Stabilizing Business Cycles by PLS Banking and Ethic Economics

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Abstract

In addition to discuss economic cycle's theories in this paper by decomposing money market into two markets of "saving-depositing" and "investment-credit facilities", we study the time structure behavior of depositor-bank-investor and conclude that the traditional banking structure creates fluctuations in money sector and interest rate. These fluctuations affect real sector through saving and investment and fluctuate the economy. Mathematical derivations show that banking structure is one of the main factors of economic cycles. Therefore, the abolition of usury (Riba) is proposed as the solution to relate directly investment to saving via Profit and Loss Sharing Banking. In this framework, bank offers investment management services and obtains commission. In Profit and Loss Sharing Banking risks are practically transferred from credit facility sector (loans) to deposit sector and bank does not face any losses. On the other hand, the creation of strong structural relationship between interest rate of deposits and credit facility interest rate does not let any losses to occur in capital market while there is profit in deposit market. This concept is against conventional banking system in which if the borrower obtains profit or loss, he has to pay interest (profit) to depositor.

The second pathological defect of economic crisis is the excessive consumption and economic greed and similar bad habits which expand economic cycles. The adjustment of mankind behavior according to Islamic and other divine religions ethical and mystical tuitions will practically prevent the intensity of crises. Prevention of extravagance frees a large portion of economic resources and therefore the magnitude of the business cycle will be reduced and economic stability will be relatively increased.

Keywords: *Usury-free banking, ethic economics, business cycle, extravagance.*

Introduction

Countries of the world have always experienced business cycles in the economy with a sinusoidal trend. These fluctuations which are the result of the capitalistic nature of the economy, spreads over other countries through international transactions of goods and capital. Practically, the price signals of commodities and various capital yields create the global flow and the movement of business cycles. Various business cycles caused by weekly, monthly or seasonal and cycles caused by inventory fluctuations which last less than half a decade and are called "Kitchin"[2] cycles are not considered in this paper. Fluctuations considered here are economic or business cycles which happen in a decade and turns the economy from prosperity to recession and crisis, and again, to prosperity usually within a decade. The large cycles which are usually caused by structural changes and occur within two decades, are reputed as

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[2] -Kitchin, Joseph (1923). "Cycles and Trends in Economic Factors". Review of Economics and Statistics 5 (1). 10–16.
http://www.jstor.org/stable/1927031

"Kuznets"[3] cycles, and longer fluctuations caused by science and technology developments and take about half a century to complete, are called "Kondratieff"[4] cycles. Sometimes, the overlap of these cycles with usual business cycles creates large global crises such as crisis of 1920 decade and the crisis of the end of 2000 decade.

This waviness is the result of the nature of mankind behavior; that is to say, the natural manner of men causes this behavior. This is because human being is extravagant and when he is rich, shows more extravagance, but the limited available sources do not let him to continue. Therefore, it has to stop during the economic prosperity. That is because resources do not increase proportional with people's economic activities. The scarcity of resources causes price increase and decrease of profit margin which is the beginning of recession and the turning point of business cycle.

Business cycle theories

For the first time, Juglar[5] realized this phenomenon at 1862 for 8-11 years periods. After that, several theories were introduced about business cycles which studied business cycle from different points of view. As Schumpeter[6] described the four stages of business cycle, during prosperity stage, increase in production and prices and the decrease of interest rate are seen. During the second stage or recession, production and prices will decrease but interest rate will start to increase until we reach to the third stage which is the crisis when stock markets collapse and firms become bankrupt. Recovery starts during the fourth stage and is accompanied by stock exchange prosperity, increase of output, demand and prices.

"Goodwin"[7] believes that the reason for business cycles is the gap between income distribution between the profit of investors of economic firms and the earnings of labor force; when the economy has a high employment rate and labor demand increases, workers can't ask for higher wages because labor contracts are annual or have a fixed time and wages can be changed after the end of the contract period. The reverse happens during recession. Therefore, the income of the labor force is adjusted with the income of capital factor after a time lag which creates a cyclical behavior for matching production with consumption and ultimately shapes the cycle. Although Goodwin's theory has time dynamism, but mathematically, it's simple form gives first order difference equations. Although these equations have time ascending or descending trend, and are converging or diverging trends, but cannot obtain time oscillatory trends. The difference equation should be of second order to create sinusoid trends.

Some economists believe that the reason for business cycles is technological shocks[8], some other believe that they are created by political party and political decisions cycles[9]. Marxists believe it as the essence of capitalism, and New Classics believe that the decrease of labor purchasing power is the reason for capitalistic crises.

By scrutinizing the nature of waving and sinusoid movement of economic activities we can realize

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[3]- Simon Kuznets, Secular Movements in Production and Prices. Their Nature and their Bearing upon Cyclical Fluctuations. Boston: Houghton Mifflin, 1930.

[4] - Kondratieff, N. D.; Stolper, W. F. (1935). "The Long Waves in Economic Life". Review of Economics and Statistics 17 (6): 105–115. http://www.jstor.org/stable/1928486

[5] -Clement Juglar, Des Crises commerciales et leur retour periodique en France, en Angleterre, et aux Etats-Unis. Paris: Guillaumin, 1862. http://gallica.bnf.fr/ark:/12148/bpt6k1060720

[6] - Schumpeter, J. A. (1954). History of Economic Analysis. London: George Allen & Unwin.

[7]- Richard Goodwin, "The Business Cycle as a Self-Sustaining Oscillation", 1949, Econometrica.
Richard Goodwin, Nonlinear Dynamics and Economic Evolution", 1991, in Niels Thygesen et al., editors, Business Cycles.

[8] - Real business cycle theory. Kydland, Finn E.; Prescott, Edward C. (1982). "Time to Build and Aggregate Fluctuations". Econometrica 50 (6): 1345–1370. http://www.jstor.org/stable/1913386

[9] -Political business cycle. Partisan business cycle. Michal Kalecki.

this nature automatically leads to situations in which economy turns from prosperity to recession and crisis and again into prosperity. Some believe the reason behind this sinusoid movement is inventory operation and supply flow. That is, when the economy produces more than consumption, goods are accumulated in the warehouses and the producer has to decrease price to sell the inventory. The lowering price and the large accumulated inventory will loosen production and producer has to decrease production which decreases the income of factors of production (labor, capital and others). That is to say, income at macro level will drop which decreases demand for goods and services. The lower demand will decrease price and economic firms face more recession. This phenomenon goes forward until recession changes to crisis. During this stage, production continues to decrease, but practically the trend of price decrease is lowering or stopped. Price reaches production cost and since it is not possible for the producer to decrease price below production cost, production is stopped and many inefficient firms become bankrupt and total supply will decline in the country. The decrease in supply is followed by price increase and persuades production which increases income of factors of production in the next stage and is followed by more price increase and moves the economy from crisis to prosperity until we reach the beginning of next business cycle. After a while, recession starts and the cycle reiterate again.

According to Keynesian Economists, fluctuation in total demand causes the economy to reach equilibrium in short period which is not equilibrium at full employment. The motivation to obtain full employment in equilibrium which is below full employment and the inefficient excessive use of sources and factors of production and production capacity in equilibriums beyond full employment will cause business cycles. Keynesian theories believe that the lack of enough effective demand in the economy is an indigenous cause for crises while Classic and New-Classics believe exogenous factors are the causes of business cycles. They believe supply will create its own demand[10]. Since according to these two views, government interference policies have positive or negative effect in abolishing crises, will lead to different policy results. The first offers financial and the second offers monetary policy. Paul Samuelson[11] describes Keynesian analysis on the basis of multiplier effect (on consumption) and accelerator (in investment) which create cycles through changes of total demand components. The struggle between Keynesian and Classic economists can be introduced in this discussion. Keynes believed when the economy is in liquidity trap, or there is no coordination between investment and saving, in order to obtain equilibrium in money market, it is necessary to reduce interest rate below zero. In this situation it is not possible to use monetary policies to overcome crisis because, interest rate is so low that cannot be reduced. Essentially, the liquidity trap is because of poor relationship between efficiency rate of production in real sector and interest rate. That is to say, the interest rate has decreased to a very low figure, regardless of productivity rate. One of the reasons behind this situation is the increase of investment risk which decreases the net investment yield. The point is that, if it was possible to make negative interest rate in the economy, which is not possible operationally, monetary policies were capable of overcoming crisis. Therefore, national policies are recommended which are conducted in group 20 by injecting about $5 trillion to overcome the present crisis. This method practically causes the crisis stricken economies come out the crisis, but in order to achieve this effect it is necessary to wait about half a decade until economic mechanisms lead the economy to prosperity through natural ways. The overview of economic variables in the last decade shows the same in comparison with 1920 crisis. The sever oil and grains price increase and successive draughts and unexpected ecological and meteorological events had increasing effects on this crisis. Similar conditions of the present crisis were also seen in the crisis of 1920 decade. Also during that period interest rate was severely reduced, but the economic conditions were so bad that even the low price of capital could not allocate adequate resources for production. Therefore, similar to financial policy which took about a decade to recover the global economy from crisis, accordingly at present time we have to wait until the injection of financial resources could again turn the global economy to recovery and prosperity.

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[10] -Say's Law.
[11] - Oscillator Model.

Money market and the role of banks in creation of economic cycles

The essential solution which is forgotten by economists is the reform of monetary and banking structure. Some theories suggest that banking structures are among factors which create crisis. In spite of excessive inventory theory, the variation of inventory is the effect of cycles, not its cause. In contrary to what is formed in the minds of economists around the world, the recent recession was not because of recession in American housing market; rather it was the consequence of this crisis. In spite of the set fort theories, the cause of recession was not in housing sector, but it was the result of a structural behavior in money and banking sector. The theory of credit cycles by Irving Fisher[12] is one of the interesting theories about the cause of business cycles. He believes that credit cycles are the starting reason for economic cycles. Accordingly, the net increase of credits and equal with that, the debts as a percentage of GDP, creates economic prosperity, and vice versa, the decrease of net credit, moves the economy towards recession and crisis. In direction of Fisher theory, Minsky[13] puts forward the financial instability theory and develops Fisher theory by describing credit bubbles and the burst of these bubbles and their effects on economic cycles. He believes that the reason is the accumulated debts to banks. In this connection the Austrian school of thought[14] can be put forward which believes that the cause of credit changes is the monetary expansionary policies of central banks. This school refers to the role of interest rate as the price of capital for investment and agrees that in an open economy without central bank, interest rate describes the real time preference of borrowers and lenders, but central bank disturbs this equilibrium between them and inevitably creates fluctuations in the economy. When Fisher put forward this theory, the dynamic mathematical tools such as difference equations were not used. If the application of difference equations which was set forth in 1950 decade were introduced into economic analysis a few decades earlier, by using this tool, Fisher could dynamize the occurrence of crisis, as he explained the richest monetary theory which is the quantitative theory of money with the help of Balance Law from physics[15].

In spite of the view of recent economists who believe in a single money market, we divide it into two separate markets where banks operate as intermediates between them. In other words, the demand of the bank for deposits is at one side of the bank which intersects with the supply of deposits and fixes interest rate which is called deposit interest rate. On the other side, bank creates another market by supplying funds for credit finance and its intersection with demand for credit facilities creates the interest rate for credit facilities. That is to say bank stands between two markets of supply and demand of monetary funds. Now suppose that because of the consumption increase, deposit supply falls down. This will increase the deposit interest rate. The increase in deposit interest rate cannot instantly increase credit interest rate because credit contracts have been fixed for a period of time and bank has to wait for the duration of the contract before increasing the rate in new contracts for credit facilities and subsequently, the interest rate for credit facilities will increase in the economy. Bank will face losses during this period of time and after a time lag will compensate it by the increase of credit facility rate. Although this lag is not quite visible for people, from economic point of view it creates a special dynamic relationship between supply and demand for capital. It can mathematically be shown that because of this lag, the relationship between these two variables is a second degree behavioral difference equation. Second degree difference equations

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[12] - Fisher, Irving (1933), "The Debt-Deflation Theory of Great Depressions", Econometrica, http://fraser.stlouisfed.org/docs/meltzer/fisdeb33.pdf

[13] Hyman Minsky The Credit Crisis: Denial, delusion and the "defunct" American economist who foresaw the dénouement. http://www.finfacts.ie/irishfinancenews/article_1014734.shtml
Hyman Minsky The Financial Instability Hypothesis, Working Paper No 74, May 1992, pp. 6-8. http://www.levy.org/pubs/wp74.pdf

[14] - Works of Ludwig von Mises and Friedrich Hayek.

[15] - William Jack Baumol, Topology of Second Order Linear Difference Equations with Constant Coefficients, 1958, Econometrica
William Jack Baumol, Economic Dynamics, R. Turvey, 1951.

have a wavy character which creates cycles. Therefore, practically, the cycles created in the saving and families' consumption will transfer into the investment and production sectors.

In other words, all fluctuations seen in real sector of the economy are induced by fluctuations in the money market. Many studies have been carried out about this subject which is one of the obvious subjects of monetary theories in the economy. If fluctuations of the money sector of the economy alleviate, many of the fluctuations of the real sector will also tend to be stabilized. The most important effect of elimination of "usury" is the direct bridging of the investment sector to saving sector of the economy[16]. When banks try to maximize profit through optimizing their behavior, the intermediate sector (banks) acts as a separate sector of the economy and the differences created by them between interest rates of supply and demand of funds, create fluctuations in financial markets. Since loan contracts have maturity periods, changes in supply (sources) or demand (uses) side of funds take time to be transferred to the other side. This time lag creates continuous fluctuations in financial markets. This analysis can be seen in the following graph:
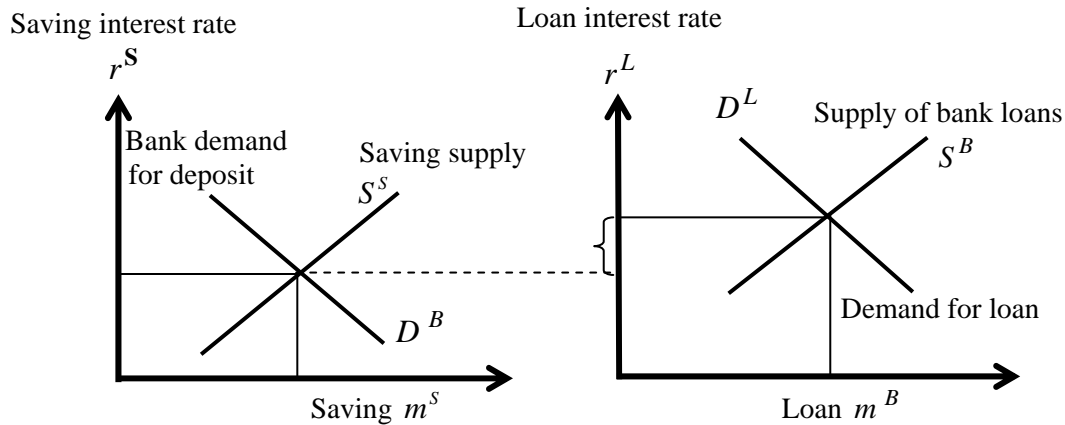
Figure 1

Where:

S^B	Loan supply by banks
s^S	Fund supply by depositors
D^L	Loan fund demand
D^B	Bank demand for funds
r^S	Saving interest rate
r^L	Loan interest rate
m^S	Amount of saving
m^B	Amount of loans
R	Bank's revenue

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[16] - For more information look through: Bidabad, Bijan, Economic-juristic analysis of usury in consumption and investment loans and contemporary jurisprudence shortages in exploring legislator commandments. Proceeding of the 2nd International Islamic Banking Conference. Monash University of Malaysia. 9-10 September 2004. Reprinted in: National Interest, Journal of the Center for Strategic Research, Vol. 2, No. 1, winter 2006, pp. 72-90. Tehran, Iran. http://www.bidabad.com/doc/reba-english-4.html

Bank's revenue at time t is equal to:

$$R_t = m_t^B r_t^L - m_t^S r_t^S \tag{1}$$

At equilibrium we have:

$$m_t^B = D_t^L = S_t^B \tag{2}$$

$$m_t^S = D_t^B = S_t^S \tag{3}$$

Now suppose a new condition in which demand for loans decreases and D_t^L moves to left side to D_{t+1}^L. In the new equilibrium, if bank's revenue turns negative, we have:

$$r_{t+1}^L < r_t^L \tag{4}$$

Or:

$$R_{t+1} = m_{t+1}^B r_{t+1}^L - m_t^S r_t^S < \circ \tag{5}$$

Therefore, regarding time-loan contracts of bank, bank has practically to compensate losses during t+1 period from other sources until the next period when D^B curve moves to the left hand side. That is to say:

$$r_{t+2}^S > r_{t+1}^L \tag{6}$$

$$R_{t+2} = m_{t+1}^B \ r_{t+1}^L - m_{t+2}^S \ r_{t+2}^S > \circ \tag{7}$$

By generalizing this hypothesis we clearly see that whenever shocks occur in deposit supply or demand for banks' credit facilities (loan), because of time contracts, these shocks will be transferred to the other market in the next period and the fluctuations transfer from market to market alternatively and permanently fluctuates other related markets.

By considering the sign of three equations of (1), (5) and (7), we can clearly see that the behavior of variable R is alternative in different time periods. The behavior of the two markets described above can be drowned according to Cob-Web model which creates different fluctuation according to the gradient of different parts of supply and demand curves.

The interest rates in the two markets are as follows:

$$r_t^S = r^S(m_t^S) \tag{8}$$

$$r_t^L = r^L(m_t^B) \tag{9}$$

If according to the above assumptions we adjust the relationship of the two markets with one time-lag, we have:

$$m_{t+1}^S = f(m_t^B) \tag{10}$$

By replacing (8) and (9) in (10), we have:

$$r_t^S = r^S(f(m_{t-1}^B)) = r^S(f(r^{L^{-1}}(r_{t-1}^L))) \tag{11}$$

In other words, the interest rate in the deposit market is a function of interest rate in loan market in the last period. The adjustment takes place when the return movement occurs in the next period which means that the interest rate of loan market is itself a function of interest rate of deposit market in the previous period, or:

$$m_{t+1}^B = g(m_t^S) \tag{12}$$

By replacing (10) in (12), we will have:

$$m_{t+1}^B = g(f(m_{t-1}^B)) \tag{13}$$

This is a second order difference equation which is characterized to fluctuate easily in time. This is also true about interest rates. By replacing (12) in (10), we have:

$$m_{t+1}^S = f(g(m_{t-1}^S)) \tag{14}$$

This equation similar to equation (13) can be completely oscillatory. By replacing (12) in (9), we will have:

$$r_t^L = r^L(g(m_{t-1}^S)) = r^L(g(r^{S^{-1}}(r_{t-1}^L))) \tag{15}$$

Since equations (15) and (11) are function of m_{t-1}^S and m_{t-1}^B these two variables can completely be oscillatory according to (14) and (13).

Therefore, interest rate similar to the amount of deposits (savings) and loans in both loans and deposits markets can fluctuate.

Transfer of fluctuations from monetary sector to real sector

Although the transfer of monetary fluctuations to real sector can be clearly seen and understood, but in order to clarify the subject, we consider the equilibrium at macro level and its relation with interest rate fluctuations induced by the banking behavior. According to national accounting relationship we can write:

$$\begin{aligned} gdp &= con + inv + gov + ex - im \\ gde &= con + sav + tax + tr \\ gdp &= gde \end{aligned} \tag{16}$$

In which:

gdp = gde   Gross domestic product = Gross domestic expenditure
con   Consumption
inv   Investmnt
gov   Government expenditures
ex   Exports
im   Imports
sav   Saving
tax   Tax
tr   Transfer payments to outside

By solving equation (16), the equilibrium condition in macro economy will be obtained:

$$(inv - sav) + (gov - tax)(e + x - im - tr) = 0 \tag{17}$$

Foreign exchange markets relate international capital markets to real sector through foreign exchange rates and financial derivatives such as options, futures, forward contracts, and time deposit certificates where these markets also oscillatory affect the real sector through interest rate similarly, but for simplicity, we do not consider it and according to equations (15) and (11), we will only consider the two

variables of investment and saving as functions of interest rates of saving deposits and loans (r^S and r^L). In other words, the equilibrium condition in the economy in time t will be as follows:

$$(inv_t(r_t^L) - sav_t(r_t^S)) + (gov_t - tax_t) + (ex_t - im_t - tr_t) = 0 \qquad (18)$$

By replacing r_t^S and r_t^L from equations (15) and (11) in equilibrium condition, we will have:

$$(inv_t\left(r^L(g(r^{S^{-1}}(r_{t-1}^L)))\right) - sav_t\left(r^S(f(r^{L^{-1}}(r_{t-1}^L)))\right)) + (gov_t - tax_t) + (ex_t - im_t - tr_t) = 0$$

$$(19)$$

If the government has balanced fiscal policy which means $(gov_t - tax_t) = 0$ and the trade balance is also balanced $((ex_t - im_t - tr_t) = 0)$, again the equilibrium (19) is a second order difference equation which can lead the economy into disequilibrium in different times. In other words, the mathematical behavior of equation (19) will be different regarding the behavioral characteristic of saving and loan contracts and the reaction of depositors and borrowers (investors) to interest rates of deposits and loans which can show any kind of oscillatory behavior. But this behavior cannot be expanding (diverging) or dampening (converging) forever, because disequilibrium tends to zero in the long run. Therefore, necessarily even if the equilibrium is a moving equilibrium, it should oscillate around its long run equilibrium and this phenomenon creates economic cycles.

It may be necessary to brief that by using fiscal policy $(gov_t - tax_t)$ according to Keynes theory, we can compensate disequilibrium in equation (18). But by injecting financial resources to the economy equal to $(gov_t - tax_t) > 0$, the excess government budget in time t *Ceteris Paribus* will be government debt to the central bank at time t+1 and disrupts budget balance and the government has to levy more tax to compensate this deficit in the next period which leads to recession and disequilibrium and fluctuation in the next period. The same is true about the last parentheses of equation (19) about trade balance which is $(e + x - im - tr)$. By creating export incentives and import barriers for imports at time t, government increases the trade balance equal to $(ex_t - im_t - tr_t) > 0$, and by increase of exchange rate in period t+1, exchange stability will be disrupted and we will face deficit in foreign trade which will have negative effects on the economy and creates fluctuations.

The capability of second order difference equation in explaining fluctuations

In order to clarify more second order difference equations' behavior, we will brief the time trend dynamism of linear non-homogenous difference equation with fixed coefficients. Consider a linear non-homogeneous second order difference equation with constant L and fixed coefficients of a and b:

$$y_{t+2} + ay_{t+1} + by_t = L \qquad (20)$$

According to the amounts of a and b, the time trend of this equilibrium can be linear or non-linear for each Special Solution. By foregoing L for the time being, the Complementary Function will be as follow:

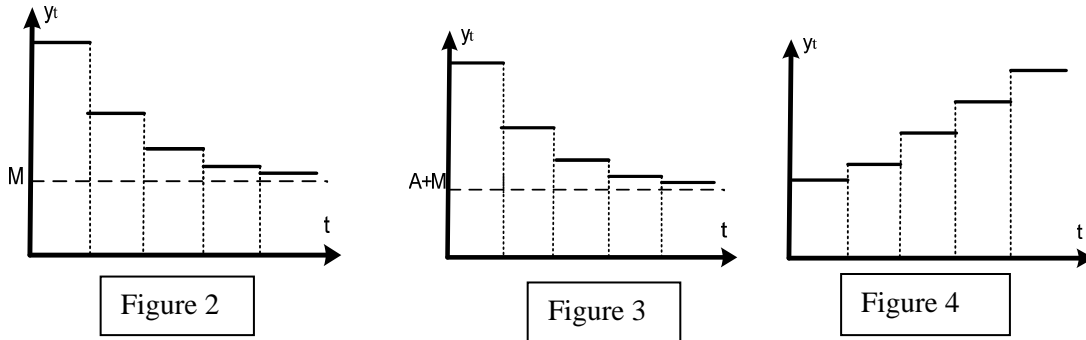$$y_{t+2} + ay_{t+1} + by_t = 0 \qquad (21)$$

This difference equation has the following second order Characteristic Equation with roots x',x":

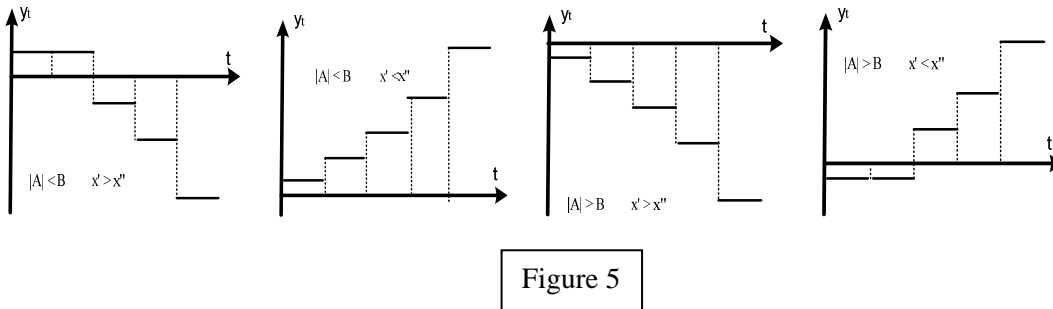$$x^2 + ax + b = 0 \qquad x', x'' = (-a \pm \sqrt{a^2 - 4b})/2 \qquad (22)$$

The Final Solution is in the form of the sum of "Special Solution" (y_p=M) (by solving the non-homogeneous equation) and "Complementary Function":
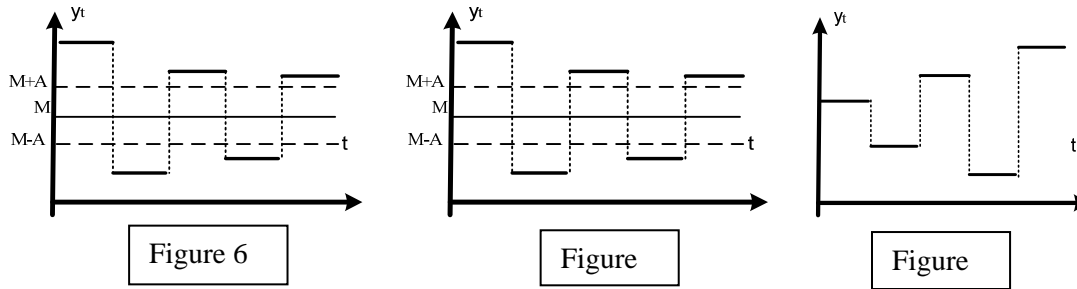
$$y_t = A(x')^t + B(x'')^t + y_p$$

If the equation has <u>two true positive or zero roots,</u> when both of these roots are true and less than one, by the increase of t, y_t tends to constant M (figure 2). But if x'=1 and x"<1, when t increases, y_t tends to A+M (figure 3). If x"=1 and x'<1, when t increases, y_t will finally tend to B+M. If one of the roots is bigger than the other (x'>1) and B and A are both positive, by increase of t, y_t will increase (figure 4).

Figure 2

Figure 3

Figure 4

If A<0 and B >o, the result depends on whether x' or x" is larger. At the preliminary stages, by increase of t, the amount of y_t is more affected by the term whose root is larger (figure 5).

Figure 5

If <u>the two roots are true and negative (or zero),</u> when x", x'<0, when t is even, $(x'')^t$ and $(x')^t$ will be positive, and when t is odd, these items will be negative. This causes y_t to oscillate in successive periods. If the absolute value of both roots are less than one, 0<|x'|, |x"|<1; which means: -1<x', x"<0, by increase of t, $|A(x')^t|$, $|B(x'')^t|$ will reduce and the amount of y_t tends towards M and finally will fit on line y_p= M (figure 6). If x'= -1 and -1<x"<0, $A(X')^t$ does not depend on the amount of t, but only on its being odd or even. When t is even, the last expression is equal to A and when it is odd, it will be equal to –A. Also by increase of t, the amount of $B(x'')^t$ will decrease and y_t oscillatory tends to $A(x')^t$+M and $A(-1)^t$+M (figure 7). When x',x"<-1 , y_t fluctuation will increase by the increase of t and the root with higher absolute value, will have a more effective role in fluctuations of y_t (figure 8).

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Figure 6	Figure	Figure

If <u>one root is positive and the other is negative</u>, the absolute value of the larger root will have more effects on y_t. The following cases may occur:
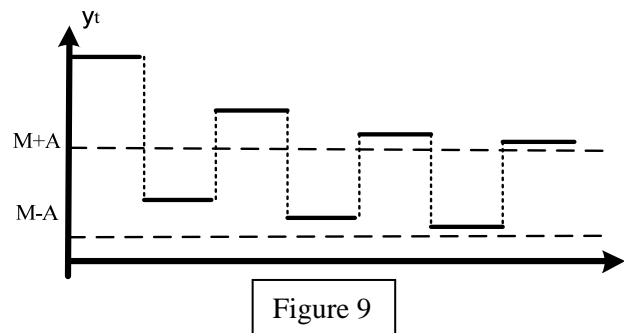
If $1>x'>0$ and $|x'|>|x''|$, y_t will finally tend to M (figure 2).
If $x'=1$ and $|x'|>|x''|$, y_t tends to A+M (figure 3).
If $x'>1$ and $|x'|>|x''|$, the increase of t will increase y_t (figure 4).
If $-1<x'<0$ and $|x'|>|x''|$, by increase of t, the amount of y_t will fluctuate and finally will tend to M (figure 6).
If $x'=-1$ and $|x'|>|x''|$, by the increase of t, y_t will oscillate around A+M and $-A+M$ (figure 9).

Figure 9

If $x'<-1$ and $|x'|>|x''|$, y_t will have expanding fluctuations in relation with M when t increases (figure 8).
If $x'=-x''$, changes in y_t depends on the sign of A, B and larger absolute value of A in relation with B and vice versa.

If <u>the root are double and real</u>, the solution of the difference equation will be as follows:

$$y_t = Ax^t + Btx^t + M \qquad (23)$$

If $1>x>0$, Btx^t will increase by the increase of t and will have an expanding time trend.
If $x=1$, and $Btx^t = Bt$, we will have a similar case to previous one.
If $0<x<1$, Btx^t tends to zero when t increases. This trend is not compensated by the expanding trend of t and when t increases, x^t will be more than t and therefore, the term Btx^t will tend to zero.
If $-1<x<0$, we have a trend similar with the case $0<x<1$, except that the term Btx^t has a fluctuation trend which tends to zero.
If $x=-1$, the trend of Btx^t is similar with $x=1$, but with fluctuations.
If $x<-1$, the result is similar with $x>1$, but with fluctuations.

If the <u>roots are imaginary or complex</u>, the solution of the difference equation will be:

$$y_t= D^t[E \, Cos \, (tR)+F \, Sin \, (tR)] + M \qquad (24)$$

where the roots of the complex characteristic equation will be c±di and its module will be $D=\sqrt{c^2+d^2}$.
The term in the bracket has an iterated fluctuation in each 360°. In other words, y_t has a cycle equal to t=360°/R. Since Sin R=d/D, if for example R=60°, the range of the cyclical movement will be t=360°/60°.
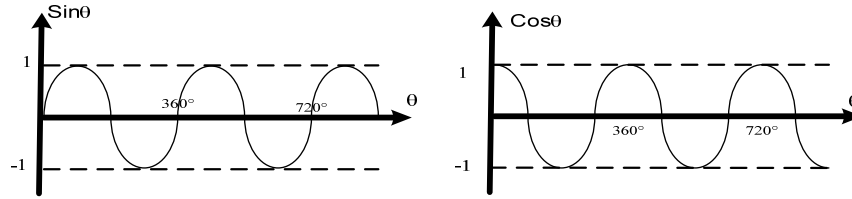

Figure 10

For, $\theta=tR$ the curves $Sin\theta$ and in $Cos\theta$ figure 10 have symmetrical cycles. Since amount of t is discrete, t may not be located at the beginning or middle of those cycles; therefore, figures 11, 12 and 13 look unbalanced. The term in the brackets of equation (24) has smooth fluctuations, but when reaches to power t, if D>1, by increase of t, D^t will increase and multiplied by the amount of the brackets in equation (24) will increase the fluctuations (figure 11). If D=1, D^t will also be equal to 1 and will have no effects on the amount of the bracket and y_t will have a monotonous (smooth) fluctuations (figure 12).
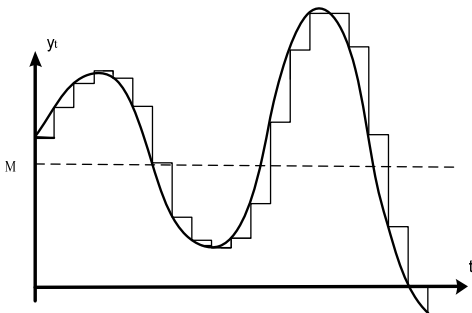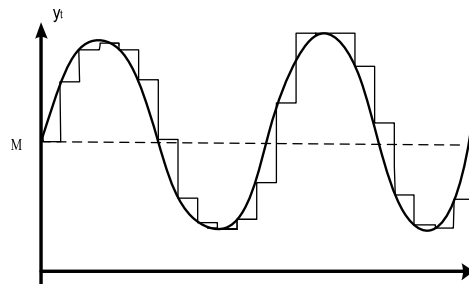

Figure 11

Figure 12

If D<1, when t increases, D^t decreases and fluctuations of y_t will tend to zero (figure 13). If we have a Special Solution, (this solution may be in the form of M, Mt or Mt^2), we define y_p as the temporary equilibrium of y_t. But if the special solution is not fixed, the equilibrium will be moving. For example, the Special Solution can be in the form of $y_p=bt$ where the difference equation has no temporary equilibrium and bt is a moving equilibrium (figure 14).
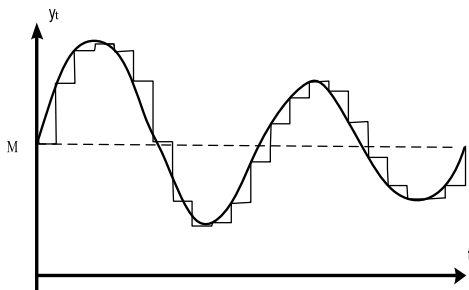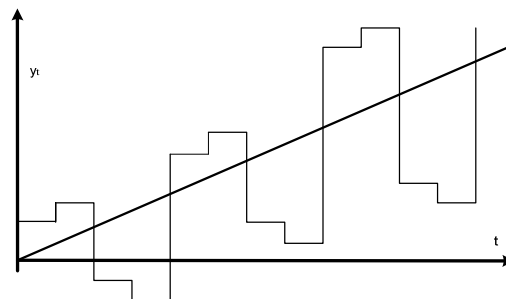

Figure 13

Figure 14

11

In general, for a second order homogenous difference equation with constant coefficients such as:

$$y_t + by_{t-1} + cy_{t-2} = 0 \qquad\qquad\qquad (25)$$

With the help of figure 15 we can describe the time trend of y_t by considering the coefficients of difference equation (b, c) and the roots of characteristic equation.
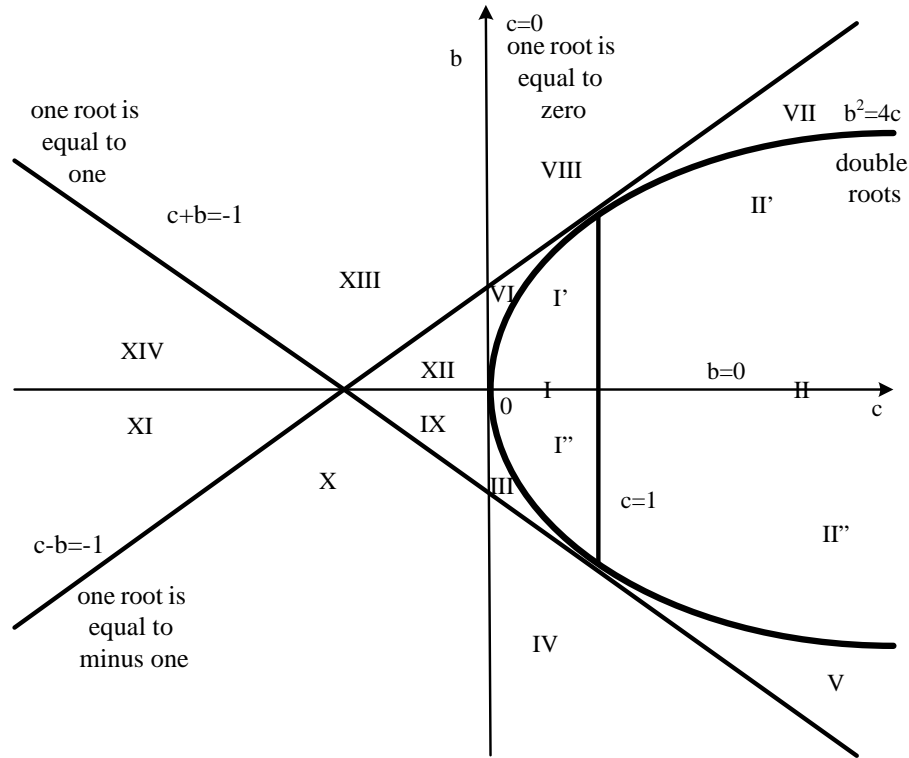

Figure 15

In this figure:

Area I: includes (I", I'): oscillatory dampening fluctuation (complex roots, module<1)
Area II: includes (II", II'): explosive oscillatory fluctuation (complex roots, module>1)
Area III: dampening and non-oscillatory (real roots, less than one)
Area IV: finally dampening and without oscillation (real roots, both positive, one larger than and the other less than one)
Area V: non-dampening and without oscillation (real roots and larger than one)
Area VI: oscillatory dampening (real roots, both negative with absolute values less than one)
Area VII: explosive with oscillation (real roots, both negative with absolute values larger than one)
Area VIII: finally explosive with oscillation (real roots, both positive and less than one)
Area IX: dampening without oscillation (real roots, both positive and less than one)
Area X: finally explosive without oscillation (real roots with opposite signs, the positive root is larger than one and the absolute value of the negative root is less than one)
Area XI: finally explosive without oscillation (real roots, with opposite signs, the absolute value of both roots are larger than one and the absolute value of the positive root is larger)
Area XII: dampening with oscillation (real roots with opposite signs, the absolute value of both roots less than one)
Area XIII: finally explosive with oscillation (real roots with opposite signs, the absolute value of the

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negative root is larger than one and the positive root is less than one)
Area XIV: finally explosive with oscillation (real roots with opposite signs, the absolute value of both roots are larger than one and the absolute value of the negative root is larger than the positive root)

In analyzing the time trend of y_t in a second order difference equation, the characteristics of being real roots, complex roots and double roots, their signs, the absolute value of them and being larger or smaller than one, are critical. In figure 15, many other areas can be enumerated and studied like all the points located on drawn lines and curve or at the intersection of them and so on, but since it is time consuming, we stop here[17].

All the above analyses are only about second order non-homogeneous difference equations with a constant term and fixed coefficients. But if the constant term is a function of time or the difference equation is not linear, or has a higher order, or the coefficients are functions of time, y_t will have different trends which create moving equilibriums with various fluctuations. The mathematical behavior of this kind of equations can be coinciding with difference equation in the previous discussion about interest rates and deposit and loan sources which create any kind of fluctuations in money and capital markets that can easily fluctuate the supply and demand in real sector through investment and consumption demands functions.

Reforming banking structure by elimination of usury

As it is understandable from the relation (5), the clearest phenomenon of business cycles is the bankruptcy of banks which is historically proved. This is because banks during continued recession and crisis, cannot suffer a position like relation (7) for several years. Therefore, in order to solve this difficulty, the banking mechanism should be changed in some way so that the negative and positive fluctuations of their income become minimized. The above mentioned theory shows that the banking initiation of business cycles is the main source of crisis and therefore, in order to control the cycles, the structure of this important monetary structure should be reformed. Since the cause of this disease is observed, it can be cured. The method of cure of this economic problem is to prevent the time lag between equilibrium of interest rates of deposits and loans caused by banks, and fluctuates the markets of supply and demand of banking resources. This means that banks should not operate as a traditional economic firm, but as a financial intermediate to obtain income through commission. Banks operate as separate firms in traditional economies and not as financial intermediate who obtain commission for rendering capital management services. Therefore, banks can create fluctuations in the market. In order to change bank's position into a financial intermediate, we have to define the performance of interest rate of loan sector in such a way that it affects depositors, rather than banks. The essential method of this remedy has been clearly mentioned in divine books such as Old Testament, New Testament and Quran which is the elimination of usury from monetary activities.

The elimination of usury does not mean that banking activities should be eliminated. It means that the owners of financial assets always obtain a yield proportional to the real yield of their financial assets; that is to say, they should practically be shared in profit and loss of the borrower. This participation is described in various Islamic banking contracts. Lenders can share in the profit and loss of the borrower. This banking system is classified into profit and loss sharing banking which is the result of the elimination of usury doctrine in banking activities. Since profit and loss participation transfers banks from financial economic firms into financial intermediates, it can accomplish the previous descriptions and can equilibrate saving and investment markets without any time lag. In addition, established risks in loan

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[17] - For more information about time behavior of difference equations look through "Difference Equations and the Stability of Equilibrium Dynamism", Bijan Bidabad. http://www.bidabad.com/doc/difference-equations.pdf

market are transferred to depositor sector and lender (depositor) and borrower (investor) will both get benefit or loss in the market.[18]

In other words, if we want to establish profit and loss sharing banking system, we have to carry out special transformations in traditional banking. This includes the reform of usury free banking procedures, as well as elimination of Shariah tricks used by banks to show their activities are in compliance with Shariah, and change of their organization structure.

As it is deducted from equation (18), it should be mentioned that the imbalances in government fiscal policy and foreign trade sector can also be encountered as instability factors, but these instabilities are not usually permanent, and the adjustment of government fiscal position or the exchange rate change will return the economy to equilibrium, and while they create annual fluctuations, but do not create business cycles.

Profit and loss sharing banking

In order to implement real Islamic banking, extensive researches have been carried out and the profit and loss sharing system is starting to be experimentally established in Bank Melli Iran[19]. After landing this system successfully it will extend to other banks. We expect that investment risks will not be transferred to banks and crisis would not find ground to spread. This is because profit and loss sharing practically does not transfer investment risks to banks and operating risks will be covered by special insurance and a supervision unit called "Trustee"; and credit risk is minimized because of profit and loss sharing, and because of the special contracts with depositors and the ability to sell deposit certificates, liquidity risks will be limited and bank will not face losses in economic fluctuations. In addition, the creation of a strong and structural relationship between loan interest rate and deposit interest rate prevents profit in one market while the other market is facing loss. That is to say, when investor faces losses in loan market, the profit and loss sharing system does not let the loss to be transferred as profit to depositor, but transfers the loss to the depositor and both markets will enjoy relative stability. Therefore, the fluctuations in supply sector which is related to loan interest rate and in demand sector in relationship

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[18] - When talking about profit and loss sharing banking, it should not be associated with the present banking system of Iran. Because, it can easily be shown that many of the contracts set forth in the Usury Free Banking Law passed in 1983, are usuric. According to the exact definition of usury, contracts of Installment Selling, Hire Purchase Selling, Debt Purchase and compound interest because of the inability of the debtor to pay his debt are in the realm of usury. Clearly, loan facilities in the form of Good Loan (loan without interest), Civil Participation, Legal Participation, Direct Investment, Forward Deals, Modarebah (sharing), Joalah (giving loan to someone who does something on behalf of us), Modareah (sharing in growing crops), Mosaghat (sharing in growing trees) and Rent, if certain conditions are observed, are not in the realm of usury. In all of these contracts, except for Good Loan which does not have any interest and Rent which should be defined before the contract, the interest rate should not be pre-fixed, otherwise they are usuric For more information look through:

- Bidabad, Bijan, Non-Usury Bank Corporation (NUBankCo), The Solution to Islamic banking, Proceeding of the 3rd International Islamic Banking and Finance Conference, Monash University, KL, Malaysia, 16-17 November, 2005. http://www.bidabad.com/doc/nubankco.html

- بیدآباد، بیژن، مبانی عرفانی اقتصاد اسلامی، پول، بانک، بیمه و مالیه از دیدگاه حکمت. پژوهشکدۀ پولی و بانکی، بانک ایران، ۱۳۸۳، تهران. http://www.bidabad.com/doc/eghtesadislami4.pdf

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[19] - Bidabad, Bijan; Aghabeigi, Jina; Naimi, Mahasti; Azarang, Ostovar; Salehian, Saeed; Nafisi Zideh Sarai, Saeed; Mehdizadeh Chelehbari, Alireza; Ghasemi Seighalsarai, Hojatallah; Hoseinpour, Bijan; Sheikhani, Saeed; Allahyari Fard, Mahmoud; Safai Pour, Mahmoud; Khalily Valai, Nadia. Detailed Project of Profit and loss Sharing, Department of Research and Planning - Bank Melli Iran. 2008, Tehran, Iran.

with deposit interest rate will be stabilized[20].

This is in contrary to conventional banking where if borrower gains profit or loss, the lender will certainly obtain his profit (interest) and bank will face credit, liquidity, operational and market risks. In profit and loss sharing system, if borrower gains profit, the lender will also obtain profit, and if borrower faces losses, the depositor will also lose. Regardless of bank ownership to be private or governmental, in profit and loss sharing banking, the base for defining loan rate is the yield of real sector and bank works as intermediate, obtains commission and allocates funds to investment as an attorney or agent and by rendering capital management services and supervision of investment activities, earns commission and transfers the results of investment in the shape of profit or loss to the owners of funds who are depositors. Accordingly, the banks can use investment deposits on the basis of depositor's decision and according to a general or special mandate in joint ownership in form of a partnership contracts divide the yields between depositors. Then the real profit or loss will be divided between the two parties according to their agreement contract and the defined standards, instructions and directions. In this connection, in order to implement its task as a financial intermediate, after deducting its own commission, bank transfers the profit to the owners of fund resources (depositors).

Special financial innovations called Certificate of Mosharakah (Partnership), and Certificate of Pazireh (Subscribed) which can be bought and sold in internet secondary markets have also been considered in this project. These two new instruments practically create a market similar to stock exchange for transfer of deposits among people. According to the economic development in investment and productions, the price of these new financial instruments will increase or decrease. These two new instruments practically are financial papers which are used for transaction of deposits and represent investment in the form of profit and loss deposits allocated to entrepreneurs. Partnership Certificate is anonymous papers with a fixed face value and with a period equal to the duration of investment and is issued by profit and loss sharing bank. The holders of these papers participate in the profit of investment project according to the face value and the period of participation and in exchange with its capital management services rendered to depositors, bank can invest depositor's deposits in one of the three banking products defined by PLS banking instructions. The holders of Partnership Certificate can transact their Certificates at bank counters or over internet; therefore, these Certificates can be transacted internationally. Pazireh Certificate is similar with Partnership Certificate and can be used in continuous or end-less projects, so that after the end of construction or at the beginning of operation, Pazireh Certificate holders become share holders of the company in proportion to the amount of their Certificates and the duration of participation[21].

[20] - Bidabad, bijan, Non-Usury Banking Fits to Obama's Change Strategy, The Solution to Revive the Economy. http://www.bidabad.com/doc/PLS-paper-en-5.pdf

[21] -The generalities of this project can be seen in the papers listed below:

• Bidabad, bijan, Mahmoud Allahyarifard. IT role in fulfillment of Profit & Loss Sharing (PLS) mechanism. Proceeding of the 3rd International Islamic Banking and Finance Conference, Monash University, KL, Malaysia, 16-17 November, 2005. http://www.bidabad.com/doc/english-pls-5.pdf

• Bidabad, bijan, Mahmoud Allahyarifard Implementing IT to Fulfill Profit & Loss Sharing Mechanism. Islamic Finance News (IFN), Vol. 3, Issue 3, 6, February 2006, pp. 11-15. http://www.bidabad.com/doc/summary-pls-it-1.html

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فصلنامۀ علمی- پژوهشی اقتصاد و تجارت نوین، سال اول، شمارۀ سوم، زمستان ۱۳۸۴، صفحات ۳۷-۱.

http://prd.moc.gov.ir/jnec/farsi/3rd/Article2.pdf
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http://bidabad.com/doc/PLS-Banking-7.pdf
http://bidabad.com/doc/PLS-Banking-Export-Deveopment-Bank-2.ppt

The intrinsic risk control characteristics of this banking system manage wavy financial markets automatically. This is because when interest rate is connected to the yield of usually stable real sector, it will become stable too and the risk of financial activity will be controlled.

In addition, because of its intrinsic risk control and ease of use, this banking method will practically absorb foreign investment funds and since transactions can take place over the internet, international transaction can be done all over the world, because the essential problem with conventional banking system is financial risks which bankrupt the banks. This method of banking possibly solves the problem of exposure to crisis.

The other interesting aspect of this banking system is its ability to absorb a variety of financial actives. Usually people are divided into three general categories from risk accepting point of view which are risk lovers, risk neutrals and risk averts. Profit and loss sharing banking absorbs risk averters very easily, because with supervision and insurance measures, probability of loss tends to zero. The secondary market for transaction of Partnership and Subscripted Certificates will absorb risk lovers, and risk neutrals can also easily invest in this framework too.

Squandering and ethic economics

Another version of economic pathology returns to human being behavior. Mankind's inner tends to love and ameliorate the people materialistic aspects of her life, but without a self control, this will automatically exacerbate the conditions of economic crisis. That is to say, that by nature, Mankind tends to excessive consumption, economic greed and passion for accumulating wealth and unrestricted consumption and waste (meaning spending more than need) and lavishness (meaning spoiling resources) and similar behaviors aggravating the spread of business cycles. The am facts increase the intensity of crisis by deeper recessions and higher prosperities. Human behavior needs to be reformed according to ethical, moral and mystical advices raised by divine religions, to reduce the tenses of crises. When there is lavishness in a community, the practical extravagance makes crises wavier. Therefore, it should be tried to institutionalize ethical, moral and mystical behavior in people. By this type of education without government interference, people prevent ravishment and greed and attenuate the domains of business cycles.

Avoiding lavishness in general contributes to free a major part of economic resources including labor and capital which can easily be used by firms in case of crisis. This leads the business cycle reaching its turning point towards prosperity very quicker than usual. In addition, during prosperity, since there is no extravagance or extra consumption, the economy does not get too hot and therefore, it moves towards recession before it gets hot and the economy will face a soft prosperity and softer crisis and practices a very narrow spread of wave which means a relative economic stability[22].

- بیدآباد، بیژن و محمد صفائی پور. چارچوب بازار الکترونیکی معاملات گواهی مشارکت/پذیره در قالب طرح مشارکت در سود و زیان (PLS). پنجمین همایش تجارت الکترونیکی، ۴-۳ آذر ۱۳۸۷، وزارت بازرگانی، تهران.

http://www.ecommerce.gov.ir/EArchive/EArchiveF/Item.asp?ParentID=43&ItemID=182

[22] - For more information look through the following:

- بیدآباد، بیژن. اسراف در اقتصاد اخلاق. http://www.bidabad.com/doc/esraf-eghtesade-akhlagh.pdf

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- بیدآباد، بیژن. شاکله اجتماع و اقتصاد اخلاق. http://www.bidabad.com/shakeleh-ejtema-eghtesade-akhlagh.pdf

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Perhaps it should finally be appropriate to consider that God's messengers have been the wisest and most intellectual peoples on the earth and certainly wisdom is leader and guide for moral soundness and salvation of human beings. The science testimonies their messages and teachings are the leaders and guide for appropriate life, and human being will certainly have better materialistic and spiritual life by obeying their commands.

Conclusion and policy recommendations

This paper clarifies that the structure of traditional banking causes fluctuations in money sector and interest rates and ultimately spreads fluctuation to real sector of the economy and creates economic cycles. On this basis, Islamic banking is proposed which can minimize the range of cycles. Bank renders capital management services and earns commission in this proposal. The practical solution of this mechanism is set forth in profit and loss sharing banking system which does not let losses in investment market while there is profit in saving market.

The profit and loss sharing project of Bank Melli Iran is at its preliminary stages of operation which is a proper model for elimination of probable problems involved in this banking method. This system being implemented successfully, it practically creates conditions which prevent the transfer of investment risk to banks, and crisis does not find ground to spread.

There are also new special financial innovations offered in this proposal called Mosharakah Certificates and Pazireh Certificates, which can be transacted over internet and practically makes it possible to create a financial market similar to stock exchange for transaction of deposits. The holders of these Certificates can transact their certificates at bank counter or over internet and therefore, they can be transacted internationally.

It is expected that Profit and Loss Sharing banking system will spread to all world banks and as long as all operations can be carried out on internet, these transactions can be carried out at any time of day and night, all the days of the week and all places over the world which will be a good incentive for all banks in all countries.

Lavishness in consumption, economic greed, uncontrolled waste and passion for accumulating wealth aggravate economic crisis – by spoiling resources. Therefore, human behavior should be reformed according to ethical and mystical points of view to relatively control the intensity of lavishness and greed in human community so the intensity of crisis will be dampened. Prevention of lavishness and waste will free a great portion of resources and will narrow the range of business cycles.

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