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Saving Behavior in an Economy Without Fixed Interest

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Summary

It has been argued that the Islamic prohibition against an ex ante
fixed rate of return on borrowed money will lead to an increase in
uncertainty that may reduce savings. The effect of increased
uncertainty on savings has been analyzed in recent years in the liter-
ature but the theoretical models constructed have only dealt with cases
where the rate of return has been kept constant while uncertainty is
increased. These studies have shown that, in the absence of certain
strong assumptions about the risk aversion factor, the effect of
increased uncertainty on saving is indeterminate. In this paper a model
is presented, on the basis of which an unambiguous condition is derived
that must be satisfied if, in the face of variation in riskiness and the
rate of return, saving is to decline. This condition requires that the
rate of return when risk is present must be no more than the rate of
return when risk is absent. It is suggested that the structural changes
accompanying the adoption and implementation of an Islamic financial
system may produce favorable effects on the rate of return. More
importantly, the derived condition suggests that a priori assertions
that the elimination of interest will reduce savings may not be justi-
fied without sufficiently strong reasons to believe that the rate of
return will also not increase. A stronger conclusion might be derived
if the effects of structural changes and adoption of Islamic rules of
behavior on the rate of return were taken into account.

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I. Introduction

Concerns have been expressed that the adoption of a financial system based on Islamic principles, which include notably the absolute prohibition of an ex ante fixed rate of return on borrowed money, may lead to a reduction of savings. 1/ This assertion has been based on various arguments, the most convincing of which contends that uncertainty in the rate of return affects saving adversely. Heretofore, such assertions have been made without reliance on an analytic framework and have tended implicitly to compare the effects on saving of a fixed and certain rate of return with effects on saving of an uncertain return whose expected value is the same as the fixed rate of return. Although this conclusion is in line with the view that an increase in risk is of the same nature as an unfavorable change in the expected rate of return, its implicit assumption that the rate of return is kept constant while uncertainty is increased is not necessarily valid, since the main feature of a change to an Islamic financial system--i.e., the elimination of an ex ante fixed rate of return--may change the expected rate of return.

Even when it is assumed that the rate of return is more uncertain but has the same expected value, the conclusion that uncertainty will adversely affect saving is far from obvious. Although the question was raised by Marshall 2/ who, on the basis of casual observation, maintained that an increase in uncertainty might lead to a reduction in saving, only recently has this question been subjected to rigorous theoretical analysis. Some studies have shown that the results obtained depend crucially on assumptions regarding the form of the utility function and its risk properties, e.g., the degree and the extent of risk aversion, the degree to which the future is discounted, the choice of a utility index, and the income and substitution effects of increased uncertainty regarding future capital income. It has been shown, for example, that when future noncapital income alone is subject to risk, decreasing temporal risk aversion is a sufficient condition for increased uncertainty about future income to decrease consumption and increase savings. 3/ With respect to capital income, the total effect (income and substitution effects) of increased uncertainty on savings is shown to be indeterminate. 4/ Other studies have shown that, under reasonable assumptions, in the face of uncertainty the precautionary demand for savings increases. 5/

In the present stage of the research few testable hypotheses are possible even in the case where the rate of return is kept constant. The problem becomes more complex if it were to be considered in the

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1/ See, for example, Pryor (1985) and De Rosa (1985).
2/ Sandmo (1970).
3/ See, for example, Phelps (1967).
4/ See, for example, Sandmo (1970).
5/ Leland (1968).

setting of an economy run entirely according to Islamic precepts; in such an economy not only the risk-return configuration but also the form of the utility function, as well as the institutional and behavioral rules affecting the consumer's decision, must correspond to that envisioned by Islam. 1/ In undertaking an analysis of this problem, a first step should be to derive the conditions that must be satisfied in order for increased uncertainty to affect saving adversely and to determine whether or not these conditions can reasonably be expected to be satisfied within a system without fixed interest rates. Moreover, since the general problem in which the rate of return is allowed to vary along with increased uncertainty has not been treated in the literature, 2/ it seems important that this first attempt be made in the framework of standard economic analysis so that the unambiguous results obtained will find general applicability. Once the problem is resolved in the traditional framework its applicability to an Islamic system can then be investigated.

Section II reviews the relevant literature on the effect of uncertainty on saving. Section III states the problem of eliminating interest from the economy as required by Islam and currently being implemented by some Islamic countries. This section considers the impact of the elimination of a risk-free asset for the economy. Section IV derives the optimal time paths of consumption, saving and wealth in the context of a deterministic infinite horizon, optimizing model. The optimal time paths of the same variables in a stochastic framework are derived in Section V, and the condition that must be satisfied in order for increased uncertainty to reduce savings is derived by comparing (in Section VI) the results obtained in Section V with those of Section IV. Section VII summarizes the main results of the paper and examines the reasonableness of the conditions derived in Section VI in the context of an economy without fixed interest.

II. Saving and Uncertainty: A Review

One of the first attempts at formulating the problem of choice between consumption and saving was made by Irving Fisher (1930), who introduced a two-period model in which the consumer has a preference ordering over present and future consumption. In this formulation, Fisher argued that income risk (uncertainty about future income) reduces the rate of time preference and thus increases current saving. Fisher's model was later reconsidered and reformulated by Hirshleifer (1958) and applied to various theoretical settings. In a later discussion of the problem, Boulding (1966, page 535) reached the same conclusion that the

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1/ Among these are Islam's emphasis upon work and moderation in consumption, its exhortations against extravagance and waste in consumption, encouragement of thriftiness and transfer payments to the needy, and discouragement of accumulation of idle balances.
2/ To the author's knowledge the only exception is Phelps (1967).

greater the risk of the future income, the greater is the impulse to provide for the future at the expense of present consumption. The Fisher-Boulding thesis seemed to have contradicted the casual observation made by Marshall that:

> "...The laborious and self denying peasant who had heaped up a little store of wealth only to see it taken from him by a stronger hand, was a constant warning to his neighbors to enjoy their pleasure and their rest when they could." 1/

Sandmo (1970) resolved this contradiction by suggesting that the difference between the two contrasting positions lay in the fact that they are not referring to the same kind of uncertainty and whereas

> "Boulding is concerned with uncertainty concerning future non-capital income, Marhall analyzes the effect of an uncertain yield on capital investment. The role of saving in the two cases is fundamentally different." 2/

Consequently, if capital holdings are not subject to risk and only future income is, then saving is increased (reduced) if relative risk aversion is greater (less) than unity and is non-increasing (nondecreasing). This case, which is referred to as "income risk", was considered by Boulding (1966), Phelps (1967), Leland (1968), Hahn (1970) and Sandmo (1970). Since accumulated savings are certain components of total resources available in the future, they provide a guarantee of a certain minimum level of consumption in the period ahead. Quite appropriately, therefore, an individual's response to increased income risk is to increase saving and this response varies directly with risk aversion.

Much of the research on the effect of uncertainty on saving has been concerned with the effect of income uncertainty on saving and almost all studies have, under alternative assumptions about the behavior of the risk aversion function, confirmed the Fisher-Boulding position that income risk increases current savings. 3/ In contrast to the problem of uncertainty about future income, the accumulated savings or individual capital holdings themselves may be subject to risk, as in the case of the peasant in Marshall's example. Studies that have dealt with this problem have found no clear direction for a change in saving behavior. In an analysis of this case, Sandmo (1970) derived a Slutsky-like expression and found that, given certain assumptions about the risk aversion function, when the rate of return to saving is uncertain there is first a substitution effect, which tends to reduce saving, but then there is also an income effect, which tends to increase saving. Hence, the total effect of increased capital risk was found to be

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1/ Marshall (1920), p. 226.
2/ Sandmo (1970), p. 523.
3/ See, for example, Leland (1968), Dreze and Modigliani (1972), and Menezes and Auten (1978).

indeterminate. Here too, later research has confirmed Sandmo's
findings. 1/ Moreover, other works have shown that the ambiguous
results can be rendered unambiguous only if one is willing to allow
certain restrictive assumptions regarding the utility function. 2/

It must be recalled that all of the studies mentioned have examined
saving behavior in the context of a two-period model in which attempts
were made to determine the direction of change in saving as a conse-
quence of a mean preserving spread. 3/ An exception is a study by
Phelps (1967), who in the context of an N-period model attempted to
determine the effect on consumption of variations in the riskiness and
expected return from capital. While Phelps concludes that the conflict
between substitution and income effects leads to indeterminate results,
risk always "opposes" return: "where increase of the return raises
(reduces) the propensity to consume, an increase in risk reduces
(raises) it; and where return has no effect, neither does risk." 4/ One
objective of this paper will be to obtain conditions which lead to
unambiguous results regarding this problem. In doing so, an optimiza-
tion model of consumer behavior is constructed, first in the context of
a deterministic infinite horizon (Section III) and then in a stochastic
context (Section IV); the optimal time paths of saving resulting from
these two models are then compared (Section V).

III. The Statement of the Problem--The Impact of the Elimination of the Risk-Free asset

The position which asserts that as a result of the adoption of an
Islamic financial system savings will decline can be interpreted as
implicitly assuming that the elimination of an ex ante fixed rate of
return limits the menu of assets available to the saver and thereby
increases risk, which in turn affects savings adversely. This view
would therefore regard the move to an Islamic banking as equivalent to
that from a system in which a wide range of assets with varying risk
characteristics, including a risk-free asset, are present to a system
where the only available assets are those representing risky equity-
participation projects. If this interpretation of the argument is
correct, the resulting conclusion seems unrealistically strong.

1/ See, for example, Block and Heineke (1972, 1975).

2/ See, for example, Hanson and Menezes (1978) and Sproule (1985).
Sproule, for example, has observed that by restricting the utility
index the effects of a mean-preserving increase in interest-rate
uncertainty can be shown to decrease the level of labor supply and
decrease the optimal level of savings.

3/ See Rotschild and Stiglitz (1970). A mean preserving spread
denotes an experiment for the study of behavior under risk in which
the expected rate of return of a prospect is kept constant while risk
is increased.

4/ Phelps (1976), p. 140 and pp. 149-53.

Consider a conventional system in which a whole range of assets is available to the saver (investor), such as those available in the United States. One such ranking of these assets in terms of their risk characteristics could be the following order (arranged in increasing order of risk): Certificates of Deposits, Treasury Bills, money market funds, mutual funds, blue chip stocks, other stocks, and finally future contracts and options. Given the availability of these assets, the investor can put together a portfolio of assets best suited to his needs. It must be kept in mind, however, that the higher the degree of diversification of the asset portfolio the lower will be its risk. Now assume that by some process the society decides to eliminate the assets considered as risk-free (CDs and Treasury Bills) from this menu. It can now be argued that the range of assets with a spectrum of risk starting from zero (for CDs) to some finite positive number has changed, so that the starting value on the risk spectrum is some positive number ϵ (for money market funds or perhaps more appropriately mutual funds, for example). There is nothing to bar the investor from organizing a new and well-diversified portfolio of assets, chosen from the available menu, which minimizes risk. How seriously this change will affect the risk characteristics of the investor's portfolio will depend on the magnitude of ϵ (which is not significantly large for money markets or mutual funds in the United States).

In an Islamic financial system the availability of assets with a variety of risk characteristics is a distinct possibility, and there is no reason to assume that there is a limit to the diversity of assets in such a system. 1/ The saver, then, can organize a diversified asset portfolio which can enable him to minimize risk in this system as in its counterpart. In an Islamic financial system, however, other assets representing profit-sharing arrangements will also exist that can affect the return property of the asset portfolio. The question now becomes what effects will this new risk-return configuration have on the saving behavior of the consumer. The problem can be stated as follows:

In an economy it is possible to rank all the returns to assets by the amount of risk that each carries. In such an economy, it can be argued that saving is a function of the rate of return on various assets and the risk associated with those assets. For simplicity, saving can be represented as a function of the average rate of return in the economy, as well as the average risk, i.e.,

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1/ A variety of assets are available even in countries where an Islamic financial system has been adopted although this adoption has taken place relatively recently so that the range of asset availability is still limited (see Khan and Mirakhor (1985)). Theoretically, any asset whose return is not ex ante fixed and tied to the amount of money invested can be admitted into the menu of assets available in an Islamic financial system.

(1) $S = S(r, \sigma)$
         $+$ $-$

The signs in equation (1) indicate that saving is positively related to the average rate of return and negatively related to the average risk in the economy. If a risk-free asset is allowed to exist, assets can be ranked from zero risk to some finite number, say $\bar{\sigma}$. But, when a society does not permit risk-free assets to exist, as is the case in some countries that have adopted the Islamic financial system, the ranking of assets is done over the interval $(\varepsilon, \bar{\sigma})$ with $\varepsilon > 0$, instead of $(0, \bar{\sigma})$ ranking. Consequently, the issue is to study how behavior might change when the minimum value of the range for risk is changed from zero to some small positive value that we have termed ε. Although it may be conjectured that since ε is likely to be small the impact on savings will be small, but further insight could be gained by studying, as is done in this and the following section, the polar cases of behavior in a risk-free environment versus that in a risky environment.

IV. The Deterministic Saving Model

Assume that an individual starts at an initial date μ, with an initial wealth endowment, W_μ, which grows at the rate of Y. In order to focus attention on pure saving behavior we assume that at each point in time, the individual, out of his income $YW(t)$, makes a consumption-saving decision, with $C(t)$ being consumed and $S(t)$ added to wealth, $W(t)$.

In order to make the problem more tractable, it is also assumed that the individual possesses the following utility function [1] [2]

(2) $U(C) = C^a$

Designating r as the rate of time preference, the maximizing problem can now be stated as follows

(3) $J(W,\mu) = \underset{C}{\text{Max}} \int_\mu^\infty e^{-rt} C^a \, dt,$

subject to the constraints that

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[1] It is important to note that no claim is made here that such a function is in any way "Islamic".

[2] For concavity of the utility function it is required that $a < 1$. The coefficient of relative risk aversion for this utility function is $a-1$.

(4) $\dot{W} = \gamma W - C$

and

(5) $W(\mu) = W_\mu > 0.$

In this simple form the problem is readily solvable. Using the technique of dynamic programming 1/ and the current value function, $[J(W, \mu) = e^{-r\mu} V(W)]$, the partial differential equation that optimizes the value function is,

(6) $rV(W) = \max_C \{C^a + V'(W)(\gamma W - C)\}.$

Maximization of the LHS permits the control to be expressed as a function of the derivative of the value function, i.e.,

(7) $C = [\frac{V'(w)}{a}]^{\frac{1}{a-1}}.$

Equation (4) can now be expressed as

(8) $rV(W) = [\frac{V'(W)}{a}]^{\frac{a}{a-1}} \frac{a-1}{a} + V'(W) \gamma W.$

The solution to (8) is of the form

(9) $V(W) = BW^\alpha,$

which yields

(10) $\alpha = a$

and

1/ Although dynamic programming is more convenient, the problem can also be solved using calculus of variations or Pontryagin's Maximum Principle.

(11) $B = [\frac{a(r-a\gamma)}{1-a}]^{a-1}.$

Thus we have

(12) $V(W) = [\frac{a(r-a\gamma)}{1-a}]^{a-1} W(t)^a$

and

(13) $C[W(t)] = \frac{a(r-a\gamma)}{1-a} W(t) = AW.$

Consequently, consumption at each point in time is shown to be proportional to wealth and to vary directly with the rate of time preference and negatively with the rate of return on wealth. Recognizing that current income is γW, the marginal propensity to consume out of income is A/γ. Thus in each period a constant proportion out of current income is consumed.

Substituting equation (13) into the state equation and solving we obtain the optimal time path of the state variable, W

(14) $W(t) = W_0 e^{(\gamma-A)t}$

Consequently, wealth is accumulated whenever the rate of return on available assets is greater than the marginal propensity to consume out of wealth.

V. The Stochastic Saving Model

In the last section it was assumed that all assets earned a known and constant rate of return γ. To introduce uncertainty into the model, we assume as before that an individual starting off with some level of wealth W^* chooses his consumption at each instant over an infinite time horizon. However the rate of return γ^*, rather than being constant, is drawn from a probability distribution with a known mean $\bar{\gamma}^*$ and a known variance $\sigma^2 W^{*2}$. At each instant, therefore, a rate of return is drawn from this distribution and may actually turn out to be negative thus reducing individual wealth. This is in line with the Islamic notion of equity participation requiring individuals to directly share in the risk associated with an investment.

To incorporate the above reasoning into the model, the differential
equation in the deterministic form is now written in its stochastic
version as follows 1/

$$(15) \quad dW^* = (Y^*W^* - C)\, dt + \sigma W^* dZ$$

where $Z(t)$ is a stochastic process (known as a Weiner process) defined
on a probability space $(\pi, \mathcal{F}e, P)$ with the properties: (a) that in-
crements in the process $Z(t) - Z(s)$, $(t \leq s, t, s = 0, 1, \ldots)$ are
independent random variables and (b) that $Z(t) - Z(s)$ is randomly dis-
tributed as a standard normal variable. The first property suggests
that the past history of the process does not influence its future
position. Thus similar to Markov processes, the future behavior of the
process depends only on its present position and does not depend on how
the process got there.

Dropping the stochastic term (i.e., setting $dZ = 0$) it can be seen
that equation (15) is the same as the deterministic state differential
equation (4) above. Since the properties described above denote that
$E[dZ(t)] = 0$, the expected growth of wealth is the same as in the deter-
ministic case. However, at each instant, a drawing of dZ from the
Weiner process could increase or decrease this growth in wealth. In
more formalistic terms, the instantaneous mean growth in wealth is
still $(Y^*W^* - C)$ while the instantaneous variance of the growth in
wealth is $\sigma^2 W^{*2}$. This formulation thus allows, given a large enough
variance, a finite probability of the event that there could be a nega-
tive net addition to wealth.

Employing the same utility function as before the discounted sum of
utility is maximized subject to (15). In this way the problem,
analogous to the deterministic case encountered in the last section,
becomes one of stochastic control. The problem can now be stated as
follows:

$$(16) \quad L(W,\mu) = \underset{C}{\text{Max}} \int_{\mu}^{\infty} e^{-rt} C^a \, dt$$

subject to

$$(17) \quad dW^* \quad (Y^*W^* - C)\, dt + \sigma W^* dZ.$$

1/ *s are used to distinguish this case from the previous section.

To solve this problem dynamic programming is utilized once again. 1/
The Hamilton-Bellman-Jacobi equation for this problem is

$$(18) \quad rV(W^*) = \underset{C}{\text{Max}} \; [C^a + V'(W^*)(\gamma^* W^* - C) + V''(W^*)\sigma^2 W^{*2}].$$

Maximizing the right-hand side with respect to C, in terms of the derivatives of the value function, the control is

$$(19) \quad C = [\frac{V'(W^*)}{a}]^{\frac{1}{a-1}}.$$

Substituting equation (19) into equation (18) the Hamilton-Bellman-Jacobi equation can be written as,

$$(20) \quad rV(W^*) = [\frac{V'(W^*)}{a}]^{\frac{a}{a-1}} \; \frac{1-a}{a} + \gamma^* W^* V'(W^*) + \frac{V''(W^*)}{2} \sigma^2 W^{*2}.$$

Here again positing a solution of the form $V(W^*) = BW^*$, it can be seen that $\alpha = a$ and

$$(21) \quad B = [a(\frac{r-\gamma^* a}{1-a} + \frac{a\sigma^2}{2})]^{a-1}.$$

Therefore, the value function can be expressed as a function of current wealth and the parameters of the problem as follows:

$$(22) \quad V(W^*) = [a(\frac{r-\gamma^* a}{1-a} + \frac{a\sigma^2}{2})]^{a-1} W^{*a}.$$

Similarly, the consumption as a function of the current wealth and the parameters of the problem can be expressed as:

$$(23) \quad C(W^*) = a[\frac{r-\gamma^* a}{1-a} + \frac{a\sigma^2}{2}] W^* = A^* W^*.$$

Hence, as in the deterministic model, in each period the inviduals consume a constant proportion of their existing wealth, W^*. Moreover, optimal consumption varies directly with the rate of time preference and the riskiness of the rate of return and is negatively related to the rate of return on assets.

1/ For more information on the details of the solution technique employed here see Maliaris and Brock (1982).

VI. A Comparison of the Deterministic and Stochastic Models

Since the consumption functions derived in the stochastic as well
as the deterministic models show consumption to be a linear function of
wealth, inferences about behavior can be drawn by comparing the marginal
propensities to consume out of wealth for the two models. The differ-
ence between the marginal propensity to consume out of wealth in the
deterministic case, i.e., A, and in the stochastic case, i.e., A^* is

$$(24) \quad A - A^* = a^2 \left(\left(\frac{\gamma^* - \gamma}{1-a} \right) - \frac{\sigma^2}{2} \right),$$

which is positively related to the difference between the mean return on
assets in the two models and is negatively related to the variance (or
riskiness) associated with the return on assets in the uncertainty
case. It can be seen from this expression that if the expected return
on assets in the case of uncertainty is equal to the rate of return when
there is no uncertainty, i.e., $\gamma^* = \gamma$, then the marginal propensity to
consume will be higher when there are no risk-free assets, i.e.,
$A < A^*$. However, it can also be seen that the marginal propensity to
consume will remain unchanged when the risk-free asset is eliminated if

$$(25) \quad \gamma^* - \gamma = 1-a \frac{\sigma^2}{2}.$$

That is, the expected rate of return on assets when the risk-free asset
is eliminated is greater than the expected return when that asset is
present; the difference between these two expected returns is equal to
one minus the coefficient of relative risk aversion times one-half the
variance (or riskiness) associated with the expected return on risky
assets.

Since the wealth paths $[W(t)]$ in the two models are different, it
is difficult to make any statement on consumption itself without solving
for the wealth path in the stochastic problem. Using the optimized
value of the control variable, i.e., consumption, this is tantamount to
solving the stochastic differential equation (15), which can now be
written as

$$(26) \quad \frac{dW^*}{W^*} = (\gamma^* - A^*) \, dt + \sigma dZ.$$

The solution to equation (26) is

$$(27) \quad W^*(t) = W_0^* \exp \left\{ \left[\gamma^* - A^* - \frac{\sigma^2}{2} + \sigma Z(t) \right] \right\}$$

It is already observed from (15) or (26) that the stochastic shocks enter the consumption stream only via the time path of wealth. The marginal propensity to consume, which is unaffected by these shocks, is larger in the stochastic case than in the nonstochastic case. Consequently, inferences on consumption and hence on saving can be drawn on the basis of a comparison of the two wealth paths. However, since equation (27) retains the stochastic element, a meaningful comparison can only be made between the mean of $W^*(t)$ in the stochastic case with the time path of $W(t)$ in the nonstochastic case. Thus, whatever inferences are made, while valid in the mean sense, may not hold in terms of an actual time path because of the presence of the random disturbances. That is, the time paths of wealth and consumption may not be the same for the two cases being compared.

Since the instantaneous increments of the Weiner process are normally distributed, $W^*(t)$ in equation (25) is lognormally distributed with the mean

$$(28) \quad E[W^*(t)] = W_0^* \exp \{(\gamma - A^*)t\}.$$

The time path of the mean of $W^*(t)$ given by (28) can now be compared with that of $W(t)$ given by (14) using the following equation,

$$(29) \quad \frac{W(t)}{E[W^*(t)]} = e^{\{(\gamma - \gamma^*) - (A - A^*)\}t}.$$

It can be observed from this expression that the condition that must be satisfied in order for increased uncertainty, resulting from elimination of the risk-free asset, to adversely affect saving is that the rate of return remains unchanged. That is, if the rate of return is the same for both the deterministic case and the stochastic case (i.e., $\gamma = \gamma^*$), then wealth in the certainty case is greater than the expected wealth in the uncertainty case. If this condition in fact holds consumption will increase when the risk-free asset is eliminated.

On the other hand, if the rate of return on assets increases as the risk-free asset is eliminated, it is more difficult to meaningfully compare the two resulting wealth paths. If expression (24) holds, then the two marginal propensities to consume are equal, i.e., $A = A^*$. In this case, the path of expected wealth in the uncertainty case dominates that obtained in the certainty case. Consequently, when the risk-free asset is eliminated, consumption will decrease and savings will increase.

VII. Conclusions

Although the household's decision between consumption and saving has been considered in recent years, almost all the theoretical work in the area has examined only the effects of a mean-preserving spread upon saving. Even here the results have shown the conclusion that increased uncertainty regarding the rate of return to saving will lead to reduced savings to be far from obvious, and the best that can be said, in the absence of strong and restrictive assumptions about the risk aversion factor and/or the utility index, is that the effect is indeterminate. In any case, as has been argued in this paper the move to an Islamic banking system cannot be analyzed as an a priori increase in uncertainty in the environment in which the consumer is operating. Haque and Mirakhor (1986) have shown that the move to an Islamic interest-free system, under certain conditions, could lead to increased rates of return on savings. Consequently, the increased level of uncertainty that could result from the elimination of the risk-free asset could be compensated for by an increased rate of return on savings, leaving the overall level of savings unchanged or perhaps even leading to an increase in savings.

It appears that if the traditional theory is to be relied upon to gain insights into this problem it is necessary, as a first step, to deal with the problem of variations in risk and return in a traditional setting and derive clear and unambiguous results that could then be used to draw inferences about a system without fixed-interest assets. This has been the primary objective of the paper, in which a straightforward condition has been derived that must be satisfied if, in the face of variation in riskiness and the rate of return, saving is to decline. This condition requires that the rate of return when risk is present must be no more than the rate of return when risk is absent. This result in itself is a contribution to traditional theory. But can the condition derived here be reasonably expected to be satisfied in an Islamic system?

Although one is tempted to suggest that the question must be answered empirically, there are a priori arguments that provide useful insights. For one thing, by prohibiting interest payments Islam requires investable funds to be utilized by agent-entrepreneurs on a profit-sharing basis. This requirement will in effect remove interest from the cost side and both the saver and the entrepreneur become residual income earners. 1/ It can reasonably be argued that in the traditional system rates of return to investment are on the average higher

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1/ See Haque and Mirakhor (1986), where this case has been analyzed and contracting conditions derived to show the possibility of both levels of savings and rates of return to be higher in the Islamic than in the traditional system. Whether or not the savers will actually receive higher returns will of course depend on the spread, between deposit rates and rates of return to capital, as a reward for financial intermediation.

than the rate of interest paid on borrowed funds (since the rate has to be high enough to recover the cost of capital); therefore, as a result of adoption of the Islamic system in which the saver becomes an entrepreneur sharing in the profits earned, the rate of return to investable funds may be higher. Moreover, it can also be expected that, since the savers' reward will depend on the productivity of the investment undertaken, better quality investment projects, in terms of their rate of return, will be undertaken.

In conclusion it is useful to restate that this paper has been a first attempt at establishing a point of reference upon which meaningful theoretical discussions can proceed regarding the impact on saving of adopting an Islamic financial system. As such it has only tangentially dealt with the possible characteristics of consumer behavior if governed by Islamic precepts, which would need to be incorporated into the analysis if its conclusions were to be legitimately applied to an over-all Islamic system. For example, no attempt was made to analyze the constraints that Islamic teaching may place on either the behavior or the utility function of the believer, an aspect to which Islamic scholars attach considerable weight. 1/ Another factor that tends to influence consumer behavior is the effect of payments of compulsory levies constituting transfer payments to those in need and a 2.5 percent tax imposed on idle balances. Finally, no attempt was made to discuss the impact of adoption of an Islamic financial system on the degree and extent of individual's risk aversion, which could likewise be affected by the internalization of Islamic values by the consumer.

1/ Recently Toutounchian (1985) has analysed a Muslim consumer's behavior taking into account Islamic exhortations with respect to sharing and has derived optimality conditions employing an interdependent utility function. See his forthcoming book, Towards a Theory of Muslim Consumer Behavior.

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