles and strategies for developing innovative financial solutions.*

The difference between tools for innovation and innovation itself is emphasized by de Bono (1970). He coined the term “lateral thinking” to describe thinking strategies and techniques that permit and encourage creativity. Creativity therefore is a consequence rather than the subject of analysis. Similarly, financial engineering should be concerned with tools and techniques for developing creative instruments and innovative products (see also Mason et. al., 1995, p. xiii).

From an Islamic point of view, there are Shariah principles that should be observed for developing financial products. Thus the definition emphasizes both principles and strategies for financial innovation.

The definition mentions financial solutions rather than instruments or contracts (al-Suwailem [8]). This highlights the added value of innovation. A “solution” is something that satisfies a genuine need that was not possible before. This is general enough to include processes, instruments, or products that result in better

efficiency and returns, as emphasized by Merton (1992). According to Mason et. al. (1995), financial engineering shall not be measured by the complexity of mathematical models involved or of the legal documents required. Rather, it is measured by the expanded economic and managerial flexibility it offers (p. xiii).

Value of Innovation

Innovation is a change, and change creates instability. Instability obviously is not desirable, and thus innovation in itself is not a goal. Only when innovation creates value which offsets the instability it creates that it becomes desirable. Innovation therefore is a tool and a means for generating value. Mason et. al. (1995) rightly note that relevance of financial innovation is measured by its impact on the effectiveness of the financial system, not by its novelty. Leathers and Raines (2004) point to the negative effects of derivative innovations, and that such innovations are inconsistent with Schumpeterian view of creative destruction. This confirms the need for innovations within a different framework and in a different direction.

Shariah and Creativity

Shariah provides a comprehensive set of rules governing and guiding human behavior. Although these rules restrain behavior in some respect, this does not hinder creativity. In fact, the opposite is more likely to be true, since creativity is stimulated by constraints. Elster (2000) shows how and why rational agents in some cases might be better off when they have fewer options. In such cases, less is more, which has been supported by many experimental studies (Gigerenzer et al., 1999). Elster also shows how artists, for instance, deliberately choose to restrain themselves in order to be more creative. Silber (1983) provides evidence that constraints were a major force behind financial innovations that improved economic performance and welfare.

Thus, constraints need not hinder creativity. This is especially true with respect to Divine rulings. Such rulings imply the ultimate wisdom of Allah (*s.w.t.*), and their observance therefore will only improve human life. Islamic teachings in general provide the right environment for valuable creativity and innovation. The Qur'an frequently emphasizes reflecting and pondering upon signs of truth, and condemns those who blindly follow inherited culture even if it contradicts the facts. Again, contrarious thinking is not necessarily a virtue in itself, but a means to discover the truth and avoid deceitful perceptions.

Regulatory Arbitrage

Merton Miller (1986) argues that a major impulse for financial innovation is a desire to avoid regulation. Given the increasingly globalized financial markets, investors face different regulatory environments. This created an opportunity to overcome local regulations using suitably designed instruments (mostly derivatives) issued across the borders. Free-market advocates particularly see regulations hindering economic efficiency, and thus view circumventing regulations via financial innovation as a means to restore market efficiency (Partnoy, 1997).

This might be relevant for outdated or artificial regulations that serve little or no social function. However, regulation in principle serves a crucial role in stabilizing the market and minimizing systemic dangers. Regulations regarding disclosure and capital requirements, for example, are essential for self-discipline and risk control. Circumventing such regulations, through financial innovation and accounting manipulation, very likely leads to undesirable consequences, with Enron and similar episodes as visible examples.

Similarly, from an Islamic point of view, circumventing Shariah principles would negatively affect market performance and jeopardize objectives of Islamic finance in the first place. More on this point later in this section.

State of Financial Innovation

Professor Peter Drucker (1999) argues that financial-services industry is now declining. The reason, he writes, is simple: “The dominant financial-services institutions have not made a single major innovation in 30 years.” Instead of inventing new services to customers, financial firms are mostly trading for their own accounts, thus involved in a “zero-sum game,” since the gain of one firm is the loss of the other. The only innovations during the past three decades, he argues, have been “allegedly ‘scientific’ derivatives,” which are no more scientific than systems used in Monte Carlo or Las Vegas. “As a result, the industry’s products have become commodities and increasingly both less profitable and more expensive to sell.”

Drucker argues that there are now three possible roads the industry can take. The easiest is to keep the current practices and trends. The industry may survive, but it continues its decline. The second is for the industry “to be replaced by innovating outsiders and newcomers.” The third is that the industry “to become innovators themselves and their own ‘creative destroyers.’” With the increasing change in world

economy, the first road is not really an option. Thus, the industry either changes itself, or outsiders will do so. Not surprisingly, he titles his article: “Innovate or die.”

This points that the Islamic industry has a good opportunity at this stage to provide genuine and value-adding financial services that the industry is seriously lacking.

Principles of Islamic Financial Engineering

From an Islamic perspective, we can identify four principles for financial engineering, two concern objectives: principle of balance and principle of integration, and two concern methodology: principle of acceptability and principle of consistency.

Principle of Balance

This principle reflects the comprehensive approach of Islamic principles to human incentives. It stresses the balance between self-regarding and others-regarding interests, between for-profit and non-profit activities, between competitive and cooperative relations. Islamic rules draw clear and decisive boundaries between the two domains, and successfully achieve internal balance and equilibrium between the two. The obligation of *zakat* and prohibition of *riba* are two clear examples. Capitalism stresses for-profit and market-oriented approach for nearly all economic problems. Communism, on the other hand, relies mainly on non-profit mechanisms to solve the same problems. Islamic economics, in contrast, takes a balanced approach. Both for-profit and non-profit mechanisms are essential for satisfying economic needs.

No economy can thrive solely on for-profit transactions. In fact, the existence of the society, through families and communities, is based on cooperative rather than for-profit bases. Nonprofit organizations account for about 90% of all non-governmental schools and colleges, and two-thirds of all hospitals in the U.S. (Hansmann, 1996).

Accordingly, many financial and economic objectives can be achieved through cooperative, rather than for-profit, arrangements. The most obvious example is insurance. While commercial insurance is widely considered unacceptable from Shariah point of view, cooperative and mutual insurance is unanimously accepted. Cooperative arrangements can be more efficient than commercial instruments, and thus better able to serve relevant needs.

Interdependence

It is important to note that cooperative arrangements differ from donations and charity. Professor Stephen Covey (1990) classifies human relations into three stages depending on their degree of maturity:

1. Dependence
2. Independence
3. Inter-dependence

The first stage is dependence, where one relies on others to satisfy his or her needs. This is especially true in the early stages of life, where a child is largely dependent on his parents and family. Afterwards, one builds up his identity and try to be independent from others. The most advanced stage is inter-dependence. It is a mutual relationship between independent persons, that utilizes benefits of cooperation to achieve results no single person can.

These three stages have their counterparts in economic behavior. Dependence corresponds to donation and charitable behavior. The receiver is dependent on the donor. At any point in time, there are always people who cannot satisfy their needs on their own, and must depend on others for that. Independence corresponds to self-interested, for-profit, transactions. Agents get what they want through their own resources. The most advanced stage, inter-dependence, corresponds to mutual and cooperative behavior. It is also called reciprocal relations (e.g. Gintis et. al., 2005; Sobel, 2005). These are not pure for-profit nor pure charity, but combine properties of both to achieve higher objectives. While communism was concerned mainly with solving the problem of dependent agents, capitalism is concerned mainly with achieving independence through self-interest and market forces. Islamic economics acknowledges these two types of relations, but adds to them the more mature relation: cooperation and inter-dependence.

As we shall see later, cooperative insurance is built on reciprocal, inter-dependent relations, rather than pure charity and donation.

Principle of Acceptability

This principle belongs to methodology but logical sequencing requires presenting it at this point. The principle states that all economic dealing are generally acceptable unless otherwise stated by Shariah (e.g. Ibn Taymiah [3]).

The principle is based on the assumption that economic interactions aim to satisfy normal human needs and preferences. Islam views man to be driven by nature to the good, and thus normal interactions will normally lead to the good of the society. Obviously, evil exists, and this is why there are rules to govern economic behavior.

These rules are on the preventive side with respect to for-profit activities, but are on the affirmative side with respect to non-profit activities. The reason is the nature of human incentives. According to al-Shatibi [11], whenever there are sufficient incentives to pursue legitimate objectives, like seeking profits, the Qur'an will not overly insist on it to avoid extreme responses. On the other hand, when there are less than sufficient incentives to pursue some objectives, like giving donations, the Qur'an will particularly emphasize it to compensate for reduced incentives. This explains why most Shariah regulations of for-profit transactions are on the preventive side. Nonetheless, the Qur'an in many verses praises commerce and trade (e.g. 73:20).

The principle of acceptability is a corner stone for innovation. There are no limits on human imagination and creativity, as long as it does not cause more harm than good. One needs only to check that none of the prohibited dealings contaminate the transaction. Beyond that, all possibilities are open.

The principle implies that to evaluate a product, we don't have to show that it is acceptable; rather, we need only to see if it contains any of prohibited dealing. Accordingly, if two views are presented regarding a certain product, one considers it acceptable while the other doesn't, then the burden of proof is on the latter. Those who accepts don't have to prove it, since this is the default position of Shariah.

Roots of Prohibited Dealings

Based on the principle of acceptability, we need to worry mainly about prohibited dealings with respect to for-profit activities. Generally speaking, most regulations of for-profit activities serve to prevent the most important unjust dealings: *Riba* and *gharar*. We have already discussed the concept of *gharar* in detail. So we will focus here on *riba*, as well as the common aspects of the two.

Riba, or usury, is essentially interest on lending. Islam is not unique to prohibit *riba*, since all divine religions do (Chapra, 2004). The objective of finance in general is

to promote growth and fair distribution of real resources. Prosperity and welfare are determined ultimately by real wealth. Accordingly, the financial sector works to serve the real sector.

Riba separates finance from real transactions. Since the two counter-values of a loan are identical, it follows that interest becomes purely the cost of time, or the cost of pure finance. Pure debt creation is less constrained than real wealth; it takes only the agreement of the two parties to postpone a due debt with increasing magnitude. Consequently, growth of debt tends to exceed that of the real economy. With compounded interest, debt services grow much faster than real income, and will take an increasingly dominant share of it. Thus the real sector will be servicing the financial sector, instead of the other way around. The economy obviously cannot normally continue to grow, since interest-based debt, if not checked, threatens to absorb economic wealth through its unlimited growing services. For example, debt services in 2003 took more than 80% of exports of Lebanon, 63% for Burundi, and in 2001 it was 82% for Sierra Leon (World Bank, 2005).

The devastating consequences of interest-based debt make it necessary to regulate financing from the beginning to avoid uncontrollable results. Islamic principles therefore make finance an inseparable part of real activities. That is why there is no “pure financing” instrument in Shariah. Islamic instruments have debt finance as an integrated component of real transactions, as in deferred sale and *salam*. As long as debt is integrated with real activities, there is no issue in taking its costs into account. Such costs are controlled by real transactions, and thus debt cannot grow on its own.

This points to the difference between interest on lending and mark-up in credit sale. Interest is a self-replicating mechanism that makes debt grow and multiply independent of the real economy. As mentioned above, this eventually drains real resources, obviously to the benefit of lenders. Mark-up, on the other hand, is time value integrated into the real transaction. This eliminates the possibility of self-replication of debt. Time value as such is not the issue; rather it is the growth of debt independent of real wealth that threatens social welfare. By integrating time value with real transactions, this mechanism is eliminated.

The difference between integrated and separated debt is very much like the difference between a normal and a cancerous cell. A cancerous cell grows and multiplies in a disorderly and uncontrollable way. It escapes the control mechanism that keeps cells growing in their normal and orderly way (Buckman, 1997, p. 9). When

debt evades control mechanisms, it grows on its own, just as cancerous cells do. The control mechanism is what keeps cells synchronized and integrated to perform normal body functions. Islamic regulations of debt represent the necessary control mechanism that keeps debt synchronized with the real economy. Interest makes debt evade control, and thus become a threat to the economy.

Principle of Integration

Both *riba* and *gharar* work to sever subjective preferences from objective wealth. *Riba* applies to time, while *gharar* applies to risk. Time and risk, as pointed out earlier, are in fact two sides of the same coin. Separating one implies separating the other. It is not surprising therefore that Shariah prohibits both.

The separation of time and risk from real activities leads to divergence of the financial sector from the real sector. However, the separation is inconsistent with the nature of economic relations, and thus is not sustainable. This makes it increasingly costly to keep the two sectors apart. The rising costs of separation defeat its original purpose, namely efficiency and reduced transaction costs. Eventually, the real sector will pay much more for separation than it costs to keep the two sectors integrated. Shariah, therefore, insists on the integration between two sectors to achieve balanced and sustained economic growth. This is an essential principle in developing Islamic financial products.

Integration and Specialization

Integration can be seen as a constraint on economic behavior, but it is a productive constraint. As already pointed out by Elster (2000), not all constraints are inefficient. North (1990) explains how institutional constraints help reduce transaction and informational costs. Specialization, which drives economic progress, as economists recognized long time ago, is a sort of self-constraints to improve productivity and discipline activities. Integration builds upon specialization at the input level to synchronize the output of various sectors. As Milgrom and Roberts (1992) point out, “specialization requires coordination” (p. 25).

Advocates of derivatives argue that separation of risk from underlying assets makes it more efficient to manage risk, since it is a form of specialization and division of labor. But risk is a purely mental construct, as discussed earlier, and thus cannot actually exist outside human mind. Separation of risk therefore is an *abstraction* from reality rather than specialization. While specialization naturally imposes greater

discipline on economic behavior, abstraction by design lifts most boundaries and constraints that arise from the complexity of reality. Since abstraction is not sustainable, the real sector eventually will pay most of the costs of the undisciplined behavior resulting from abstraction. It is therefore necessary to assure the integration of the real and financial sectors from the beginning to avoid serious problems of coordination failure.

Evaluation of Financial Products

A direct implication of the principle of integration is that money-for-money instruments are unacceptable if performed for profit. An acceptable transaction therefore must incorporate a real component, e.g. goods, utilities or services. Although the real component is necessary for integration, it is not sufficient. In some cases goods are used only for artificial integration. Legitimate contracts involving real goods or services could be used in a manner that defeats the purpose of integration; namely to synergize the financial and real sectors to create real value. It is quite possible to combine acceptable contracts in a manner that makes them, in the final result, of a similar nature of an unacceptable one. This is called *hila* (artifice) or *hiyal* (artifices). In such artifices, real components are used for the purpose of financing, instead of financing used to facilitate real purposes.

The problem of artifices arises from the tension between substance and form of financial arrangements. Which side has the precedence over the other and when, determines the solution. It is useful to note, however, that this problem is not confined to Islamic jurisprudence. We already noted that the same problem arose in the late nineteenth century in the West with respect to futures and options. It arises now with respect to over-the-counter derivatives, as well as accounting rules pertaining to such derivatives. Manipulation in both domains is common, as reflected in Enron and similar scandals (e.g. Partnoy, 2003). The manipulation hinges on the tension between the letter and the spirit of the law, between form and substance of the financial product. What makes Islamic jurisprudence different, however, is its moral dimension. The intention of evading the commands of Allah (*s.w.t*) is considered a major sin, regardless of whether or not it could be proved in court.

There are theoretically two extremes with respect to the relation of form and substance: to consider either form only, or substance only, and ignore the other. Both are Islamically not acceptable. As Ibn Taymiah [1] clearly shows, *hiyal* were unanimously condemned by the companions of the Prophet, peace be upon him. Ibn

al-Qayyim [6] therefore reports that no Muslim scholar endorses all kinds of artifices. This implies that form or means cannot have an absolute precedence over substance or ends. On the other hand, all scholars agree that good intentions are not enough to approve a certain transaction. This means that ends do not justify means.

Accordingly, neither of the two extremes is acceptable, nor in fact practical.

This implies that scholars generally agree that there must be a balance or consistency between form and substance. Thus, differences among scholars in this regard can be attributed to differences in determining the degree of consistency, not regarding seeking consistency in principle. This leads to the next principle of Islamic financial engineering:

Principle of Consistency

This principle states that form and substance of Islamic products must be consistent with each other; i.e. form should serve substance, and means should conform to ends. This principle relies on generally acceptable *fiqh* maxims, like “actions are based on objectives,” and “meanings supercede litters” (e.g. Ibn al-Qayyim [6]). Accordingly, evaluation of a product should go through three steps (see Figure 10):

1. Evaluate the substance or the end result of the product. If acceptable, go to step 2. Otherwise, go to step 3.
2. Evaluate the form of the product.
If acceptable, the product is acceptable.
Otherwise, go to step 3.
3. Revise the product, then go to step 1.

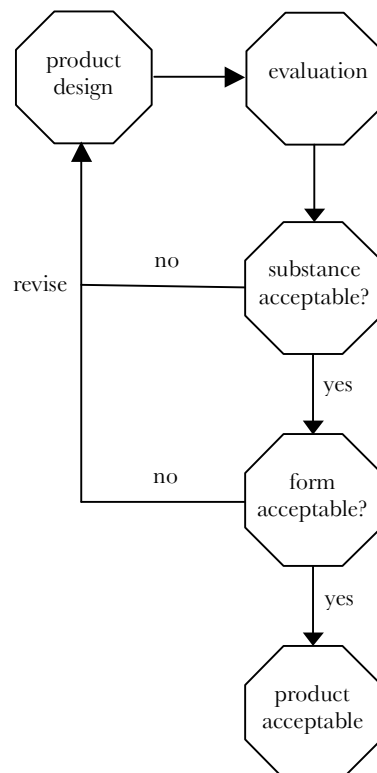


Figure 10: Process of Product Evaluation

Note that we start with substance, then move to form. Both are necessary for final approval of the product. Neither one, however, is sufficient alone for full approval.

To give an example, consider two contemporary financial products: *murabaha* for the order of a third party, and *einah*, including organized *tawarruq*. Both are used for financing, but *murabaha* requires the financier (bank) to purchase the good the customer requests, then sell it to the customer for a profit on deferred-payment basis. In *tawarruq*, the financier sells to the customer a good for a deferred price, then sells it again on the customer's behalf for cash, and deposits the money in the customer's account.

In terms of substance, the objective of *murabaha* is to provide the good the customer needs for a deferred price. The final result therefore is a normal sale. The objective of *tawarruq*, on the other hand, is to provide liquidity. The customer eventually gets cash in exchange for a debt of larger magnitude. It therefore ends in pure debt-financing. Obviously, in terms of substance, *murabaha* serves a legitimate objective, but *tawarruq* serves simply the same objective of *riba*. Not surprisingly, therefore, *murabaha* is widely accepted, while *tawarruq* is highly controversial (the *Fiqh* Academy in Mecca in fact rejected the latter in its ruling in 2003).

Given that the objective of *murabaha* is legitimate, we have to be sure it is implemented properly. The process must observe the detailed Shariah rules, like avoiding selling of what you don't have or making profit without being liable to the underlying good. Once these rules are observed, the instrument is acceptable since it passes through both stages of evaluation. For *tawarruq* or *einah*, it will not help if all detailed rules were observed, since the final result is not legitimate.

A good example to further clarify this point is to compare pork with lamb or beef. Pork is positively prohibited by the Qur'an, no matter how the pig was killed, whether slaughtered properly or not. The means are not relevant if the end itself is prohibited. Lamb, in contrast, is good in itself, so it has to be slaughtered properly to be completely acceptable. Obviously, not all animals are sheep, nor all are pigs. But it is certainly possible that people would differ whether a certain animal is a pig or a sheep. This would be normally tolerated as it is only humane to differ. Thus, in many instances we can view differences of scholars as differences regarding the type of "animal" rather than how it was processed.

Strategies of Product Development

The next step in Islamic financial engineering is to examine strategies and techniques for developing financial products. There are generally three strategies, depending on the starting point of the development process:

1. To start from conventional products.
2. To start from Islamic products.
3. To start from the real needs of customers.

Imitation

The first strategy is to have a conventional product as a reference, and then use Islamic contracts to construct an equivalent product with almost identical properties. The strategy is also called “reverse engineering” (Iqbal, 1999). Example include:

- Replicating a conventional loan with interest through *tawarruq* or *einah*.
- Time deposits are replicated through reversed *tawarruq*.
- A financial call option is replicated through *urboun*.
- Interest rate swap is replicated through reciprocal *tawarruq* and reversed *tawarruq*, with different markup structures, and so forth.

This strategy is probably the easiest for developing products, since the target is already determined. This probably explains why it has been used for centuries. Imitation might help particularly in early stages of development of the Islamic industry, but its drawbacks could affect the long term pace of the industry. The main drawbacks are:

First, the strategy gives persistent precedence of form over substance, and means over ends. Application of Islamic rules becomes a matter of passive and visionless observance of Shariah with little confidence in its economic value.

Second, the strategy makes the Islamic industry by design a follower of the conventional industry. Since it is based on replication and imitation, conventional industry will always be the leader. This contradicts the essence of creativity and innovation, and thus the strategy cannot belong to financial engineering in its true sense.

Third, since imitation implies the same objective of the conventional instruments, but with the additional constraints of Shariah rulings, it follows that Islamic instruments will always be inferior to conventional ones. This is a well known

result in optimization where a binding constraint cannot improve the value of the objective function. This inferiority arises because of taking the conventional product as the objective function. The more natural approach is to take Shariah rules as given constraints, then derive an objective function for which the solution is optimal, i.e. generates higher value than the conventional product. That is, we start from Shariah rules then arrive at the objective function, rather than going in the opposite direction.

Fourth, conventional instruments are developed to solve the problems of the conventional industry. Replicating these products will make Islamic institutions susceptible to the same problems for which these products were developed to solve. In other words, the strategy will bring in new and alien problems to the industry. As these problems get transmitted, the need for conventional products becomes stronger. This in turn necessitates replicating more products, which adds more problems, and so on. The circle becomes self-feeding and the industry risks losing its identity in the process.

It should be noted that in a healthy competitive market, imitation will lose its edge and its returns will diminish rapidly. The strategy therefore is not sustainable.

Mutation

The second strategy is to start from acceptable Islamic products, and try different variations and modifications on them, and see how the resulting products could be used. Using the jargon of *genetic algorithms* (GA), the existing products will be subjected to mutations and cross-over, then using a selection criterion based on degree of integration, for example, superior products are retained and poor ones are dropped. The process is repeated until further improvements become minimal. Genetic algorithms are used for a wide area of applications, and can be effective in evolving desirable solutions for which traditional techniques fail (see for example Mitchell, 1998; Holland, 1995; and Goldberg, 1989).

The strategy could generate effectively infinite number of products. Given that the starting point is acceptable products, and based on the principle of acceptability, a substantial part of evolved products would be acceptable. This shows that the space of Islamic products is very rich and open.

This strategy deserves a full study on its own, but we will try to apply it in a primitive, non-genetic form, in the next section.

Satisfaction

The third strategy starts from actual needs of customers, then go back and see which products or designs could serve these needs. The strategy works in the opposite direction of the previous strategy, and therefore they complement each other.

Choosing the real needs for developing products is the natural process of market evolution. Customers to a large extent determine the direction of the industry. Economic progress in fact can be measured by the ability of agents to satisfy their needs. Products, whether financial or physical, are means to satisfy such needs. This is another example of how in reality ends determine means, not the other way around.

An example of this strategy applies to lending. Consider a consumer who approaches the bank seeking a loan. He asks for cash money. But this is not his actual need, since he must use this money in another real transaction to satisfy his actual need. For example, he might use it to purchase an appliance or renew his furniture. Thus the real need is the final good, not the initial cash. For Islamic banks, this means that the bank should finance the ultimate good needed by the customer. If this is difficult for logistic reasons, advanced technology could greatly eliminate these obstacles, meanwhile improves the profitability of the bank.

If the customer needs the money to pay an existing debt, the same process could be applied to the creditor. The creditor, again, must use the money for real purposes. The bank could be ready to finance the creditor's needs using the customer's money. Money is a veil, as Classical economists long time ago argued. This means that real transactions are the ultimate objective of economic transactions. With the advancement of technology and electronic money (e.g. Shiller, 2003, pp. 73-75), we are approaching the "cashless society" where money becomes a transparent layer revealing real transactions behind. Not only this improves the integration of financial and real sectors, it also makes financing more efficient with less transaction costs, meanwhile closer to Shariah principles. Instead of taking cash then using it for real transactions, the real transaction is directly financed without the middle step. This shows that Islamic finance is potentially more efficient than conventional finance (see al-Jarhi, 2002). In other words, financing real transactions of customers is the ultimate alternative for lending and *tawarruq* products alike.

Conclusion

We have outlined some principles and strategies of Islamic financial engineering. The argument is that credible Islamic instruments are likely to be more

efficient than conventional ones. The Islamic industry however needs to review applied strategies for product development to take full advantage of such efficiency.

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