

DECOMPOSITION OF BANK RISKS UNDER INTERNATIONAL OVERBORROWING: THE CASE OF TURKEY

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Abstract:

In this paper, it is intended to analyse the co-dependent volatility patterns of exchange rates, domestic borrowing interest rates, non-performing loans and bank profits in order to decompose the risks of banks under the case of international overborrowing for Turkey in the last decade. The decomposition of those risks will assist banks to arrange the ideal ratio of international borrowing in their total obligations and distribution of these funds among domestic borrowing and corporate loans. The theoretical model is the modified version of Markowitz's efficient portfolio model. Following the equilibrium solution of the model, we estimate a multivariate GARCH model including a structural VAR process. The results show the co-dependent patterns of those risks experienced in the last decade of the Turkish banking sector.

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1.INTRODUCTION

After the banking deregulation process in 1980's, international over-borrowing syndrome became an important trend for the banking systems of developing countries. In that process, the banking sectors of developing countries faced with the default risk because of inefficient portfolios, specifically, in terms of international funds. Over-borrowing problem follows a cyclical pattern in the recovery phase of business cycle. Increased demand leads prices to rise and attracts new investment. In a feedback relationship the new investments stimulates income. Hyman Minsky focused on over-investment and over-lending problems in order to explain financial crises and call this phenomenon "*euphoria*".

Following Minsky (1977) and Kindleberger (1989), the over-borrowing problem was modelled by McKinnon and Phil (1996). Corsetti, Pesenti and Roubini (1998) emphasised the role of implicit and explicit bail out guarantees on moral hazard problem. Under these guarantees, banks take excessive risk. Over-lending problem occurs through insufficient monetary capacity, asymmetric information and deposit insurance scheme. These studies conclude that over-borrowing and bailout guarantees can cause severe currency and banking crises, (twin crises). These models are called third generation models in currency crisis literature.

In emerging markets, open economy conditions may cause banks to become vulnerable to exchange rate fluctuations under international over-borrowing. But there are also some other risks, which are stimulated by this problem, such as interest rate and credit risks. If banks switch these international funds in order to finance budget deficits by holding government bonds in their portfolios, interest rate risk would increase. But if moral hazard leads banks to take unhedged foreign exchange position in order to fulfil the domestic over-borrowing demands by the upswing of the business cycle, this would increase credit risk.

Deposit insurance has also play a crucial role in this process, because the banks may implicitly transfer most of the risk to the government through the deposit insurance scheme.

Therefore, international over-borrowing may cause interest rate and credit risk as well as foreign exchange risk. As the return and the risk levels of these three assets are mutually dependent, it is not sufficient to focus on only one of them in order to analyse the total banking sector risk. Furthermore, the levels of risk and return are not sufficient to identify the degree of non-optimality of the banking sector portfolio decisions, since, we are not sure that all the banks in the sector hold mean-variance efficient portfolios. If this were the case, then, standard multivariate CAPM and APT models will be sufficient to assess the risks and forecast the possible banking crises. In fact they are not. Consequently, in this paper, we return back to original mean-variance efficient portfolio analysis of Markowitz, (1959), in order to present the levels of optimal and actual shares of these three items in the banking sector balance sheet and determine which of the risks significantly cause the conditions for twin crises.

Turkey has also experienced two twin crises in the last decade.(in 1994 and in 2001). In order to analyse the role of Turkish banking sector risk structure in these crises, we modify the original model of Markowitz (1959) and present the solutions of the model in Section 2.1. In addition to that, we assume that the volatilities of each asset vary by time. Thus, in Section 2.2., we present the results for multivariate GARCH(1,1) estimation process. In Section 2.3., we will combine the findings of first two sections in order to compose optimal shares of asset. In that section, we will compare the actual and optimal shares of each asset, and as a consequence of that, we will decompose the Turkish banking sector risk structure.

2. THEORETICAL AND EMPIRICAL FRAMEWORK

In financial economics literature one of the main problems is the quantification of the trade-off between risk and expected return. In Markowitz's (1959) seminal research, he cast investors' portfolio selection problem in terms of expected return and the variance of return. He argued that investors would optimally hold a mean-variance efficient portfolio, that is, a portfolio with the highest return for a given level of variance. The well-known CAPM model is introduced following the baseline of Markowitz's (1959) model. Sharpe (1964) and Lintner(1965) built on Markowitz's work to develop economy-wide implications. Their main thesis was that if investors have homogenous expectations and optimally hold mean variance efficient portfolios, in the absence of market frictions and imperfections, the society's total portfolio of wealth, namely the "market portfolio" will, itself, be a mean variance efficient portfolio. However, the problem is altered if all the agents do not hold mean variance efficient portfolios as, typically, in the case of banking sector. Even if, all the banks in the sector have homogenous expectations, it can not be said that all the banks have optimal portfolios. If this is the case, then, CAPM does not work in the portfolio analysis of the banking sector. To see whether they hold optimal or non-optimal portfolios, it is necessary to adopt and modify original Markowitz (1959) model. In the first section, the risk minimisation problem of a typical representative bank and its optimal portfolio selection rules –among credits, government bonds and international borrowing- will be derived. Depending on those rules in the second section, the optimal shares of credits, government bonds and international borrowing over deposits will be computed and compared with the historical shares of each item.

In the computation of shares, standard Markowitz model assumes that the risk levels –or volatilities- of risky asset returns are historically constant. On the other hand, it is known that the asset return volatilities mostly vary by time. The estimation of time varying risks were

first set by the estimation of unconditional variances in Engle (1982), that is autoregressive conditional heteroskedasticity, namely ARCH(p) process. A more general case for ARCH(p) process is proposed by Bollerslev (1986), as the generalised autoregressive heteroskedasticity, namely GARCH(p,q) process. The multivariate case for ARCH(p) process is proposed by Bollerslev, Engle and Wooldridge (1988) and the factor ARCH specification of Diebolt and Nerlove (1989) and Engle, Ng and Rothschild (1990). Bollerslev (1990) developed a popular approach to multivariate GARCH models by assuming that the conditional correlation among the elements of residuals vector are constant over time. Demiröz (2001) has recently used this approach in Turkish foreign exchange and REPO interest rate data. Therefore, in the computation of optimal shares, it is necessary to take into account the co-dependent volatility patterns of the returns on the banking sector assets. Consequently, for each period the optimal shares vary due to the varying risks of portfolio assets. In order to achieve this purpose, in section 2, the conditional risks of banking sector asset returns will be estimated by a multivariate GARCH process referring to Bollerslev (1990). After that, using estimated returns and variances, the optimal share of each asset will be derived according to our modified version Markowitz model in section 1. In section 3, the results of the model will be interpreted and the basic conclusions will be set.

2.1. Representative Bank's Optimal Portfolio Selection Problem

A representative bank faces the portfolio selection problem due to its risk and return levels in each period as explained in equation (1), (2), and (3).

$$\min \omega' \Omega \omega \quad (1)$$

s.t.

$$\omega' \mu = \mu_p \quad (2)$$

$$\omega' z = 1 \quad (3)$$

Where

$$\omega = \begin{bmatrix} W_C \\ W_B \\ W_D \end{bmatrix}, \quad \mu = \begin{bmatrix} R_C \\ R_B \\ R_F \end{bmatrix}, \quad z = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}, \quad \Omega = \begin{bmatrix} \sigma_C^2 & \sigma_{CB} & \sigma_{CF} \\ \sigma_{CB} & \sigma_B^2 & \sigma_{BF} \\ \sigma_{CF} & \sigma_{BF} & \sigma_F^2 \end{bmatrix}$$

“ ω ” is the vector of asset shares, (W_i ; $i = C,B,F$), on bank deposits; “ μ ” is the vector of asset returns, (R_i ; $i = C,B,F$); “ Ω ” is time varying variance covariance matrix. This model is adopted from Campbell, Lo and MacKinlay (1997; p.184-188) with an exception of identity vector. Instead of the identity vector “ i ” in Campbell, Lo and MacKinlay (1997; p.184), vector z is used. The reason of the usage of vector “ z ”, can be explained by the budget constraint of banking sector.

Suppose that the representative bank collects deposits from the households and lends those funds to firms and government in the form of credit and public debt. If the sum of credits and public debt exceeds the deposits, the representative bank borrows from international markets. Therefore the budget constraint can be identified as

$$D + F = C + B \quad (4.a)$$

Where D is total deposits, F is total foreign borrowing, C is total credits and B is total public debt. Subtracting F from both sides gives:

$$D = C + B - F \quad (4.b)$$

Dividing (4.a) by the right hand side expression of (4.b) yields

$$\frac{D}{C+B-F} = \frac{C}{C+B-F} + \frac{B}{C+B-F} - \frac{F}{C+B-F} \quad (5.a)$$

And that is equal to

$$1 = W_C + W_B - W_F \quad (5.b)$$

Equation (5.b) is the open expression of equation (3), which is the second constraint in the optimisation process. Since the foreign borrowing is initially a debit item, it is subtracted from total credit items. For that reason “z” is used instead of “i”.

Equation (2) is the first constraint, which means that the portfolio return is the average of all the asset returns, which is basic in the mean variance efficient portfolio selection problem. The Lagrangian due to the equations (1), (2) and (3) can be expressed as:

$$L = \omega' \Omega \omega + \delta_1 (\mu_p - \omega' \Omega) + \delta_2 (1 - \omega' z) \quad (6)$$

Differentiating “L” with respect to “ ω ” and setting the result equal to zero, we have

$$2\Omega\omega - \delta_1 \mu - \delta_2 z = 0 \quad (7)$$

Combining (7) with (2) and (3) the below solution is found:

$$\omega^* = g + h\mu_p \quad (8)$$

Where g and h are (3x1) vectors:

$$g = \frac{1}{D} [B(\Omega^{-1}z) - A(\Omega^{-1}\mu)] \quad (9)$$

$$h = \frac{1}{D} [C(\Omega^{-1}\mu) - A(\Omega^{-1}z)] \quad (10)$$

where

$$A = z'\Omega^{-1}\mu; \quad B = \mu'\Omega^{-1}\mu; \quad C = z'\Omega^{-1}z \quad \text{and} \quad D = BC - A^2$$

Note that equation (8) depends on the desired portfolio return “ μ_p ”. If “ μ_p ” rises, the risk of the portfolio rises, too. In Ongan and Demiröz (2000), to find the optimal shares of tourism, exports and workers’ remittances in total foreign exchange revenues, equation (8) is used. To apply such a rule an optimiser should have some target portfolio return rate. In this paper, different from that of Demiröz and Ongan (2000), we do not have a target portfolio return rate. Rather, we intend to find the global minimum variance portfolio. This methodology is similar to the case in Buckley and Geyikdağı (1993). Following Campbell et al. (1997, p.185), the optimal shares, the return and the volatility of the global minimum variance portfolio is given as:

$$\omega_G = \frac{1}{C} \Omega^{-1}z \quad (11)$$

$$\mu_G = \frac{A}{C} \quad (12)$$

$$\sigma_G^2 = \frac{1}{C} \quad (13)$$

It should be noted that all the values in equations (11), (12) and (13) are fixed in original Markowitz’s (1959) paper. However, this stability refers to the constant variance-covariance matrix assumption. One of the main contributions of this paper is that we try to compute the

optimal shares of the global minimum variance portfolio under the assumption of time-varying variance-covariance matrix. This approach is different from that of Buckley and Geyikdağı (1993), since they assume a fixed variance-covariance matrix.

In the case of time varying variance-covariance matrix, each coefficient and matrix varies (A , C and Ω^{-1}) through time except the vector “ z ”. Therefore according to our model, optimal shares of credit, government bonds and foreign borrowing of deposits should vary according to changing risk levels of these items in the banking sector balance sheet. This will present us the banking sector’s optimal hedging strategies against the uncertainty inherent in the economic system.

In the next section, we will present the joint results from Vector Autoregression and Multivariate GARCH estimation and maintain insample forecasts of time varying variance-covariance matrix.

2.2. Estimation of Time-Varying Variance-Covariance Matrix

To estimate a multivariate GARCH relationship, it is necessary to estimate a Vector Autoregression at the same time. Vector autoregression will maintain the parameters estimates of the relationship between the returns of credit, T-Bond and foreign exchange rate, (R_i ; $i = C, B, F$). To assess the risk of foreign borrowing we intend to use foreign exchange rates, since in the last two decades in Turkey, most of the risk coming to the foreign borrowing is determined by the exchange rate volatility. Because the foreign exchange rates are much volatile relative to international interest rates, we omit the effect of international interest rates. Therefore the risk of foreign borrowing is represented by foreign exchange risk. The residuals from VAR show the unexpected deviations of asset returns and form the basis of conditional variances. MGARCH process, therefore, is used to estimate the conditional variances.

The data set for consists of monthly yields of interest return for performing loans, monthly yields of three-month T-Bond interest rates and monthly log return for Dollar exchange rate in terms of TL. The sample data ranges between April 1987 and December 2002. The interest return on performing loans is computed by the formula:

$$R_C = (1 - npl) \times I_C$$

where

$$npl = \frac{\text{Non - Performing Loans}}{\text{Total Credits}}, \quad I_C = \text{Monthly Yield of Credit Interest Rate}$$

If the ratio of non-performing loans over total credit rises the mean-return of credits decline. If it has large shifts, the risk of credit also rises. Thus, in our analysis, it will be shown that the “NPL” ratio has a crucial importance as it will be helpful for us to understand the true nature of crisis, especially, the 2001 February crisis.

The monthly yield of three-month T-Bond interest rate will maintain us the information about the mean return and conditional variance of banking sector’s Bond holdings. The last risk indicator is the monthly logarithmic return of exchange rate, which represent a negative return on the balance sheet of a typical bank, since, most of the banks in Turkey are said to have been short position in foreign currency liabilities.

In estimation procedure, we follow Bollerslev’s (1990) study and assume that conditional correlation among asset returns are fixed. After finding the conditional volatilities of asset returns, which follow co-dependent volatility patterns, which means that the conditional volatilities influence each other, by using those volatility estimates and the global minimum variance portfolio selection rules derived in Section 2.1, we will maintain the optimal share of each asset in each period.

The estimation process of VAR(1) and MGARCH(1,1) processes will follow the below system:

The Dummy Augmented VAR(1) System:

$$\mu_t = \mu_0 + \Gamma \mu_{t-1} + \Lambda \delta_t + u_t \quad (14)$$

where

$$\mu_t = \begin{bmatrix} R_{Ct} \\ R_{Bt} \\ R_{Ft} \end{bmatrix}, \quad \mu_0 = \begin{bmatrix} \mu_{C0} \\ \mu_{B0} \\ \mu_{F0} \end{bmatrix}, \quad \Gamma = \begin{bmatrix} \gamma_{C1} & \gamma_{C2} & \gamma_{C3} \\ \gamma_{B1} & \gamma_{B2} & \gamma_{B3} \\ \gamma_{F1} & \gamma_{F2} & \gamma_{F3} \end{bmatrix}, \quad \Lambda = \begin{bmatrix} \lambda_{C1} & \lambda_{C2} \\ \lambda_{B1} & \lambda_{B2} \\ \lambda_{F1} & \lambda_{F2} \end{bmatrix}, \quad \delta_t = \begin{bmatrix} D94_t \\ D01_t \end{bmatrix},$$

$$u_t = \begin{bmatrix} u_{Ct} \\ u_{Bt} \\ u_{Ft} \end{bmatrix}, \quad u_{it} \sim N(0, \sigma_{it}^2), \quad i = C, B, F; \quad \sigma_{ijt} = \rho_{ij} \sigma_{it} \sigma_{jt}, \quad i, j = C, B, F$$

In equation (14), the VAR(1) process is presented. In this process we have set also two dummy variables. D94 and D01, which represents the two “*twin crises*” Turkish economy has experienced on April 1994 and February 2002. “ μ_0 ” is the vector of intercepts, “ Γ ” is the matrix of VAR parameters and “ Λ ” is the matrix of dummy parameters. The residuals vector “ u ” has a specific feature: The random error terms for each return rate are distributed with a zero mean, but a time varying variance. A joint estimation procedure should be accompanied. The interesting case in equation (15) is that, as it is proposed in the original Bollerslev’s (1990) article, the MGARCH(1,1) system, basically, transforms into the collection of three univariate GARCH processes:

The MGARCH(1,1) System

$$\sigma_t^2 = \psi + A u_{t-1}^2 + B \sigma_{t-1}^2 + \xi_t \quad (15)$$

where

$$\sigma_t^2 = \begin{bmatrix} \sigma_{Ct}^2 \\ \sigma_{Bt}^2 \\ \sigma_{Ft}^2 \end{bmatrix}, \quad \psi = \begin{bmatrix} \psi_C \\ \psi_B \\ \psi_F \end{bmatrix}, \quad A = \begin{bmatrix} \alpha_C & 0 & 0 \\ 0 & \alpha_B & 0 \\ 0 & 0 & \alpha_F \end{bmatrix}, \quad u_{t-1}^2 = \begin{bmatrix} u_{Ct-1}^2 \\ u_{Bt-1}^2 \\ u_{Ft-1}^2 \end{bmatrix}, \quad B = \begin{bmatrix} \beta_C & 0 & 0 \\ 0 & \beta_B & 0 \\ 0 & 0 & \beta_F \end{bmatrix},$$

$$\xi_t = \begin{bmatrix} \xi_{Ct} \\ \xi_{Bt} \\ \xi_{Ft} \end{bmatrix}, \quad \xi_{it} \approx N(0,1), \quad i = C, B, F$$

In the estimation process, the constant correlations will also be presented together with the parameter estimates shown in matrices “A” and “B”.

The total results are shown in Table.1:

TABLE.1: ESTIMATED PARAMETERS FOR DUMMY AUGMENTED VAR(1)

(The bold characters refer to the significant parameter estimates at %99 significance level)

MEAN RETURN REGRESSION FOR CREDIT			
PARAMETER	ESTIMATE	ST. DEV.	T-VALUE
μ_{C0}	0.0042	0.0013	3.2318
γ_{C1}	0.7793	0.0364	21.4214
γ_{C2}	0.1150	0.0327	3.5156
γ_{C3}	0.0004	0.0063	0.0570
λ_{C1}	0.0059	0.0011	5.1841
λ_{C2}	0.0077	0.0022	3.5991
MEAN RETURN REGRESSION FOR T-BOND			
PARAMETER	ESTIMATE	ST. DEV.	T-VALUE
μ_{B0}	0.0068	0.0021	3.2009
γ_{B1}	0.0903	0.0598	1.5106
γ_{B2}	0.7588	0.0537	14.1197
γ_{B3}	-0.0230	0.0103	-2.2228
λ_{B1}	0.0083	0.0019	4.4441
λ_{B2}	0.0051	0.0035	1.4395
MEAN RETURN REGRESSION FOR DOLLAR EXCHANGE			
PARAMETER	ESTIMATE	ST. DEV.	T-VALUE
μ_{F0}	0.0229	0.0101	2.2676
γ_{F1}	-0.4123	0.2840	-1.4520
γ_{F2}	0.5420	0.2553	2.1232
γ_{F3}	0.1644	0.0491	3.3525
λ_{F1}	0.1237	0.0088	13.9882
λ_{F2}	0.1463	0.0168	8.6974
DESCRIPTIVE STATISTICS FOR MEAN-RETURN REGRESSIONS			
	R_C	R_B	R_F
R-squared	0.855067	0.699395	0.662946
Adj. R-squared	0.851107	0.691182	0.653737
Sum sq. resids	0.002376	0.006415	0.144762
S.E. equation	0.003603	0.005921	0.028126
F-statistic	215.9299	85.15441	71.98789
Log likelihood	798.1794	704.3	409.8023
Akaike AIC	-8.382851	-7.389418	-4.273041
Schwarz SC	-8.279939	-7.286505	-4.170128
Mean dependent	0.0415	0.041124	0.040343
S.D. dependent	0.009337	0.010655	0.047797
DESCRIPTIVE STATISTICS FOR VAR			
Determinant Residual Covariance	3.01E-13		
Log Likelihood	1919.913		
Akaike Information Criteria	-20.12606		
Schwarz Criteria	-19.81732		

Table.1 shows us the parameter estimates of the dummy augmented VAR(1) system. It is seen that all variables are strongly influenced by their own lags. Furthermore, 1994 April crisis seem to influence three of the variables, whereas 2001 February crisis influenced credit and dollar exchange returns.

Table.2 shows us the parameter estimates of conditional volatilities and the estimated correlations:

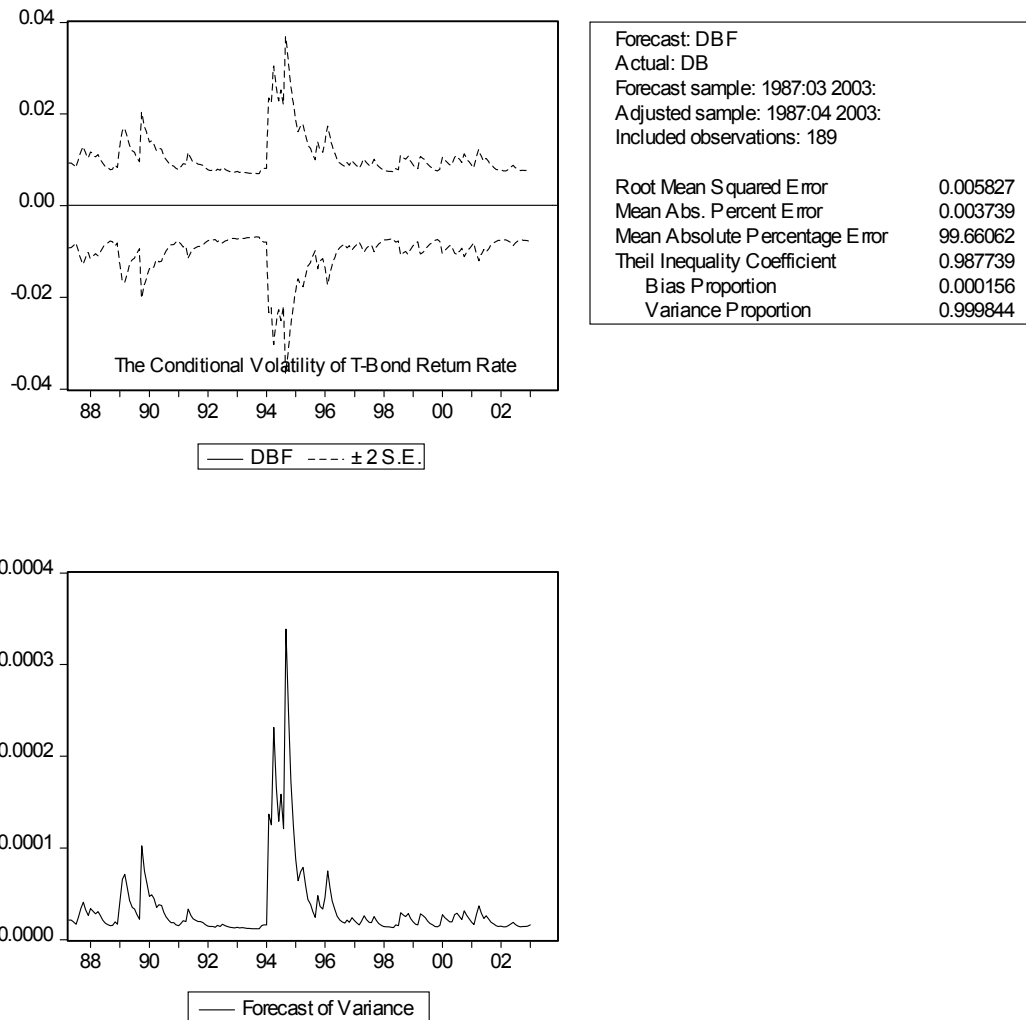
TABLE.1: ESTIMATED PARAMETERS FOR MGARCH(1,1)
(The bold characters refer to the significant parameter estimates at %99 significance level)

CONDITIONAL VARIANCE REGRESSION FOR CREDIT			
PARAMETER	ESTIMATE	ST. DEV.	T-VALUE
Ψ_C	2.69E-7	8.02E-8	3.3541
α_C	0.7433	0.1659	4.4811
β_C	0.2503	0.0286	8.7571
CONDITIONAL VARIANCE REGRESSION FOR T-BOND			
PARAMETER	ESTIMATE	ST. DEV.	T-VALUE
Ψ_B	3.59E-6	6.4E-7	5.6094
α_B	0.2189	0.0671	3.2645
β_B	0.6800	0.0529	12.8565
CONDITIONAL VARIANCE REGRESSION FOR DOLLAR RETURN			
PARAMETER	ESTIMATE	ST. DEV.	T-VALUE
Ψ_F	6.6E-5	3.83E-5	1.7248
α_F	0.2373	0.0819	2.8966
β_F	0.6779	0.1225	5.5324
CORRELATION ESTIMATES	ρ_{CB}	ρ_{CF}	ρ_{BF}
	0.6268	0.3729	0.4064

The Table.2 shows that the volatilities of T-Bond and Dollar exchange return rates gave longer term persistence to random shocks relative to the volatility of credit return, since in the regression of these assets the GARCH parameters (β) are greater than ARCH parameters, (α). The estimated correlation rates imply that the random shocks, (ξ), coming to the conditional variances of three assets positively correlated with each other.

The estimated volatilities of the returns on these three assets are represented in the Figures 1-3:

FIGURE.1: The Estimated Volatility of T-Bond Return Rate



The Figure.1 indicates that the volatility of T-Bond return rate is strongly affected by the 1994 April Crisis. The agents, who try to hedge against the T-Bond risk, should decrease the share of T-Bonds during that crisis. The optimal share of T-Bonds, therefore must be in its minimum level in 1994.

FIGURE.2: The Conditional Volatility of Credit Return

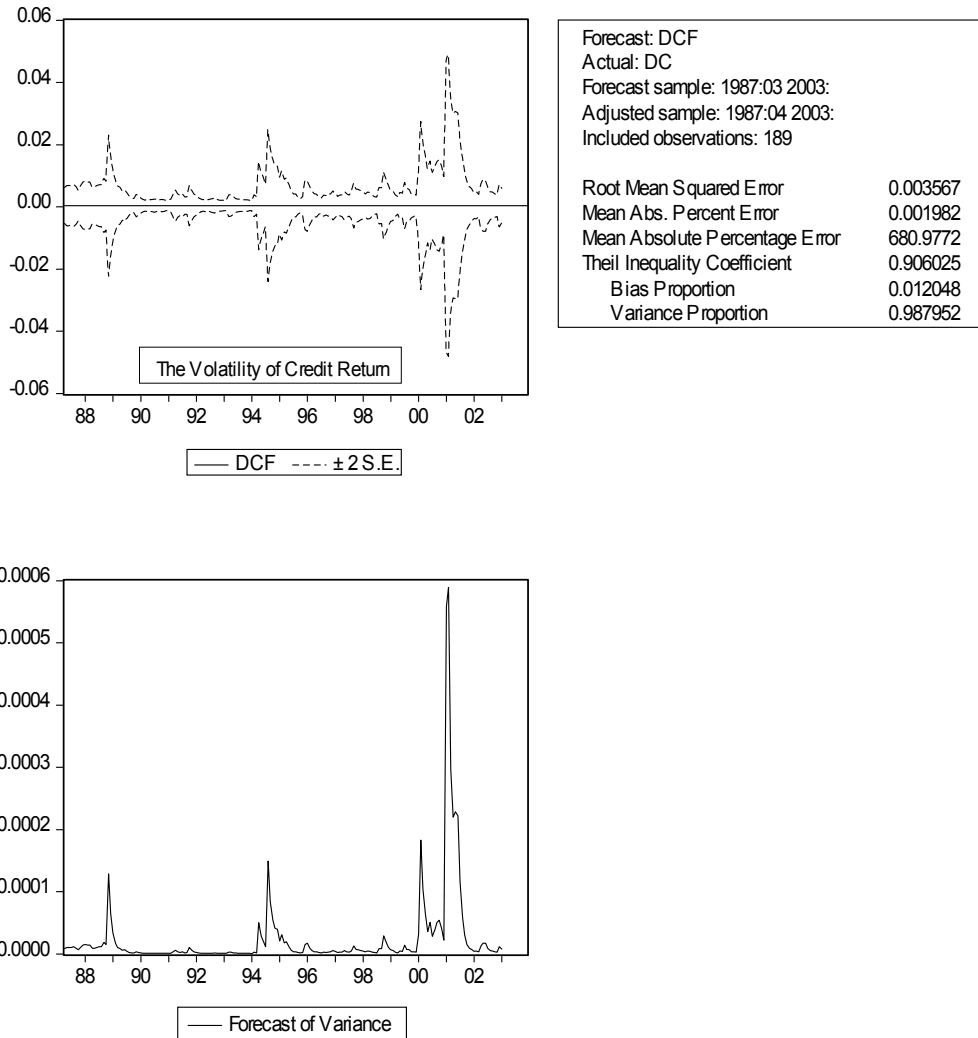
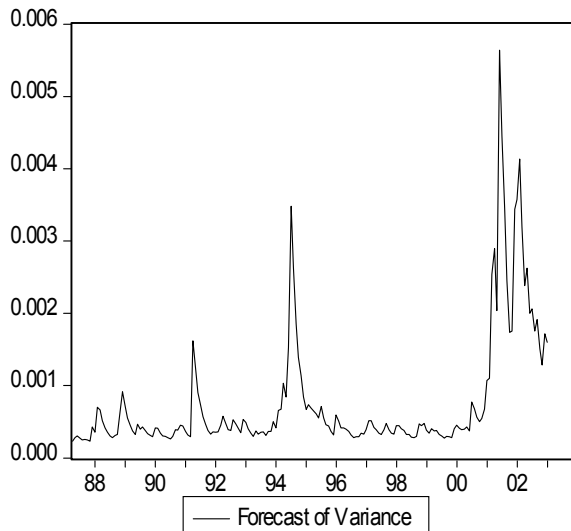
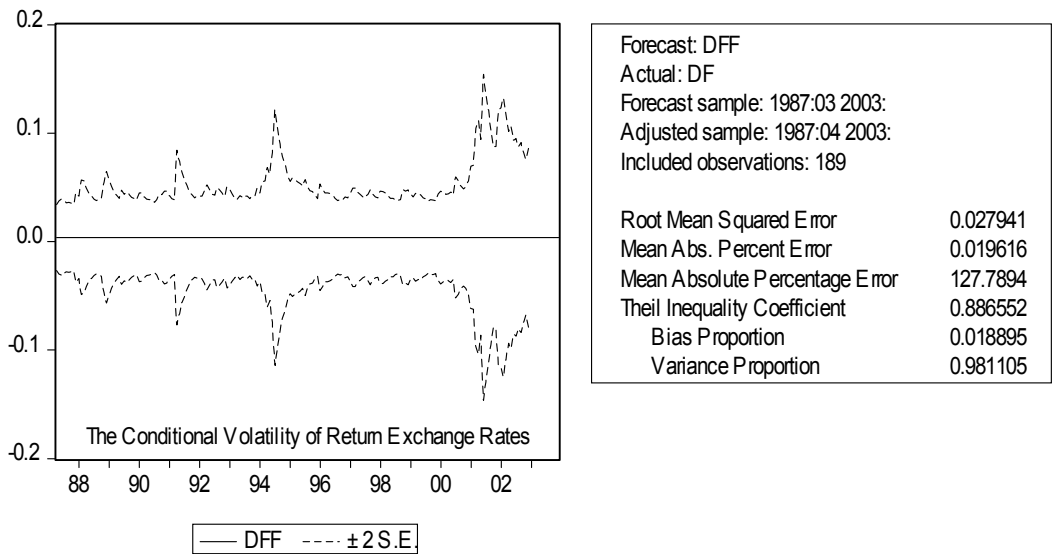


Figure.2 indicates that there are four large upswings in the conditional volatility of credit return. In 1989 after the external financial liberalisation, the risk of domestic credits rises for Turkish banking sector. In 1994 the first twin crisis hit the volatility sharply. In the beginning of 2000 stabilisation program a large decline in the interest rates cause the degree of uncertainty and volatility to rise. And the last one is the effect of the second twin crisis, which causes the volatility to its highest position within in all the sample period.

FIGURE.3: The Conditional Volatility of The Return on Dollar Exchange Rate



There are three upswings in the conditional volatility of exchange rates, therefore, in the risk for foreign borrowing, as it is indicated in Figure.3. The first rise in the volatility is rather the smallest one and it is at the same time with the first Gulf War in 1991. The second and the third occur at the same time with the two twin crises in 1994 and 2001.

The indication of the level of volatilities and the degree of risk cannot be sufficient for the optimality analysis of banking sector. Indeed, even the risk of one asset rises, the ideal banker can hedge this risk by switching the funds from that risky asset to other assets. If this is done optimally, then there is no reason for CAPM not to hold, as mentioned by Sharpe (1964) and Lintner (1965). In fact, Turkish banking sector has experienced two great fiascos in 1994 and 2001. There is no reason to suggest that Turkish banking sector has no responsibility in those failures. But in what cases and which decision making process they have failed can be significantly analysed by taking into consideration of the actual and optimal shares of those assets.

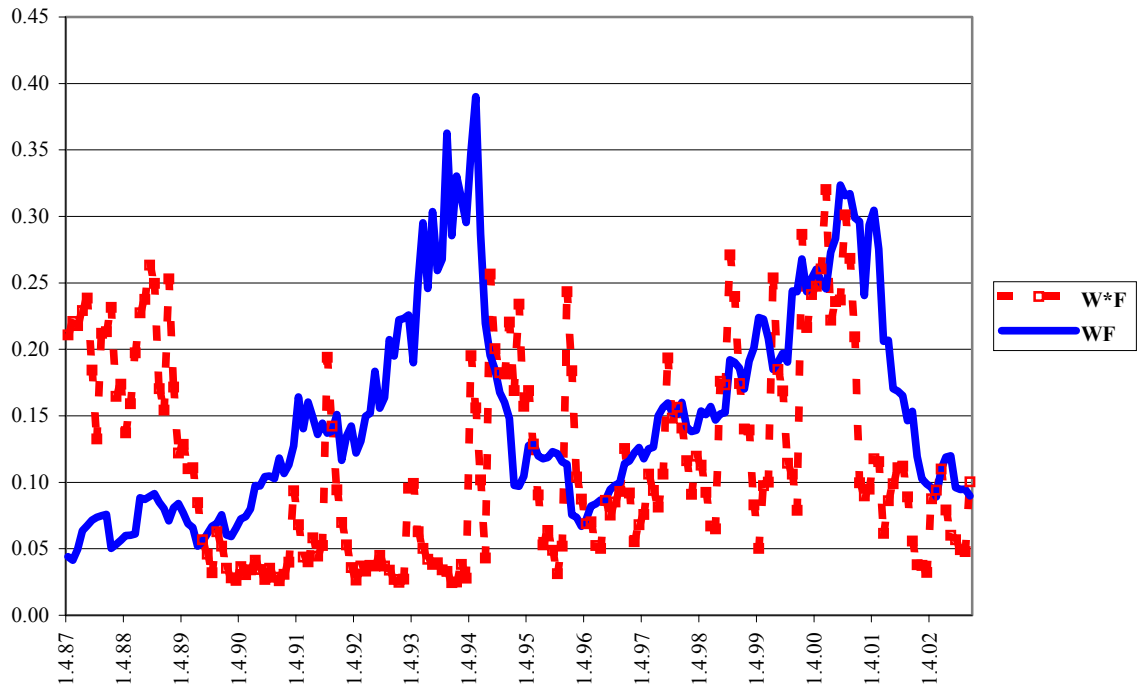
2.3. The Comparison of Optimal and Actual Shares

In this section, we will compare the actual and optimal shares of each items in Turkish banking sector. Actual shares are computed by the following formula:

$$W_i = \frac{\text{The Volume of Asset } i}{\text{The Volume of Total Deposits}}, i = C, B, F$$

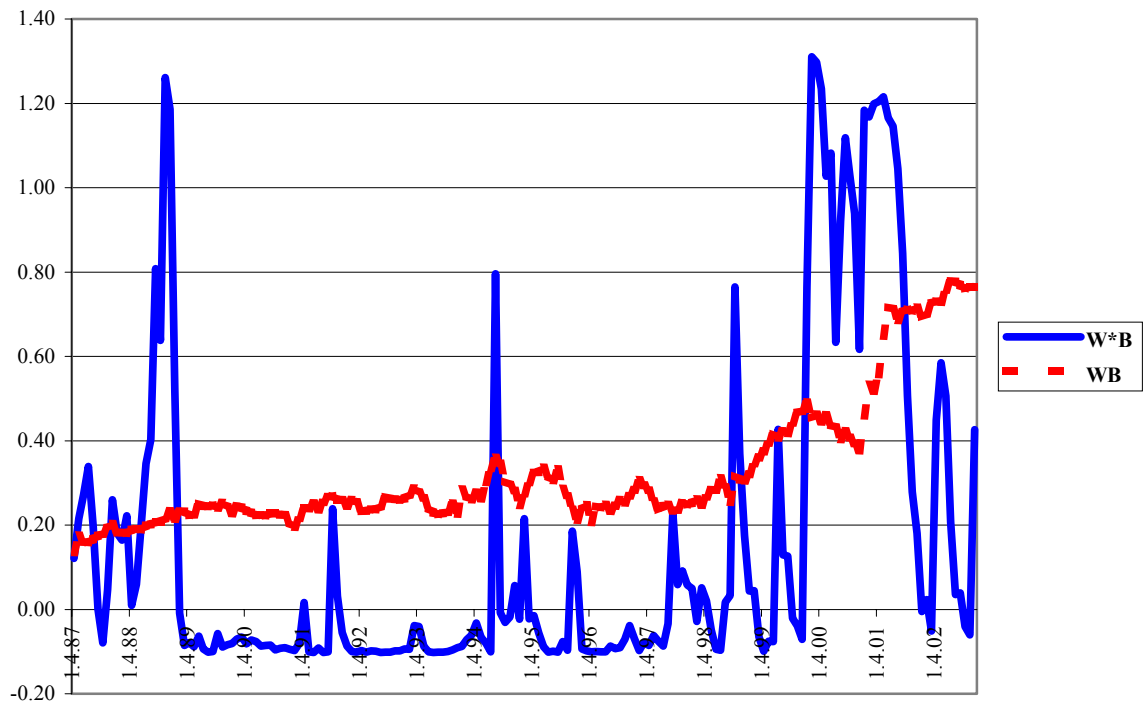
The actual share shows us the position of the banking sector portfolio with respect to the relevant asset i . It may not be the optimal share. In order to compare the optimality of the portfolio of banking sector, for each item, the actual shares should be compared with the optimal shares. This comparison will maintain us a criterion to assess the incentives of Turkish banks for hedging against credit, interest and foreign exchange risks. The optimal shares are denoted as W^*_i and they are computed by the method explained in section 2.1. The actual and optimal shares of Foreign Borrowing are shown in Figure 4:

FIGURE.4: The Actual and Optimal Shares of Foreign Borrowing



In April 1994 the first twin crisis has occurred. It is seen in figure that beginning from 1989, the date of external financial liberalisation, the banking sector's actual foreign borrowing shares continuously rose over the optimal shares. This episode ended with the 1994 banking crisis and a sharp devaluation in April 1994. The Figure.4 indicates that a five-year-period of over-borrowing lasted with a twin crisis. On the other hand, in the path to 2001 crisis, the actual and optimal shares are at about in the same levels. This maintains us that the banks benefit from the experiences they have in the 1994 crisis. They hold nearly optimal shares of foreign borrowing. However there are a lot of bank failures in 2001 crisis, too. Therefore, the reason of this failure should be explore in other dimensions of the problem. Noting this fact, Figure 5 shows the actual and optimal shares of the T-Bonds:

FIGURE.5: The Actual and Optimal Shares of T-Bonds



Until 2000 stabilisation program the actual share of the T-Bonds in the banking sector portfolio is over the optimal shares. However, beginning from 2000 to the February 2001 Crisis the banks optimal shares were to rise. This is because of either the decline in the volatility of monthly yields of three-month T-Bond rates or the rise in the volatility of other two items, (Figure 1-3). To understand the true nature of 2001 Crisis it is necessary to look at the actual and optimal shares of Credit and the fact of the domestic over-lending. Figure.6 indicates this fact:

FIGURE 6: The Actual and Optimal Shares of Credit

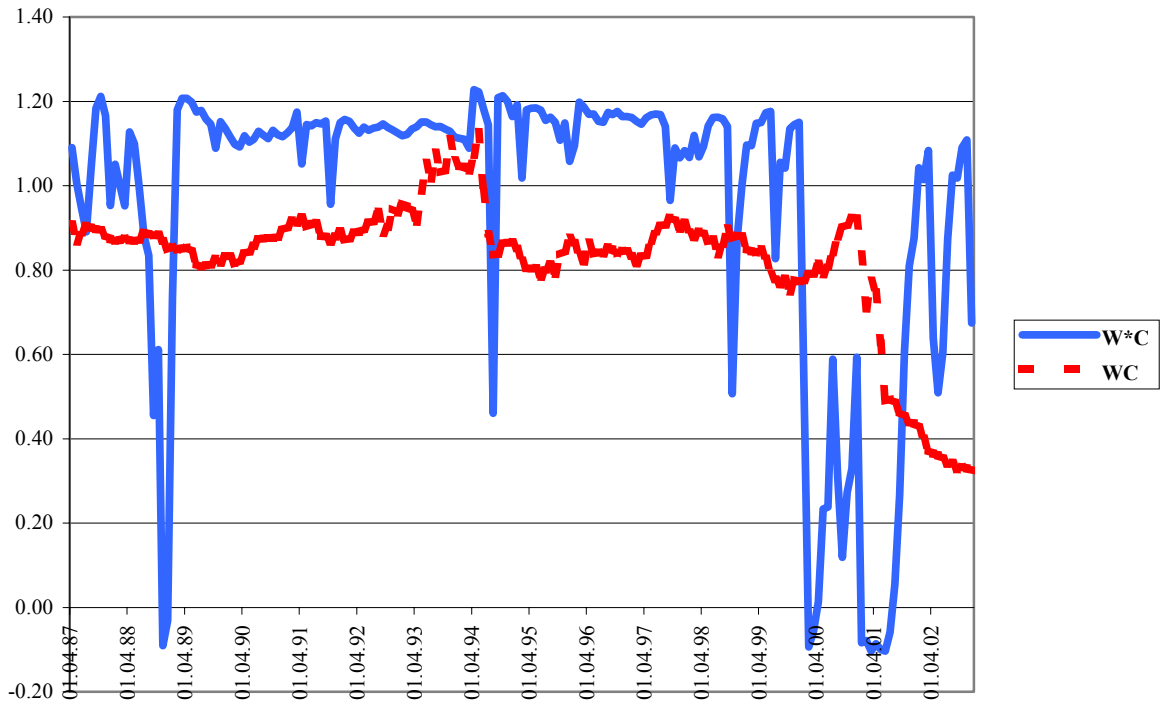


Figure.6 assures us that until 2000 stabilisation program, there is no problem of domestic over-lending; that is, actual shares of credit is under the optimal rates. On the other hand after the stabilisation program, there exists a problem of domestic over-lending and actual shares exceed the optimal shares. In fact, the seeds of over-lending problem is not sown during the stabilisation program. It can be referred to the period after the 1994 crisis. In April 1994 government announced a series of fiscal and financial measures but the recovery of confidence only began when government announced that they started to implicate a full coverage deposit insurance scheme. Former deposit insurance system wasn't abolished, only became unlimited. This new legal framework of deposit insurance made it possible to decrease monitoring costs of banks because moral hazard risk became less important since full coverage exists. Thus new deposit scheme made matters worse and Turkish banking

system suffered from serious problems with non-performing loans, as indicated by Karabulut (2002).

FIGURE.7:The Rate of Non-Performing Loans over Total Credits

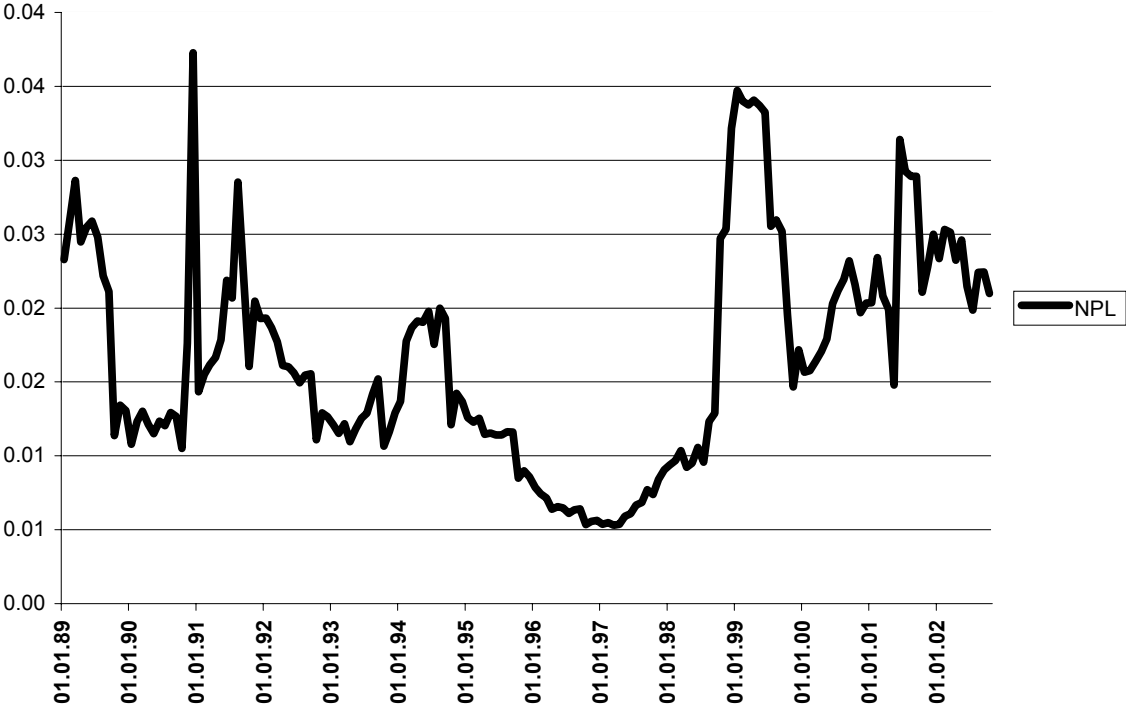
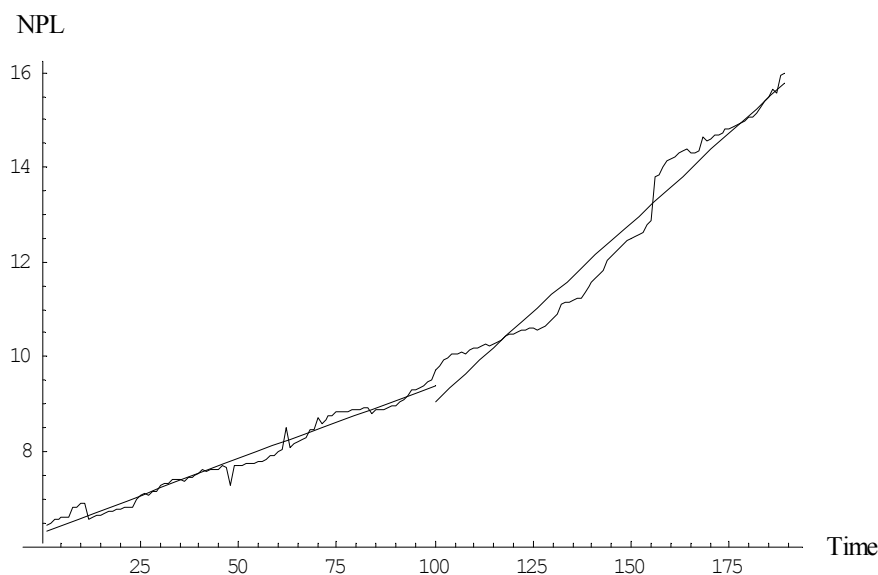


Figure. 7 presents then rate of non-performing loans to total credits and Figure.8 summarises the results of Karabulut, (2002), who shows that there is a structural change in non-performing loans in 1994. From April 1994 to January 1997, the total credits grew faster than non-performing loans since debtors should default the credit payments within a payment period. A loan can only identified as a non-performing loan at the end of period.

FIGURE.8: STRUCTURAL CHANGE IN THE VOLUME OF NON-PERFORMING LOANS



Source: Karabulut (2002)

3.CONCLUSION

In this paper we try to construct the dynamic hedging rules for Turkish banking sector by using a modified version of the Markowitz's (1959) mean-variance efficient portfolio approach and a dummy augmented VAR(1) process together with a multivariate GARCH(1,1) process, in order to analyse the nature of banking problems experienced in the last decades in Turkey. According to the results, it can be inferred that international over-borrowing does not always increase the exchange rate risk, on the other hand it may inflate other type of risks inherent in the system, such as interest rate and credit risks. If foreign funds are switched to government bonds in order to finance government's budget deficits, this fact increases the banking sector interest rate risk. If these funds are switched to credits, which are lent to the private sector, this creates a domestic over-lending problem, thus credit risk.

Turkey has experienced two twin crises in the last decade, (1994 and 2001). When we decompose bank risks for 1987-2002 sample period, the results show us that April 1994 crisis

was caused by different dynamics inherent in the structure of banking sector than February 2001 crisis. In 1994, the main cause of the banking crisis is the fact that international over-borrowing increased the foreign exchange rate risk. To avoid the systematic bank-runs in the banking sector, government change the deposit insurance scheme in 1994 and the scheme became unlimited after April 1994. It is seen that banks benefited from their experiences about their problem of short position in foreign currency after the 1994 and apply successful hedging strategies against foreign exchange risk. As it is presented in the text that actual and optimal shares of foreign borrowing over deposits are approximately are the same in 2001 Crisis process. But, the moral hazard problem created by the unlimited deposit insurance scheme caused over-lending in domestic credits and this sow the seeds of the 2001 banking crises through the rise in the ratio of non-performing credits to total credits.

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