An Econometric Analysis of Long - term Deposits in Iranian Banking Operations

Dr. Makkiyan, Faculty Member
University Of YAZD

In this paper the quarterly changes in the behaviour of long-term deposits in the operations of the Iranian banking system during the period 1984: I and 1994: IV, is investigated. Two methods are employed to analyse the data. Long-term deposits in Iran are first examined by the descriptive method. The result is then analysed by an error-correction model in order to see whether such an analysis confirms the finding of the descriptive method. The result, in general, shows that changes in the rate of return generate the changes in the level of long-term deposits. This enables us to think that the rate of return is 'weakly exougenous' and is 'causing' the changes to the level of such deposits.

Keywords: Islamic banking, long-term deposits, Iranian banking operations, *musharekah*.

1 Introduction

After the Islamic Revolution in Iran in 1979, the fundamental structure of banks was transformed from interest-based to non-interest-based operations. The idea was to adopt Islamic banking principles, and thus reject the use of predetermined interest rates on bank deposits and loans[1].

This paper is concerned with an analysis of long-term deposits and their rates of return in the Iranian banking system which operates under Islamic principles. Long-term deposits in Iran will first be analysed by the descriptive method and then with a regression analysis. To give an assessment on these kinds of deposits in the banking operations, a brief examination on the liability side of Iranian banks will also be presented. The data is

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[1] For a comparative analysis of Islamic and non-Islamic (orthodox) banking, see Murinde, Naser and Wallace, 1995.

quarterly (44 observations) at a national level. The period of investigation is between 1984 - which marks the beginning of operations of the Iranian banking system based on Islamic principles - and 1994.

2 Motivation

We are motivated by two primary objectives. First, to investigate the long-run relationship between bank deposits and the return on deposits. The magnitude of the long-term bank deposit elasticity with respect to the return may indicate the relative importance of return to deposit behaviour. Second, we explore the direction of causality between the two variables.

3 Data and Measurement

We employ quarterly data. These are obtained from the Central Bank of Iran Annual Reports (1984-1994). The variables are measured as follows:

i)- LD = Long term deposits.

ii)- R_l = Rate of return on long-term deposits.

4 Econometric Procedures

The econometric procedures we used are based on a Vector Autoregressive (VAR) framework. We call upon some techniques suggested in the recent developments in econometric research; specifically, we follow the suggestion by, among others, Gonzalo (1994), Hargreaves (1994) and Haug (1996), which recommend the maximum likelihood approach of Johansen (1988) as being generally better than a range of other estimators of long-run relationships (cointegrating vectors) among integrated processes in small sample sizes of about 100 data points. Moreover, this procedure has been shown to be efficient in testing for causality; see, for example, Toda and Phillips (1993) and Hall and Milner (1994). The procedure is therefore used, firstly to identify the number of cointegrating vectors among the variables, and secondly to examine the direction of causality.

The Johansen (1988) method is based on the vector error correction (VECM) representation of a VAR(p) model which is written as follows:

$$\Delta x_t = \Gamma_1 \Delta x_{t-1} + \Gamma_2 \Delta x_{t-2} + \dots\dots\dots\dots + \Gamma_{p-1} \Delta x_{t-p+1} + \pi x_{t-p} + \psi D_t + u_t \qquad (1)$$

where x is an $nx1$ vector of the first order integrated, or I(1), variables; $\Gamma_1, \Gamma_2, \dots\dots, \Gamma_p$ are nxn matrixes of unknown parameters, D is a set of I(0) deterministic variables such as a constant, trend and dummies; and u is a vector of normally and independently distributed errors with a zero mean and constant variance. The equilibrium (steady-state) properties of the equation in (1) are characterised by the rank of $\pi(nxn)$, and in this application n = 4. If a cointegrating vector exists, then π is rank deficient. If $r = 0$, then π has zero rank and VAR (P-1) in differences should be used; this would suggest that there are no long-run relations between the variables in x. The maximal eigenvalue and trace statistic tests for identifying the number of distinct cointegrating vectors (r) in the VAR are defined in Johansen (1988). The appropriate critical values are tabulated in Osterwald-Lenum (1992). If π is of rank r $(0 < r < n)$ then it can be decomposed into two matrixes $\alpha(nxr)$ and $\beta(nxr)$ so that we have the following:

$$\pi = \alpha\beta' \qquad (2)$$

The rows of β are interpreted as the distinct cointegrating vectors whereby $\beta' x$ form stationary processes. The α's are the error correction coefficients which indicate the speeds of adjustment towards equilibrium. The basic specification for the test of long run causality is derived by substituting equation (2) into equation (1) to yield the following:

$$\Delta x_t = \Gamma_1 \Delta x_{t-1} + \Gamma_2 \Delta x_{t-2} + \dots\dots\dots\dots + \Gamma_{p-1} \Delta x_{t-p+1} + \alpha(\beta' x_{t-p}) + \psi D_t + u_t \qquad (3)$$

As Johansen and Juselius (1992) have shown, a test of zero restrictions on α is the test of weak exogeneity when the parameters of interest are long run. In this paper, we rely on this test of weak exogeneity to investigate long-run causality between the variables of interest; our interpretation of weak exogeneity in a cointegrated system as a notion of long-run causality is consistent with that of Hall and Milne (1994). We test the null of $\alpha = 0$ using the standard likelihood ratio test.

Our estimation and testing procedure also deal with a number of issues. First, given that Baillie and Bollerslev (1994) and Diebold *et al*. (1994) have reported that cointegrating relationships are sensitive to the inclusion or otherwise of a constant term in the cointegration space, we follow Johansen (1992) and Crowder and Hoffman (1996) and address this issue by identifying appropriate deterministic terms in the cointegrating space through joint tests of the rank order and the deterministic component. Second, we also address the issue of the specification of the VAR length since the results of these procedures tend to be sensitive to lag lengths. Although the most commonly used approach is to use some information criteria such as Akaike and Schwartz, Cheung and Lai (1993) have shown that the lag length selection based on information criteria may not be adequate when errors contain moving average terms. We follow the suggestion by Hall (1989) and Johansen (1992) that the lag length should be specified such that the VAR residuals are empirically Gaussian; we specify lag lengths on the basis of non-autocorrelated VAR residuals. Third, we address the usual problem of the identification and interpretation of the cointegrating parameters, β, as long-run economic relationships. The problem is that in a system that contains n I(1) variables, there can be $n-1$ cointegrating vectors. Johansen (1991) has suggested that if a system contains r cointegrating vectors, identification should be performed through the test of r^2 just-identifying restrictions. The eigenvalue routine for testing homogenous restrictions in a cointegrating space are given in Johansen (1992). Pesaran and Shin (1995) suggest a test for $r^2 + k$ (where $k \geq 1$) restrictions which gives k over identifying restrictions.

5 The Liability Side of the Balance Sheet of Iranian Banks

In this section the liability side of Iranian banks will be analysed by descriptive method. According to the law on interest-free banking, liabilities incurred by banks are basically of two kinds, as follows:

i) *Qard-al-hasanah* deposits constitute current and savings deposits. These are similar to those of conventional banks except that they cannot earn any return. Current *qard-al-*

hasanah deposits are like demand deposits or current accounts in conventional banks. Customers are offered cheque-books. They can withdraw their money at any time without notice. The other type is the *qard-al-hasanah* savings account. In this account, depositors are offered non-fixed prize draws and bonuses in cash or kind.

ii) Investment deposits, which banks are authorised to acquire, are also of two kinds: short-term and long-term investment deposits. These deposits differ with respect to time. The minimum time limit for short-term deposits is three months and for long-term deposits, 1, 2, 3 and 5 years. No fixed amount, or rate of return, can be guaranteed to the depositors in advance. Banks pay the profits of depositors provisionally on a quarterly basis with a condition for final adjustment at the end of the financial year.[2] Depositors can withdraw their money from long-term investment deposits before the termination of agreement, if they give notice in advance. In this case, the basis for the calculation of the profit will be the next lowest category of deposits, according to the time when the money has been deposited. If the money is withdrawn several years before maturity, it falls to the appropriate lower category for the time it remained in the bank. Withdrawal from short-term deposits is possible at any time without notice. These are not cheque-book accounts; they earn a profit according to the amount and the duration they remain in the bank. Banks may insure the repayment of the principal amount of investment deposits.[3]

The performance of the liability side of the Iranian banking system needs to be briefly evaluated according to the transformation of banking operations to a non-interest basis. As already noted, 1984 is the first year of Islamic banking operations in Iran. The banking system was asked to convert its liability side according to Islamic principles during its first year of operations. There are two types of deposit. The first is sight or demand deposits (current accounts) which are withdrawable on demand. The second is time or non-demand deposits (deposit accounts) withdrawal of which usually requires some notice. In Iranian banking, long-term deposits follow this regulation. Table 1

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[2] See Proceedings of the 4th Seminar of Islamic Banking, Tehran, The Banking Institute of Iran, 1993, p.78.

[3] Article 4 of the law on interest-free banking in Iran. However, full repayment of the nominal value of investment deposits is normal practice for banks. For more information see, Habib Shirazi (ed.), Islamic Banking, London, Butterworths, 1990.

presents the summary of the liability side of the performance of Islamic banking in Iran at a national level during the period of investigation in relation to the private sector.

Current accounts which are legally defined as *qard-al-hasanah* (current) are automatically demand deposits. Non-demand deposits consist of short-term, long-term, *qard-al-hasanah* savings and other deposits - for example, advance payments for credit documents. As the Table 1 shows, the average percentage share of demand deposits is 37.91% and 62.09% for non-demand deposits. The percentage share of demand deposits decreases relatively over time. Simultaneously, the percentage share of non-demand deposits increases.[4]

Figures indicates that sight deposits which represent instant liquidity for depositors decrease continually in favour of investment deposits. The standard deviation of the percentage share of both the demand and non-demand deposits is 2.31. It can be inferred that the variation of these variables is uniform. Both the demand and non-demand deposits undergo an almost 10-fold increase in their nominal value over the period. The growth of these deposits has been due, not only to the rapid expansion of liquidity and money supply in the country, but also to the opening of new branches, especially in rural areas. The rural areas had until then little or no access to banks.

Figure 1, which shows the trend of the percentage shares of demand and non-demand deposits as a proportion of total deposits, illustrates the above discussion. It also shows a gradual decline in demand deposits in favour of non-demand deposits, reflecting the public confidence in banks after the year 1988, which marks the ceasefire between Iran and Iraq.

Table 2 gives the composition of non-demand deposits and some statistical derivatives from it. As mentioned earlier, non-demand deposits include short-term, long-term, *qard-al-hasanah* savings and other deposits. Table 2 indicates that the average percentage share of short-term deposits, that is, with a minimum of three months, is 28.28%. This means that short-term deposits, after demand deposits, constitute the second most important component of deposits in the Iranian banking system. This is

[4] All tables and figures are presented in the appendix.

because the short-term deposits are considered withdrawable at will. Moreover, they earn a profit. However, after a rapid increase in short-term deposits, they began to decrease around 1989 in favour of long-term deposits. The percentage share of long-term deposits with the mean of 17.46% during the period indicates that this kind of deposit is less attractive than demand and short-term deposits. In other words, long-term deposits, which are the main way of financing long-term for industrial projects, form a smaller proportion of total deposits. However, Figure 2 indicates that long-term deposits, despite the popularity of short-term deposits, tend to increase over the period. Figure 2 presents the percentage shares of the composition of non-demand deposits.

Variations in short-term and long-term deposits can be examined through their rates of return. Table 3 presents the actual rates of return on short-term and long-term deposits paid to depositors over the period. It also shows the consumer price indices during the period, the growth of which are much higher than the rates of return. As can be observed from Table 3, deposits with a period of 2, 3 and 5 years were introduced in 1990. The table also indicates that rates of return to depositors are varied according to maturity. In the second half of the 1980s, short-term deposits earned 6% and long-term deposits 8.5% rates of return annually. In 1990, two years after the ceasefire, the one-year deposits' rate of return rose to 9%, with correspondingly higher rates for longer maturity (for example, 13% on five-year deposits). In 1992 all rates of return were raised, ranging from 7.5% to 15%, in order to compensate for the rate of inflation. From March 1993, all rates of return were raised again to a range between 8% and 16%. Figures 3 and 4 show that an increase in the rate of return on long-term deposits is more considerable than that on short-term deposits. Figure 3 indicates that depositors reacted to the rate of return and invested more of their funds in long-term deposits, with a simultaneous increase in their rate of return. Figure 4 indicates that short-term deposits, because of a low rate of return, did not increase. It can be concluded that, with an increase in the rate of return, the long-term deposits have increased. Moreover, it can also be said that a decrease in demand and short-term deposits during the period is partly shown by an increase in long-term deposits.

The above discussion indicates that with an increase in the rate of return in Iranian banks, the share of corresponding deposits in total deposits increased. The implication of all this is that the banking system will be able to attract the excess money and liquidity which are the main causes of inflation in the Iranian economy. This may be achieved when banks are able to operate properly and choose for themselves appropriate and profitable transactions without pressure from the government.

Notwithstanding the high level of consumer prices (rate of inflation), the appropriate rate of return was important for determining the size of the deposits. Table 3 shows that all rates of return to depositors, with the rare exceptions of 1985 and 1990, are below the corresponding inflation rates. Clearly, if banks are able to pay suitable rates of return to depositors, deposits will shift from lower to higher-return deposits. Figure 5 indicates that, with an increase in consumer prices, only long-term deposits whose rate of return is higher than that of short-term deposits increased.

The average increase in the consumer price index during 1984-1994 was around 20% and the average rate of return on bank deposits was about 10% a year. This indicates that depositors lost 10% of their purchasing power each year. However, depositors found that banks were the safest place to keep their money. It is evident that the value of money tends to decrease in an inflationary situation. Clearly, if a debtor who has borrowed a certain amount of money repays the same amount plus some profit to his creditor after a period, the creditor suffers the effects of inflation. In other words, depositors suffer in an inflationary situation. This is one of the unresolved issues for Islamic banks because the demand for the loss of value of money is treated as *riba*. It is very important to find a method to compensate for the loss of deposits and bank resources, because, as this paper has shown, it is possible for net rates of return on short and long-term deposits to be almost continually negative over a period of years (falling below annual rates of inflation).

The principal core of Islamic banking is that, as a mechanism for allocating financial resources, the rate of interest is replaced with the rate of return on real activities. However, if the salient feature of an Islamic banking system is that the rate of return to depositors arises from the rate of return in the real sector of the economy as well as the efficiency of individual banks, this has not so far been reflected in the performance of the Iranian banking system. The Justification offered by the authorities has been that conditions did not allow market realities to be reflected in the rates of return. In Iran, the rates of return paid on the investment deposits are calculated by the Bank Markazi on the basis of the overall profits made by banks. Therefore, all depositors receive equal rates of return according to their deposits. This applies regardless of the bank in which the depositors hold their funds. The Bank Markazi also estimates the nominal ranges of expected profit to guide banks on the asset side of their operations. Consequently, the rates of return to depositors are influenced by regulation rather than actual market information.

Qard-al-hasanah savings deposits, with an average of 8.96% in total deposits, are the primary source of *qard-al-hasanah* loans. The ability of the banking system to provide this kind of loan depends on the capacity of banks to attract *qard-al-hasanah* savings deposits. This kind of deposit, which is recommended by Islamic principles, as Figure 2 shows has a decreasing trend over the period.

Other deposits, with the mean of 7.39%, have a large share in total deposits at the beginning of the period, which was the first year that the Islamic banking system was implemented in Iran. After 1984 they show a general decline and have a small share in total deposits. However, from 1991 other deposits which have been mostly used for advance payments regarding credit documents, have increased. This may indicate that after the war, foreign trade has expanded. This is shown by Figure 6.

Finally, due to the increasing government deficit mainly caused by funding war expenditure (1980-1988), the liquidity of the private sector rapidly increased. The high level of liquidity indicates that there is a high level of inflationary potential in the economy. If a main part of this liquidity can be attracted by the banking system into long-term deposits which are ultimately invested in projects which increase the GDP by producing goods, the rate of inflation can be slowed. Table 4 and Figure 6 give some insight on this.

Table 4 shows that a main part of the liquidity with an average of 80.31% was deposited in banks. However, a small proportion of these deposits belongs to long-term deposits. Table 4 indicates that the percentage share of short-term deposits in the liquidity of the private sector is 22.55% and of long-term deposits is 14.33%. A comparison of the standard deviation of percentage share of short-term deposits (which is 4.51) with that of long-term deposits (which is 3.38) indicates that the variation in long-term deposits was less than in short-term deposits. This can be explained by the fact that short-term deposits were considered as demand deposits by the depositors. Short-term deposits are withdrawable at any time and depositors can withdraw these funds whenever they expect to earn more benefit from them in other activities than investing in banks.

Nonetheless, Figure 6 shows that the share of long-term deposits, compared with short-term deposits, in the liquidity of the private sector is tending to increase, especially after 1988. As already mentioned, this may be attributable to public confidence in the banking system after the ceasefire and the rise in the rates of return. This is advantageous for banks whose profitability has a direct relationship with those long-term deposits being utilised in long-term projects. The banking system must implement a policy which will increase the share of long-term deposits, one of the most important objectives of Islamic banking on the liability side.

The above has explained the operation of the Iranian banking system on the liability side. In what follows, this paper has carried out a regression analysis in relation to long term deposits in order to see whether such an analysis confirms the finding of the previous discussion of this form of deposit.

6 Econometric Procedures and Results

Since the long-term deposits in the Iranian banking system are the most important deposits in banking operations on the liability side, we use a simple model for the examination of these kinds of deposits. In other words, we want to see the effect of rates of return on such deposits. The equation for the regression analysis is as follows:

$$LD_t = \beta_0 + \beta_1 R_{1t} + u_t \qquad (4)$$

where LD_t = long-term deposits as the dependent variable; R_{lt} = weighted average rate of return on long-term deposits as the independent variable; β_l = parameter to be estimated; u_t = stationary disturbance term.

The theory of savings states that when the rates of return on deposits increase, the amount of deposits will increase. This behavioural assumption requires that the amount of $\beta_1 \rangle 0$. The above linear equation is consistent with the theory and indicates that long-term deposits would have a positive relationship with their rates of return. This means that with an increase in the related rates of return, the level of long-term deposits will increase, and vice versa.

In a normal linear regression it has been assumed that $E(u_t) = 0$ and u_t has a constant variance for all (t). If these assumption are satisfied, the series u_t is stationary. However, many economic time series are nonstationary in the sense that the mean and variance depend on time. They tend to depart ever further from any given time value as time goes on. If this movement is principally in one direction (up or down), the series exhibits a trend. In the regression analysis it is important that a series is stationary or nonstationary. For a stationary time series the variance of the error terms of the mechanism from which the series is generated is constant and for a nonstationary time series the variance is not constant. If indeed the data series are of nonstationary type, the errors (u_t) in the equation will have variances increasing over time. Under these circumstances many of the properties of the least squares as well as tests of significance are invalid. Therefore, we cannot imply the usual regression model which may be a spurious regression when the series belongs to a nonstationary type. The assumptions of the classical regression model necessitate that the variable sequences be stationary, meaning that the errors have a zero mean and constant variance.

To test the hypothesis that a time series belongs to a stationary class against the alternative that it belongs to a nonstationary one, economists use a test developed by Dickey and Fuller which is called testing for a unit root. In this test, if a series have an autoregressive representation with a white-noise error, the series is integrated of order zero or I(0). On the other hand, a time series is said to be integrated of order (d), or I(d), if it must be differenced 'd' times to become stationary. This test determines the order of integration of a series. Since the test of order of integration is a prerequisite for any regression analysis, the ADF tests (Augmented Dickey-Fuller) for the series of long-term deposits and their rates of return are implemented and the results are reported in Table 5.

We reject the unit root hypothesis for large negative value of the test. The above results show that the series of long-term deposits and their rates of return are not stationary, but integrated of order (1) or first difference stationary process. Moreover, the critical values assume that the test equations have serially uncorrelated disturbances.[5]

The next stage is to determine whether the variables are actually cointegrated. If the variables themselves are stationary, it is not necessary to proceed since standard time-series methods apply to stationary variables. If the variables are integrated of different orders, it can be concluded that they are not cointegrated. Cointegration necessitates that the variables be integrated of the same order.

The results of the ADF tests show that the variables, i.e. the series of long-term deposits and their rates of return, are integrated of same order. Since estimating a model does not make sense unless the variables are cointegrated, that is, when there is a long-run equilibrium relationship between them, we need to search for cointegration between the variables. This means that the dependent and independent variables should not move too far apart from each other over time. In other words, the equilibrium relationship states that the variables cannot move independently of each other.

The methods devised in the literature for determination of a cointegration relationship between the variables are that of the Engle-Granger and Johansen approaches. In the Engle-Granger method, the variables of long-term deposits and their rates of return are actually cointegrated if the residuals (the error terms) from the long-run equation are stationary. If these deviations from long-run equilibrium are found to be stationary, the series of long-term deposits and their rates of return are cointegrated of order (1,1). However, this method may have some problems. The difficulties of

[5] It should be noted that the unit root tests on the series of long-term deposits and their rates of return have passed the LM test, indicating no serial correlation in the errors.

applying this method arise from the fact that if more than two variables are included in an equation, there can, in principle, be more than one cointegrating vector while the Engle-Granger procedure can only identify one vector of cointegration. Furthermore, the result of cointegration tests using the Engle-Granger method can be changed according to which variable is chosen as the dependent variable. The Johansen procedure, on the other hand, overcomes the above mentioned problems through simultaneous maximum likelihood estimation of the cointegration vectors and adjustment parameters. Thus, in this regression analysis the Johansen approach is applied for the cointegration test. If the Johansen test for cointegration in the variables is implemented it produces the results reported in Table 6.

This result shows that the variables of long-term deposits and their rates of return are cointegrated. This means that any deviation from long-run equilibrium must be temporary. The test also indicates that there is one cointegration vector between the variables. Clearly, if there are two variables, there can be at most one independent cointegrating vector which is stationary (for details, see appendix 2).

When variables are found to be cointegrated, there is an error-correction model (ECM) between them. The error-correction model implies that changes in the dependent variable are a function of changes in the explanatory variables as well as the level of disequilibrium in the cointegration relationship. This connection between the changes in the variables and deviation from equilibrium is called ECM. As far as the variables of long-term deposits and their rates of return are concerned, there is an error-correction form like this:

$$\Delta LD_t = \alpha_0 + \alpha_1 \Delta R_{1t} + \sum_{i=1}^{n} \beta_i \Delta LD_{t-i} + \sum_{i=1}^{j} \lambda_i \Delta R_{1t-i} + \alpha_2 EC(-1) + u_t \quad (5)$$

The error-correction model can be described as a short-run dynamic model. As the variables are cointegrated the residuals from cointegration relationship can be used as an 'error-correction' term. This is because the short-run dynamics must be influenced by the deviation from the long-run relationship.

Now we can estimate the error-correction model using the saved residuals from the estimation of the cointegration relationship between the variables. The saved residuals with one lag appear in the right-hand side of the model as an explanatory variable indicating the error-correction mechanism. It is worth noting that for the estimation of the ECM the general-to-specific methodology is applied: for both variables the same large lags (6) are introduced and then worked down by eliminating the insignificant lagged terms. The following result is produced from the estimation of the ECM equation:

Dependent v.	Lagged Δterms	R-bar squared	Durbin-Watson	EC(-1): coef.	t-sig. EC(-1)
LD	LD(-1, -4, -5): R_1(-1)	0.774278	1.909751	-0.7362	-2.5630

The error-correction model necessitates that the coefficient of saved residuals with one lag (the error-correction term) obtained from the cointegration relationship should be negative and significantly different from zero. The above result confirms this, indicating that the variables respond to the level of disequilibrium in the cointegration relationship. The coefficients of other explanatory variables, i.e. the respective time lags of dependent and independent variables, are also significantly different from zero.

The result of the error-correction model shows that the coefficient of ΔLD, i.e. changes in the rates of return have an important positive effect on the changes in long-term deposits.

The coefficient of the error-correction term (also known as the 'speed of adjustment') in the error-correction model, i.e. the coefficient of EC(-1), is of particular interest in that it has an important implication for the dynamics of the model. It is clear that a large value of speed of adjustment is associated with a large value of change in long-term deposits (ΔLD_t). If the speed of adjustment is zero, the changes in long-term deposits do not respond in any way to the deviation from long-run equilibrium in (t-1). The speed of adjustment in the above ECM equation is 0.73. Thus, any deviation from the long-run equilibrium can be expected to adjust quickly.

Through the error-correction term, we can find an additional means for the Granger-causality. This can be found throughout the statistical significance of the t-test of the lagged error-correction term. This means that the error-correction term can be helped to clarify the exogeneity or endogeneity of the variables. The significance of the error-correction term in the above table indicates that the rate of return is 'weakly exogenous' and is causing the level of long-term deposits. To put it another way, the long-term deposits are Granger-caused by rates of return. However, it is not possible to confirm this unless we examine the error-correction model for the variable of rate of return on long-term deposits(ΔR_1). This equation is implemented and the result is as follows:

Dependent v.	Lagged Δterms	R-bar squared	Durbin-Watson	EC(-1): coef.	t-sig. EC (-1)
R_1	LD(-1, -3)	0.066937	2.230893	0.00079	0.7260

As the result of the above test shows, the EC(-1) has a coefficient that is statistically speaking zero.[6] This means that the disequilibrium does not affect the rate of return. Therefore, it is changes in the rates of return which generate the changes in the level of long-term deposits.

The last stage is to assess the adequacy of the model. By performing diagnostic checks we can determine whether the estimated error-correction model is appropriate. The Durbin-Watson (DW) value of the ECM equation for long-term deposits (1.90) is very close to 2. This appears to suggest that there is no serial correlation in the residuals of the model. Although the DW test is the most commonly used test for serial correlation, it has some limitations. For example, the DW test cannot be applied in the models in which lagged dependent variables appear on the right-hand side of the equation. Thus, the Lagrange Multiplier (LM) test is employed for the serial correlation.

The result shows that the reported probability of the LM test (0.100532) is greater than significant level, therefore, the null hypothesis of H_0 = no autocorrelation cannot be rejected. This means that the variances of the error terms in the ECM

[6] The ECM for the rate of return (ΔR_1) has been examined with the maximum possible number of lags (6), as required by the general-to-specific modelling strategy.

equation are independent. In other words, the necessary assumption of independence of residuals in the equation is met.

Having failed to detect serial correlation, we can test for normality of residuals to see whether the other necessary assumption in the error terms of the equation is violated. The distribution of residuals may not appear to be normal for reasons such as misspecification of the model, non-constant or unequal variances, etc. In order to evaluate the normality of the residuals the Histogram and Normality Test can be implemented. This test produces the Jarque-Bera statistic (2.281678) with its associated probability (0.319551). Since the probability of the test (0.3195) is more than the significant level of 5%, we cannot reject the null hypothesis that the residuals are normally distributed.

Now, we need to see whether there is any pattern in the residuals that suggests *heteroskedasticity* (unequal variances) in the error terms. If the residuals increase or decrease with the value of the independent or dependent variables, the assumption of equality of variances to be broken. In order to detect the evidence of ***heteroskedasticity*** the ARCH test (Autoregressive Conditional *Heteroskedasticity*) can be employed.

The probability of the ARCH test (0.603914), which exceed the significant level of 5%, indicates that the null hypothesis of ***homoskedasticity*** (constant variance) cannot be rejected. Thus, the assumption of equality of variances for the equation is met.

Since the bivariate equation of long-term deposits with their rates of return passed the most important tests for the residuals, such as the LM test for serial correlation, normality in the residuals and the ARCH test for detecting *homoskedastisity*, the estimated ECM equation can be written as follows:

$$\Delta LD = \underset{(2.49)}{81.57(\Delta R_1)} + \underset{(3.90)}{1.01(\Delta LD_{t-1})} + \underset{(5.52)}{.68(\Delta LD_{t-4})} - \underset{(-2.76)}{.77(\Delta LD_{t-5})} + \underset{(2.10)}{73.93(\Delta R_{1t-1})} - \underset{(-2.56)}{.73(EC(-1))}$$

Figure 7 shows that the actual and fitted values of the dependent variable come close to each other. This indicates that the changes in long-term deposits are fairly predicted by the changes in their rates of return, especially after the year 1989. This period begins after the ceasefire, and also the year in which the authorities introduced new types of long-term deposits with a period of 2, 3 and 5 years. Furthermore, this year signals the beginning of an increase in the rates of return on long-term deposits. It can be said that the above ECM model is able to estimate the variability in the dependent variable, i.e. the changes in long-term deposits, with reasonable accuracy.

The previous discussion demonstrates that there is a strong positive relationship between the amount of long-term deposits and their rates of return. It also demonstrates more clearly that the changes in rates of return cause the changes in the level of deposits. It can be said that the regression analysis of long-term deposits in the Iranian banking system comes up with the same result as in descriptive examination. As already noted, long-term deposits increased to almost 21% of total deposits by the end of the period of investigation. This increase was due to a simultaneous increase in the rates of return on long-term deposits (from 9% to 16%) which motivated savers to invest more of their funds in long-term deposits.

7 Concluding Remarks

The descriptive analysis of long-term deposits shows that the increase in such deposits intensified after 1989 due to a simultaneous increase in the rates of return to depositors. In contrast, the rate of return on short-term deposits remained almost stable. As a result, the proportion of this kind of deposit declined over the period. This indicates that there was a partial shift from demand and short-term deposits as these gave way to long-term deposits. The cointegration and ECM analysis also demonstrates that changes in the rates of return have an important positive effect on changes in long-term deposits. Moreover, Causality finding shows that it is changes in the rate of return which generate the changes in the level of long-term deposits.

The profitability of banks is dependent on stable resources. The main source of these resources is long-term deposits. These deposits can be utilised in long-term projects which are in the overall interest of the economy. Long-term deposits are also able to bring greater returns to banks. On the other hand, investment in profit/loss-sharing modes of financing, for example *musharakah*, which are in accordance with the theory of Islamic banking and are usually used to finance long-term projects, need long-term resources. Long-term deposits in banks by the public are one way of providing such resources. The result of the above analysis shows that there is a significant association between long-term deposits and their rates of return. This analysis also indicates more clearly that changes in rates of return can generate changes in the level of long-term deposits. Thus, with an appropriate increase in the rates of return on long-term deposits, banks are able to attract more funds from people in the form of long-term deposits. In pursuit of this goal, a relative market rate of return can constitute the basis for savings and thus for the allocation of resources. In the case of Iranian banks, rates of return on deposits were and still are lower than the rate of inflation. This would indicate that depositors had lost their purchasing power. On the contrary, borrowers have benefited from such a situation by obtaining low-cost loans. If an important feature of Islamic banking is that the rate of return to depositors is the reflection of the rate of return in the real sector of the economy, this is so far not reflected in the performance of the banking system. Furthermore, if the share of long-term deposits in total deposits becomes low, the financial operations of banks moves towards short-term modes of financing - such as mark-up - which is considered to be a second-best method in comparison to profit/loss-sharing modes. This arises from the fact that financing medium and long-term projects is very risky when the deposits in the banks are of a short-term nature. It can be concluded that an appropriate, i.e. a market rate of return to depositors can promote the formation of capital in the form of long-term deposits.

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Appendix 1:

Table 1:
Bank deposits in Iran (1984-1994) from the private sector

(Units: Billions of Iranian *Rials*)

	Demand Deposits	% Share of D.D. in Total Deposits	Non-demand Deposits	% Share of N.D.D in Total Deposits	Total Deposits
Mean	6975.13	37.91	11692.20	62.09	18667.33
Std. Dev	5015.18	2.31	8309.08	2.31	13293.85
Minimum	2154.600	34.75	3219.300	57.10	5564.500
Maximum	21731.20	42.90	31412.10	65.25	53143.30

Source: Central Bank of Iran, Anual Reports, 1984-1994.

Table 2:
Composition of private sector non-demand deposits in Iranian banks (1984-1994)

(Units: Billions of Iranian *Rials*)

	Short-term Deposits	% Share of S.D. in Total Deposits	Long-term Deposits	% Share of L.D. in Total Deposits	*Qard-al-hasanah* Deposits	% Share of Q.D. in Total Deposits	Other Deposits	% Share of O.D. in Total Deposits
Mean	5255.61	28.28	3645.20	17.46	1475.42	8.96	1316.11	7.39
Std. Dev.	3385.35	5.96	3022.80	4.31	785.66	2.76	1366.78	8.65
Minimum	514.500	9.12	107.700	1.91	194.300	3.45	246.100	2.74
Maximum	12783.0	35.60	10432.6	22.31	3494.70	17.10	5400.50	42.61

Source: Source: Central Bank of Iran, Anual Reports, 1984-1994.

Table 3:
Nominal rates of return (Ex-post) on short-term and long-term deposits in Iran 1984-1994

Year	Nominal Return on S.D.	Nominal Return on L.D.				CPI,(π)
		1-year	2-year	3-year	5-year	
1984	7.2	9.0				37.1 (9.8)
1985	6.0	8.0				38.8 (4.6)
1986	6.0	8.5				45.9 (18.3)
1987	6.0	8.5				59.0 (28.5)
1988	6.0	8.5				75.9 (28.6)
1989	6.0	8.5				92.9 (22.4)
1990	6.5	9.0	10.0	11.0	13.0	100.0 (7.6)
1991	6.5	9.0	10.5	11.5	14.0	117.1 (17.1)
1992	7.5	10.0	11.5	13.0	15.0	144.0 (23.0)
1993	8.0	11.5	13.5	14.5	16.0	173.2 (20.3)
1994	8.0	11.5	13.5	14.5	16.0	228.4 (31.9)

Source: Central Bank of Iran, Anual Reports, 1984-1994.

Note: CPI is the consumer price index; π is the inflation rate calculated as follows:

$\pi = ((CPI)_t - (CPI)_{t-1} / (CPI)_{t-1})*100$

Table 4:
Composition of various type of deposits in the liquidity of the private sector

(Units: Billions of Iranian *Rials*)

Year	Total Deposits	Liquidity of the Private Sector	% Share of T.D. in the Liq.	Short-term Deposits	% Share of S.D. in the Liq..	Long-term Deposits	% Share of L.D. in the Liq.
1984	5918.300	7966.900	74.29	914.200	11.47	627.200	7.87
1985	6825.800	9002.100	75.82	1863.400	20.70	1041.300	11.57
1986	8080.200	10722.60	75.36	2477.000	23.10	1235.700	11.52
1987	9685.600	12668.20	76.46	3088.800	24.38	1458.400	11.51
1988	12242.00	15687.60	78.04	4260.700	27.16	2132.700	13.59
1989	15108.50	18753.30	80.56	5245.200	27.97	2761.600	14.73
1990	18850.20	22969.50	82.07	5945.100	25.88	3749.600	16.32
1991	24048.50	28628.40	84.00	6809.900	23.79	4929.700	17.22
1992	30503.80	35866.00	85.05	8115.800	22.63	6530.900	18.21
1993	41303.00	48135.00	85.81	10303.90	21.41	8748.800	18.18
1994	53143.30	61843.90	85.93	12084.30	19.54	10432.60	16.87
Mean			80.31		22.55		14.33
Std. Dev			4.49		4.51		3.38
Minimum			74.29		11.47		7.87
Maximum			85.93		27.97		18.21

Source: Central Bank of Iran, Anual Reports, 1984-1994.

Table 5:
Unit root test results

Variable	Lags	Constant	Trend	Seasonal	t-adf	1% cv	5% cv	10% cv
LD	4	yes	yes	no	-2.2399	-4.2092	-3.5279	-3.1949
Log(LD)	4	yes	yes	no	-2.4806	-4.2092	-3.5279	-3.1949
LDR	4	yes	yes	no	-3.6929	-4.2092	-3.5279	-3.1949
Log(LDR)	4	yes	no	no	-0.2611	-3.6067	-2.9378	-2.6069
R_1	4	yes	no	no	-0.1571	-3.6069	-2.9378	-2.6069
Log(R_1)	4	yes	no	no	-0.2330	-3.6067	-2.9387	-2.6069
R_1R	4	no	no	no	-0.9746	-2.6227	-1.9495	-1.6202
Log(R_1R)	4	no	no	no	-1.2837	-2.6486	-1.9535	-1.6221
ΔLD	4	yes	yes	no	-3.2238	-4.2092	-3.5279	-3.1949
ΔR_1	4	no	no	no	-2.1094	-2.6243	-1.9498	-1.6204

LD = Long-term deposits in level.

LDR = long-term deposits in real.

R_1 = Nominal rate of return on long-term deposits.

R_1R = Rate of return on long-term deposits in real.

Table 6:
Johansem cointegration test (lags interval: 1 to 8)

Eigenvalue	Likelihood ratio	5% cv	1% cv	Hypothesized No. of CE(s)
0.498933	24.18900	15.41	20.04	None**
9.84E-05	0.003446	3.76	6.65	At most 1

Notes:

*(**) denotes rejection of the hypothesis at 5% (1%) significance level.

L.R. test indicates 1 cointegration equation at 5% significance level.

The above result is obtained using the EViews package.

Figure 1:

Percentage share of demand deposits and non-demand deposits in total bank deposits in Iran (1984-1994)

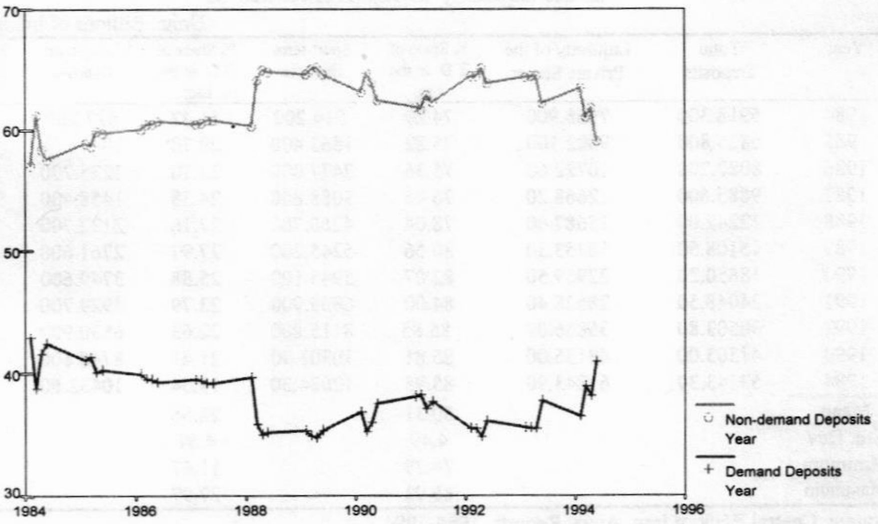


Figure 2:

percentage share of non-demand deposit categories in total demand deposits (private sector) for 1984-1994 in Iran

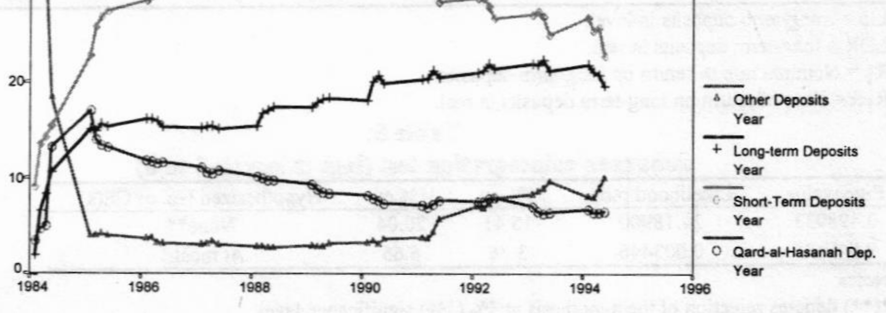


Figure 3:
Percentage share of long-term deposits against their nominal rates of return

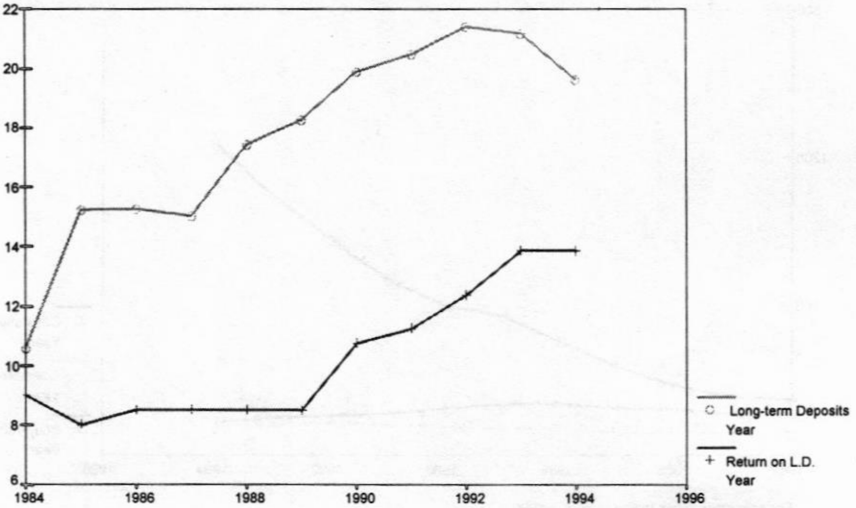


Figure 4:
Percentage share of short-term deposits against their nominal rates of return

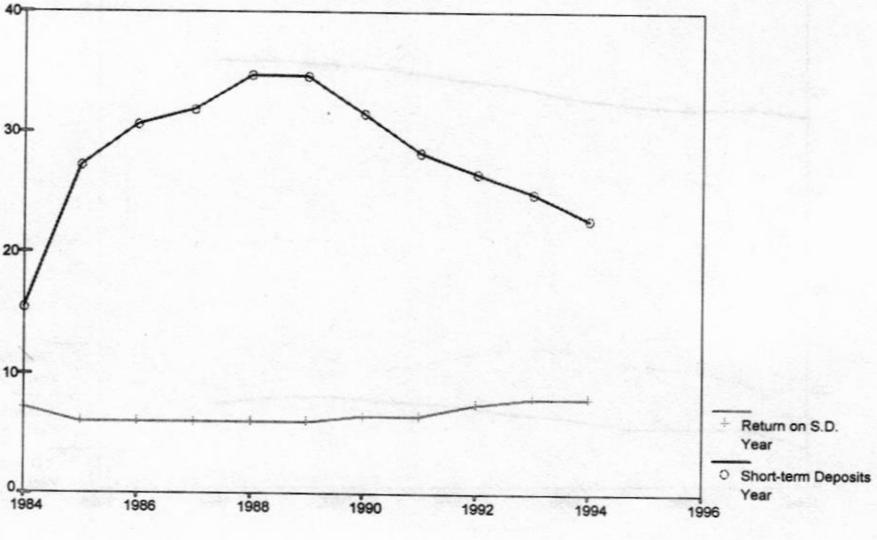
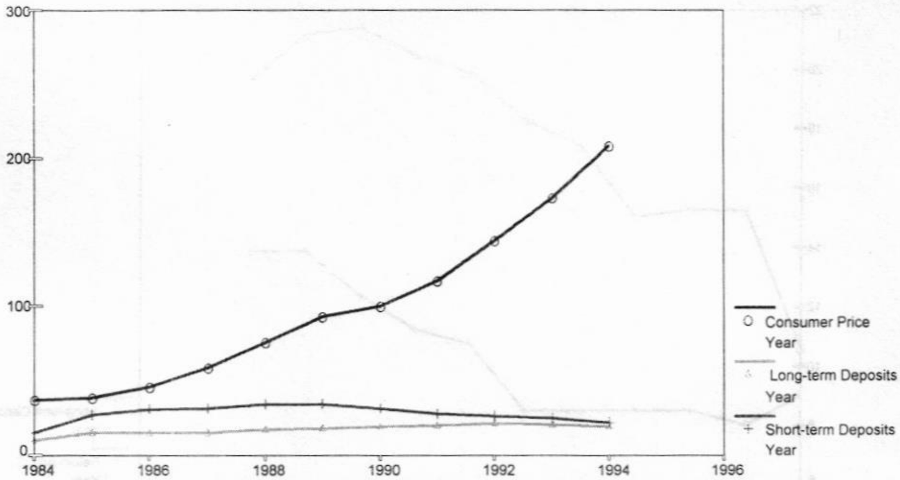


Figure 5:

Percentage share of short-term and long-term deposits against consumer prices



For consumer prices the base year is 1990.

Consumer prices: From International Financial Statistics Yearbook, 1994.

Figure 6:

Percentage Share of Total, S.D. and L.D. Deposits in Total Liquidity

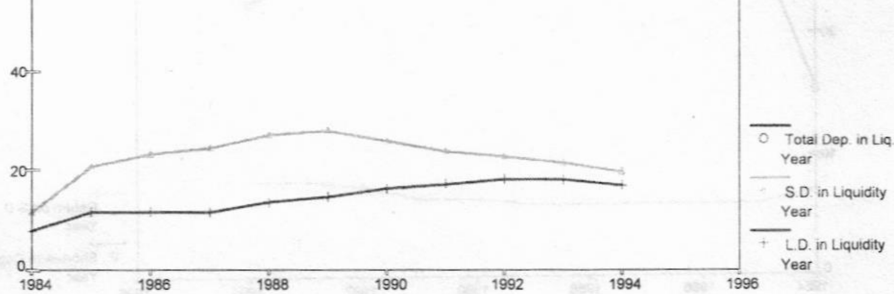
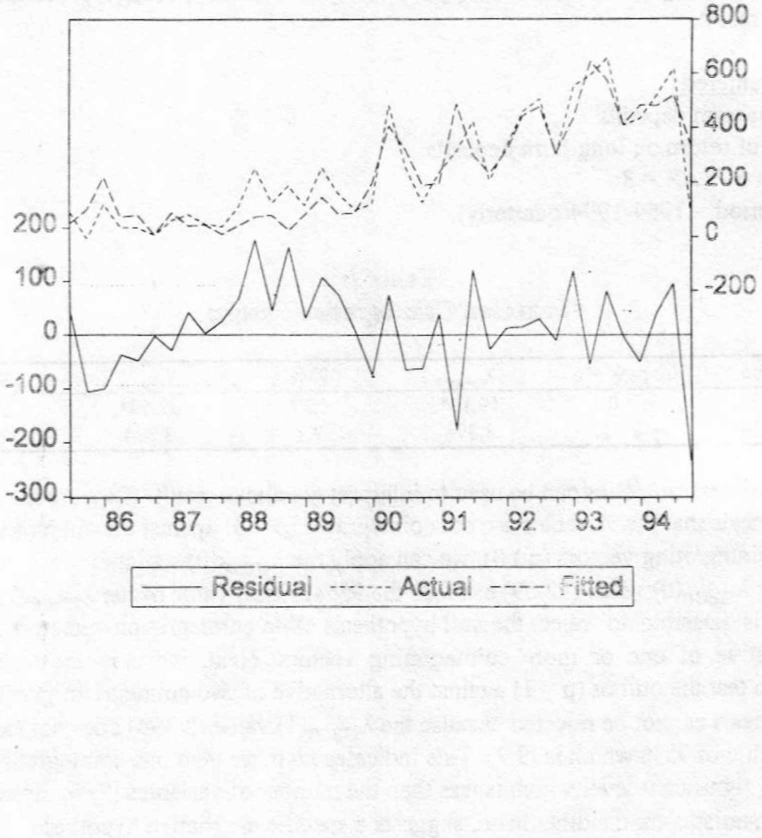


Figure 7:

The actual and fitted values of the dependent variable in the ECM



Appendix 2:

The cointegration test is also applied using the 'PcFiml' package, producing the following result:

Variables entered:
LD = Long-term deposits.
R_1 = Rate of return on long-term deposits.
Lag length of VAR = 8
Sample period = 1984-1994(quarterly).

Table 7:
Johansen Cointegration Results

Eigenvalue	H_0: rank = p	λ_{max}	95%	λ_{trace}	95%
0.381111	p = 0	19.19*	15.7	22.59*	20.0
0.00883239	p <= 1	3.394	9.2	3.394	9.2

Two test statistics can be used to interpret the above result. If we are interested in the hypothesis that the variables are not cointegrated (p = 0) against the alternative of one or more cointegrating vectors (p 〉 0), we can apply the $\lambda_{trace}(0)$ statistic:
Since the $\lambda_{trace}(0)$ value (22.59) exceeds the 95% critical value of the $\lambda_{trace}(0)$ statistic (20.0), it is possible to reject the null hypothesis of no cointegration vectors and accept the alternative of one or more cointegrating vectors. Next, we can use the $\lambda_{trace}(1)$ statistic to test the null of (p = 1) against the alternative of two cointegrating vectors. The null hypothesis cannot be rejected because the $\lambda_{trace}(1)$ value (3.394) does not exceed the critical value of 95% which is (9.2). This indicates no more than one cointegrating vector at the 95% significant level which is less than the number of variables (2) in the equation. The λ_{max} statistic, on the other hand, suggests a specific alternative hypothesis. Since the $\lambda_{max}(0,1)$ value (19.19) exceeds the 95% critical value of (15.7) the null hypothesis of no cointegrating vectors, i.e. (p = 0), against the specific alternative (p = 1) is clearly rejected. Furthermore, the test of the null hypothesis (p = 1) against the alternative (p = 2) cannot be rejected at the 95% level. This is because the value of λ_{max} (1,2) which is (3.394) is less than the critical value of 95% (9.2). Thus, both the trace and maximum eigenvalue statistics convince us to accept one vector for the cointegration relationship between the variables of long-term deposits and their rates of return.

Table 8:
Standardised β Eigenvectors

LD	R_1	Constant
1.00	-2581	18430.00
0.0004915	1.00	-9.066

Weak exogeneity tests: chi-square (1)	p-value
LD	0.0153
R_1	0.4728

Estimated Cointegrating Vector

Report of the long-run equation, $LD = -18430 + 2518*R_1$

Vector autocorrelation test (8 lag): F(df) = 1.0917 (0.5334)

The above table presents the normalised coefficients of the long-run relationship of the variables. An analysis of the first row of the table of 'standardised β eigenvectors' (which is normalised with respect to long-term deposits) indicates that long-term deposits change by 2518 billion *rials* in response to a single unit change in their rates of return. Thus, '$LD = -18430 + 2518*R_1$' is the long-run relationship between the long-term deposits and their rates of return.

It is worth mentioning that constant, trend and seasonal variables have been examined in the cointegration test. The result shows that only the constant term is significant. It is therefore included in the cointegrating vector. In addition, the vector passed the LM and the normality tests for the residuals.