Do Bank Stockholders Share the Burden of Required Reserve Tax?

Evidence from Turkey

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Abstract. This study examines whether bank shareholders bear the burden of required reserves tax by analyzing the reaction of banks' stock returns to the changes in the required reserve ratio. Results show that increases in reserve requirements significantly lower bank returns implying that shareholders share a portion of the required reserve tax. Required reserves changes are partially predicted by investors, and increases and decreases in required reserve rates have an asymmetric effect on stock returns. In addition, large and public banks bear a larger share of the tax, and the remuneration of reserves has important implications for the tax burden. Finally, some heterogeneity across banks exists as reflected by differences in the signs and magnitudes of the estimated coefficients.

Key Words: Stock returns, required reserves tax, monetary policy, tax incidence, Istanbul Stock Exchange (ISE), Turkey.
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1. Introduction

Most central banks, particularly in emerging and developing economies, require commercial banks and some depository institutions to hold a fixed percentage of their deposits and other liabilities in the form of reserves at the central banks. While its role has changed overtime, policymakers, particularly in developing economies, often call the use of reserve requirement for monetary control, and for prudential and liquidity management purposes.[1]

In most instances the required reserve balances with the central banks are not remunerated or are remunerated at a lower rate than the rates of return on alternative investments. Hence the required reserves (RR) are usually characterized as an implicit tax on financial institutions. However, the extent to which this tax burden is shared by banks' share holders and consumers has been an open debate among scholars and policymakers. To examine the implications of foreign exchange intervention by sterilizing with changes in RR for output and real exchange rate changes, Reinhart and Reinhart (1999) provide an analytical framework for the incidence of RR tax. They argue that the incidence of tax depends on the competitiveness of the depository sector, the ability of bank customers to have access to alternative banking products, and the degree of competition within the banking system.[2] Therefore, the extent to which reserve tax is shared between bank customers and bank owners depends on the competition within the banking sector.

Among the earliest studies, Dwyer and Saving (1986), Romer (1985) and Sargent and Wallace (1985) provide a general equilibrium framework for the reserve requirement and the incidence of this tax. Black (1975) and Fabozzi and Thurston (1986) find that the incidence of the tax falls entirely on depositors. The findings by Fama (1985) and James (1987), on the other hand, do not support any relationship between reserve requirement ratios and interest rates paid on bank deposits in the United States. Thus, Fama's argument that the required reserve tax is transferred entirely to borrowers was supported by empirical findings in James (1987). In addition, the empirical studies that find evidence supporting the argument of shared incidence of RR tax among bank customers and shareholders in the United States include Kolari et al. (1988), Slovin et al. (1990), and Osborne and Zaher (1992). For the case of Brazil, Carvalho and

[1] See Gray (2011) for detailed discussion on the main purposes of reserve requirement and the current practices of this policy tool based on 2010 IMF survey of 121 central banks.

[2] See, for example, Kurul (2011) and Yayla (2007) for some indicators on the degree of competition in Turkish banking industry.

Azevedo (2008) find some evidences that the tax implied by RR is shared by bank owners, customers and, in some cases, only by bank owners.

Using data on bank share prices and required reserve changes, this paper examines the effect of changes in RR on banks' stock prices in Turkey. Doing so, we test whether the tax incidence is partially absorbed by the bank share holders. The argument here is that an increase in RR ratios should depress the market value of banks since the associated tax should reduce the cash flows for a bank (Slovin et al. 1990).

With inflation targeting as the main monetary policy objective, the Central Bank of Turkey (CBT) has been using a policy mix to deal with the capital inflow, lower pressure on exchange rate, and restrain the credit growth. To deal with surges in capital inflows and excessive credit growth, CBT has lowered short term policy rates or has kept them constant in recent months while increasing the required reserve rates several times.[3] Besides historical data, recent and more frequent changes in RR give us an opportunity to test the effect of this policy on share prices, and derive some conclusions on the incidence of this financial tax. Particularly, the effect of recent changes in RR are more pronounced not only due to the size and frequency of these changes, but because market participants in the current economic environment are more interested in the RR hikes than policy rate changes. Therefore, the market participants have started to form their expectations of changes in RR in advance of the monetary policy committee meetings.[4]

In this study, we analyze the behavior of daily bank stock returns around the RR ratio changes over the sample period of 1988-2011 to see whether there exist abnormal returns, which imply that RR tax is partially absorbed by bank shareholders. We construct event windows starting from 30 days before the announcement of changes in RR to capture possible formation of the market expectations. To evaluate the overall effect of these changes, we first examine the Istanbul Stock Exchange (ISE) banking index that includes price information of all ISE-listed bank stocks. Second, we study individual bank returns to determine if the changes in RR have

[3] Since May 2010, CBT has been using one-week repo rate as policy interest rate. After keeping the policy rate at it 7 percent level for the remaining of year, the bank has reduced the rate to 5.75 percent by August 2011.

[4] Until recently, any changes on required reserves have been taken by the board; however the time of meetings are not publicly available. The recent change in Central Bank law allows the monetary policy committee (MPC) members to take any decision on required reserves and the timing of MPC meeting are announced at the beginning of the calendar year. However, the timing of decisions on required reserves are not restricted to MPC meeting, thus any decision could be taken occasionally.

heterogeneous effects across banks. Because these two approaches utilize a time series framework, we also use a panel data framework to discern if changes in RR have differential impact on banks' share prices depending on their business models, size and ownership types.

The results provide evidence that the changes in RR have observable significant effects on commercial banks' stock returns. Time series and panel data models also indicate that changes in RR are partially predicted before the actual announcements are made and that the impact of increases or decreases in required reserve rates has an asymmetric effect on stock returns. For instance, we find that increases in RR have a significant and negative impact on stock returns on the day of announcements, while the decreases in RR significantly affect the bank returns on the day after. Secondly, the asymmetric effect of increases and decreases in RR are also observed before the announcement dates. While there are some significant negative results showing that increases in RR dampen the bank stock returns starting around 16 days before the announcement day, the decreases in RR affect the returns significantly in a limited number of pre-event windows. In addition, the study finds that large and public banks bear a larger share of the RR tax, and that the remuneration of reserves has important implications for the tax burden. Finally, some heterogeneity across banks exists as reflected by differences in signs and magnitudes of the estimated coefficients.

This is the first paper that addresses the incidence of RR tax using Turkish data. To do so, we have documented changes in reserve requirement, liquidity requirement and remuneration of reserve balances for more than two decades. Overall, the results in this study provide evidence that RR are an implicit tax on financial institutions, and the burden of such a tax is partially borne by banks' shareholders. The contribution of our paper to the literature is that we address more subtle questions by looking at the asymmetric effect of required reserve changes, the effect of such changes when the balances are remunerated, to what extent changes in RR are predicted before the actual event, and the implication of such tax for banks with different business models, size and ownership type.

The remainder of this paper is organized as follows: Section 2 discusses the data, section 3 describes the empirical methodology, section 4 presents empirical results, and section 5 concludes.

2. Data

We use daily compounded returns for 16 banks listed on the ISE.[5] Bank names, tickers and sample period for each bank are presented in Table 1. As of March 2011, the shares of these banks' assets, credit and deposit in the total banking industry are 74, 78 and 72 percent, respectively.

In addition to analyzing stock return data, we document the changes in required reserves for Turkish lira and foreign currency liabilities since the late 1980s.[6] Until March 2002, RR base had only included deposits while for non-deposit liabilities, banks were also required to hold free-deposit, non-cash assets, such as sovereign bonds with the central bank, and also vault cash under liquidity requirement (LR) regulation. Since the free-deposit under liquidity requirement is in practice the same with required reserves, any changes of free-deposit ratio are considered as an RR change and is included in the event construction. Therefore, our sample includes changes in LR ratio until March 2002. In addition, both Turkish lira (TL) and foreign exchange (FX) required reserve balances have been remunerated for certain periods. Since the remuneration of reserve balances is a reduction in effective RR rate, we also examine whether the impact of changes in RR on bank returns depends on the remuneration of reserve balances. The history of RR and LR changes, and hence indicator variables are presented in Tables 2, 3 and 4.

Table 4 indicates that there are 25 RR events of which 20 are changes of TL liabilities and 15 are changes of FX liabilities. In addition, there are also several LR (8 for TL and 5 for FX) events before March 2002. Therefore, combining both regulations over the sample period of 09/1988-01/2011, we observe a total of 28 events, of which the number of increases (decreases) in RR is 17(13). As seen from Table 4, the events are clustered in early 1990s, and after 2008 as global financial crisis (GFC) spread to emerging economies. The wide use of RR in early 1990s is mainly determined by the domestic economic environment which is characterized by high inflation, the extensive amount of public debt and the large structural problems in the banking

[5] These banks are Akbank, Albaraka Turk Bank, Alternatif Bank, Asya Katılım Bankası, Denizbank, Finans Bank, FortisBank, Garanti Bankası, Halk Bankası, T. Iş Bankası, Şekerbank, Turk Ekonomi Bankası, Tekstil Bankası, Sınai Kalkınma Bankası, Vakiflar Bankası, Yapı ve Kredi Bankası. Türkiye Kalkınma Bankası (TKBNK) is excluded from the analysis since it is exempted from RR regulation.

[6] The required reserve changes appear in Official Gazette before the markets open, and on the same day the Central Bank also makes an announcement of such a change on its official web site covering some details. In some cases, changes in RR may appear on the Official Gazette which could be published with some reiteration on the same calendar day while the markets are still open.

industry. The use of RR during and after GFC of 2007-2009 has been driven by external and domestic conditions. For instance, the RR rates for Turkish lira and foreign currency liabilities were lowered due to liquidity shortages stemming from sudden reversal in capital flows at the beginning of crisis. However, the post-crisis increases in RR rates are due to rising financial stability concerns which is mainly the acceleration of credit growth fueled by capital inflow and lax monetary conditions. As discussed above, the recent frequent changes in RR are a part of the new policy mix that the CBT has been implementing to help align financial stability with the price stability objective by using macroprudential instruments.[7]

3. Empirical Methodology

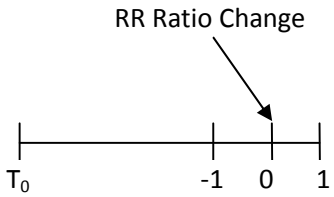
3.1 Analysis of the Banking Sector

We use the following model to analyze the effect of RR changes on bank stock index:

$$XBank_t = \beta_0 + \beta_1 XU100_t + \beta_2 RR_t + \varepsilon_t, \quad (1)$$

where $XBank_t$ *and* $XU100_t$ are daily compounded returns for ISE-Bank and ISE-100 indices, respectively, *RR* is the *signed* required reserve indicator variable as described below, and ε_t is an exogenous random shock to the *XBank* index. *XU100* is included in the model to control for other factors that may have an impact on bank stock returns. Due to the data limitation over the sample period considered, it is not possible to construct a consistent quantitative measure of the size of each reserve requirement changes; therefore we use indicator variables in this study.[8]

We define 30 different event windows as follows:



[7] A speech by Hakan Kara (Head of Research and Monetary Policy Department of the CBT) at "BIS Chief Economist Meeting" (Basel, 04/04/2011) nicely summarizes the recent policy of the CBT and its effectiveness. The speech is available at http://www.tcmb.gov.tr/yeni/iletisimgm/H.Kara_BIS.pdf

[8] As documented in Table 2, required reserve rates are differentiated with respect to maturities from late 1980s to mid-1990s. During this period, not all changes on RR rates were uniform across maturities. In addition, marginal liquidity and required reserve rates were also applied for some periods. However, we were not able to construct the data series on deposits and other liabilities with different maturities or total reserve balances and liabilities around RR events. Thus, we were not able to construct a consistent quantitative measure of the size of each reserve requirement changes from late 1980s to mid-1990s. Therefore, we define indicator variables to represent changes in RR (or liquidity requirement until early 2000s) rate.

where T_0 = -30, -29,…,-1. The RR indicator in equation (1) is defined for the event window as:[9]

$$RR_t = \begin{cases} +1 \ in \ [T_0,1] \ if \ RR \ ratio \ increases \\ -1 \ in \ [T_0,1] \ if \ RR \ ratio \ decreases \\ 0 \ otherwise \end{cases}$$

We expect that increases (decreases) in RR decrease (increase) the profitability of the banking sector, since less (more) reserves are available for profitable investments. Accordingly, we test the following hypothesis by using equation (1).

$$H_0 : \beta_2 = 0$$
$$H_1 : \beta_2 < 0$$

Notice that there is no general rule for the choice of the event window. For instance, Dann and James (1982) use a 26-business day event while Osborne and Zaher (1992) have an 11-day window to examine the effect of changes in RR on bank stock returns. In their study for Brazil, Carvalho and Azevedo (2008) use a 6 business day window, where they argue that the event window should not be too long to be contaminated by other innovations but also not too short to let out eventual price corrections. Therefore, in this study an event window map extending up to 30 days before the event date is used to capture the possible effects of changes in RR on stock returns.[10] We examine bank stock returns starting 30 days before event days since market participants could start forming their expectations long before the actual announcements which depend on any information or signal revealed by the central bank. [T_0, 1] period covers T_0 days prior to the event, the event day and the day after. Defining the event window in this way, we aim to capture the future, contemporaneous and lagged changes in the stock returns as a response to changes in reserve requirements.

More than half of the banks included in the *XBank* index are also included in the *XU100* index. This causes *XU100* to be correlated with the error term ε_t. Therefore, we use instrumental variables methodology to consistently estimate the parameters of Model (1) (and Models 2-5 below). The instruments we employ are the first, fourth and tenth lags of *XU100* and the first lag of MSCI Emerging Markets Index.[11,12] We also calculate the heteroskedasticity- and

[9] Slovin et al. (1990) use a similar approach.
[10] We examine 30 different event windows which are [-30,1], [-29,1], ……[-1,1].
[11] The lags of instruments are chosen so that the null of the Sargan-Hansen test of overidentifying restrictions is not rejected and the null of the Kleibergen-Paap test of whether the equation is under identified is rejected.

autocorrelation-robust (HAC) standard errors by using bandwidths selected according to the procedure described in Newey and West (1994).

Model (1) captures the overall effect of changes in RR in the whole event window defined as $[T_0,1]$. However, the effect of changes in RR on bank stock prices might differ depending on whether the extent of the Central Bank RR policy is fully predicted. If the timing or the extents of these changes are not fully predicted, the impact of the policy change might be more pronounced on the event date or the day after. Accordingly, we partition the event window into three periods defined as $t \in [T_0,-1]$, t=0, and t=1 to disentangle the RR effect over these sub-periods. Specifically, we estimate the following model:

$$XBANK_t = \beta_0 + \beta_1 XU100_t + \beta_2 RRBef_t + \beta_3 Day0Signed_t + \beta_4 RRAft_t + \varepsilon_t, \qquad (2)$$

where $RRBef_t$ and $RRAft_t$ represents before and after the event of *RR* changes, and they are defined as follows:

$$RRBef_t = \begin{cases} +1 \ in \ [T_0,-1] \ if \ \ RR \ ratio \ increases \\ -1 \ in \ [T_0,-1] \ if \ \ RR \ ratio \ decreases \\ \ \ 0 \ \ otherwise \end{cases}$$

where T_0 = -30, -29,…,-1. Since the window after event day is constrained to one day only, $RRAft_t$ is defined by following equation.

$$RRAft_t = \begin{cases} +1 \, at \, t = 1 \, if \ \ RR \ ratio \ increases \\ -1 \, at \, t = 1 \, if \ \ RR \ ratio \ decreases \\ 0 \ \ otherwise \end{cases}$$

The last indicator variable is defined by following equation.

$$Day0Signed = \begin{cases} +1 \, at \, t = 0 \, if \ \ RR \ ratio \ increases \\ -1 \, at \, t = 0 \, if \ \ RR \ ratio \ decreases \\ 0 \ \ otherwise \end{cases}$$

Similar to Model (1), we test the following hypotheses in Model (2):

$$H_0 : \beta_i = 0$$
$$H_1 : \beta_i < 0,$$

where i = 2, 3, 4.

[12] The MSCI Emerging Markets Index is a free float-adjusted market capitalization index of emerging markets. As of May 30, 2011, the MSCI Emerging Markets Index consisted of the following emerging market country indices: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey.

The models introduced thus far capture different aspects of the effect of changes in RR on banks' stock returns. Another relevant question, in this context, is whether changes in RR have an asymmetric effect on bank returns. While it might be reasonable to expect that the decrease or increase of RR rates have a symmetric effect on bank profitability, the perception by the market or the macroeconomic environment in which these changes are made could be systematically different. For instance, the decreases in RR are typically made when there are substantial liquidity problems in the banking sector which might be coupled with overall economic distress. During such periods, the banking sector might have already suffered losses, hence the decreases in RR may not be perceived by the market participants as a factor that could contribute to the overall strength of the banks' balance sheets. On the other hand, increases in RR would occur when there is a boom in credit growth or when other financial stability concerns are rising.[13] If there is no structural change in market competition, an increase in RR would be made in an environment in which the banks' share holders are expecting high returns. Therefore, the degree to which the monetary policy decision is pronounced on the share returns could depend on economic cycle.

Models (1) and (2) assume that the effect of increases and decreases in RR are symmetrical. To address the possible asymmetric effect of changes in RR on bank share prices, we use the following specification:

$$\begin{aligned} XBank_t = \beta_0 + \beta_1 XU100_t + \beta_2 RRBefInc_t + \beta_3 RRDayInc_t + \beta_4 RRAftInc_t \\ + \beta_5 RRBefDec_t + \beta_6 RRDayDec_t + \beta_7 RRAfDec_t + \varepsilon_t, \end{aligned} \tag{3}$$

where dummy variables are defined as follows:

$$RRBefInc_t = \begin{cases} 1 \; in \; [T_0, -1] \; if \;\; RR \; ratio \; increases \\ 0 \; otherwise \end{cases}$$

and

$$RRBefDec_t = \begin{cases} 1 \; in \; [T_0, -1] \; if \;\; RR \; ratio \; decreases \\ 0 \; otherwise \end{cases}$$

where T_0 = -30, -29,…,-1 as before. The other dummy variables $RRDayInc(Dec)_t$ and $RRAftInc(Dec)_t$ also takes value of one on the event day or the day after, respectively, if RR

[13] In particular, the required reserve increases after mid-2010 support this argument.

ratio increases (decreases). It is important to note that the dummies are not *signed* in Model (3). The hypotheses being tested in this case are as follows:

$$H_0 : \beta_i = 0 \qquad H_0 : \beta_j = 0$$
$$H_1 : \beta_i < 0 \qquad H_1 : \beta_j > 0,$$

where i = 2, 3, 4 and j = 5, 6, 7.

As discussed earlier, the international evidence suggests that in most instances RR balances are not remunerated. Over the sample considered in this study, there are periods during which CBT also has not remunerated both Turkish lira and FX required reserve balances. The remuneration of reserve balances decreases the intermediation cost or the tax burden introduced by this policy; hence it partially eliminates the distortion emanating from monetary policy. When the central bank starts (eliminates) the remuneration of reserve balances, it effectively reduces (increases) the RR ratio. The marginal effect of a particular RR change on stock returns could vary depending on whether reserve balances are remunerated. Therefore, we construct the following model to examine whether the remuneration of RR balances influences the extent of changes in RR on stock return.

$$XBank_t = \beta_0 + \beta_1 XU100_t + \beta_2 RRDecNR_t + \beta_3 RRDecR_t + \beta_4 RRIncNR_t + \beta_5 RRIncR_t + \varepsilon_t, \quad (4)$$

where *RRDecNR (RRIncNR)* are dummy variables for decreases (increases) in required reserve rate when there is no remuneration, and *RRDecR (RRIncR)* are dummy variables for decreases (increases) in required reserve rate when there is remuneration, hence RR changes are defined based on whether reserve balances are remunerated.

In equation (4), we assume that the interest rate difference between market rates and the rates at which reserve balances are remunerated are constant. However, this difference might affect the marginal impact of changes in RR on returns. Accordingly, we construct a continuous measure of the difference between returns on reserve balances and market returns that can be earned elsewhere on banks assets as follows: As a proxy for TL and FX asset returns, we use the benchmark Turkish treasury bill/bond returns and one-month LIBOR rate on USD and Euro, respectively. The interest rates applied to TL and FX required reserves are determined by the CBT based on the market conditions, and the price and financial stability objectives. The market rates and interest rates on RR are presented in Table A1, and Figures A1 to A4 in the appendix.

Having both interest rate measures, we calculate the ratio of rates on required reserves to market rates as follows:

$$RDif_t = \frac{Rates\ on\ Reserves_t}{Market\ Rate_t}$$

RDif changes between zero (RR balances are not remunerated) and one (the rates on RR balances are close to the market return). Another possible measure for the difference between rates on reserves and market rate is the simple linear difference rather than the ratio above. The linear difference, however, has the disadvantage that it does not distinguish between the following two illustrative cases: (i) RR interest rate is 1% and market rate is 2%; (ii) RR interest rate is 99% and market rate is 100%. In both cases, the interest rate differentials are equal, however in the first (second) case the interest rate paid on reserves is 50% (99%) of the market rates. *RDif* accurately reflects the significant difference between the two cases.

To summarize, we use the following model to test the impact of interest rate differentials on stock returns:

$$XBank_t = \beta_0 + \beta_1 XU100_t + \beta_2 RRInc_t + \beta_3 RRIncRDif_t + \beta_4 RRDec_t + \beta_5 RRDecRDif_t + \varepsilon_t, \quad (5)$$

where $RRInc(Dec)$ is a dummy variable for increases (decreases) in RR ratio, and $RRIncRDif\ (RRDecRDif)$ is the interaction term which equals $RRInc \times RDif$ $(RRDec \times RDif)$. A value of *RDif* that is close to zero (one) implies a higher (lower) effective RR rate, and the impact of a change in RR rate is expected to be higher (lower).[14]

3.2 Individual Bank Analysis

In addition to examining the aggregate effect of changes in RR on the banking sector as a whole, another important question is whether the impact of changes in RR may differ across banks. A different impact across banks could be expected since their customer profile and the share of each bank in total industry, and hence the degree of competition is different.[15] These

[14] As in previous two models, it is important to observe that we do not use *signed* dummies in model (5). The dummy variables for *RRInc* and *RRDec* are simply 1 for changes in RR and 0 otherwise.

[15] For instance, Gunalp and Celik (2006) provide some evidence that over the period of 1990-2000 Turkish banking industry has displayed monopolistic competition structure. Kurul (2011) presents some concentration and dominance indicators for the deposit and loan market in Turkey. She finds that the degree of competition for the loan market is larger then the market for deposits. Employing a discrete choice structural demand model, Akin et al. (2011) also find more competition in credit market, and larger welfare loss for depositors during the period of 2001-2009.

factors would determine the extent to which banks customers and stock holders would share the incidence of RR tax (Reinhart and Reinhardt, 1999). Therefore, we use the following models to address the impact of changes in RR at the bank level:

$$Bank_t^i = \beta_0 + \beta_1 XU100_t + \beta_2 RR_t + \varepsilon_t, \tag{6}$$

$$Bank_t^i = \beta_0 + \beta_1 XU100_t + \beta_2 RRBef_t + \beta_3 Day0Signed_t + \beta_4 RRAft_t + \varepsilon_t, \tag{7}$$

$$\begin{aligned} Bank_t^i = \beta_0 + \beta_1 XU100_t + \beta_2 RRBefInc_t + \beta_3 RRDayInc_t + \beta_4 RRAftInc_t \\ + \beta_5 RRBefDec_t + \beta_6 RRDayDec_t + \beta_7 RRAfDec_t + \varepsilon_t, \end{aligned} \tag{8}$$

where $Bank_t^i$ indicates daily compounded returns for bank *i* at time *t*, and *XU100* and dummies relates to *RR* are defined as before.

The shareholders of individual banks would have heterogeneous information or different priors on the timing and content of central bank policy changes. In addition, even if the asymmetric information about the policy change is ruled out, the effect of this policy might differ across banks since their financial structure are different around the timing of any event. Therefore, the results from estimating equations 6-8 could be considered as a possible outcome of information heterogeneity or ability of each bank to avoid tax incidence.

In equations (6) and (7), the null hypothesis is that changes in RR do not have any impact on stock returns of individual banks ($H_0 : \beta_i = 0$) against the alternative that increases (decreases) in RR have negative (positive) impact on bank returns ($H_1 : \beta_i < 0$). In a similar vein, the alternative hypotheses for equation (8) are $H_1 : \beta_i < 0$ and $H_1 : \beta_j > 0$ where *i* = 2, 3, 4 and *j* = 5, 6, 7. These equations are estimated using ordinary least squares with heteroskedasticity and autocorrelation corrected standard errors (HAC).

The event window considered for the analysis of individual banks is [-5, 1]. Unlike the aggregate analysis above, we are interested in examining the cross sectional variation across individual banks, bank groups, business models and ownership, rather than the evolution of investor expectations over event windows that have different widths. Therefore, we select a single window of [-5, 1] for the individual bank and panel analysis.

3.3 Panel Analysis

In addition to time series analysis on banking sector and individual banks, we also consider panel analysis to investigate the effect of changes in RR across cross-sectional units (banks), which would enable us to answer more subtle questions such as whether the incidence of RR tax depends on ownership (public vs. private),[16] size (large vs. small)[17] or business model (participation banks vs. others) of individual banks.[18] To address these questions, we extend model (8) to a panel data framework as follows:

$$Bank_{it} = \beta_0 + \beta_1 XU100_{it} + \sum_{k=2}^{4}\left(\beta_k X_{k,t} + \theta_k X_{k,t} * LargeB\right) + \sum_{k=5}^{7}\left(\beta_k Y_{k,t} + \delta_k Y_{k,t} * LargeB\right) + \mu_i + \varepsilon_{it} \quad (9)$$

$$Bank_{it} = \beta_0 + \beta_1 XU100_{it} + \sum_{k=2}^{4}\left(\beta_k X_{k,t} + \theta_k X_{k,t} * PubB\right) + \sum_{k=5}^{7}\left(\beta_k Y_{k,t} + \delta_k Y_{k,t} * PubB\right) + \mu_i + \varepsilon_{it} \quad (10)$$

$$Bank_{it} = \beta_0 + \beta_1 XU100_{it} + \sum_{k=2}^{4}\left(\beta_k X_{k,t} + \theta_k X_{k,t} * PartB\right) + \sum_{k=5}^{7}\left(\beta_k Y_{k,t} + \delta_k Y_{k,t} * PartB\right) + \mu_i + \varepsilon_{it} \quad (11)$$

$$Bank_{it} = \beta_0 + \beta_1 XU100_{it} + \sum_{k=2}^{4}\left(\beta_k X_{k,t} + \theta_k X_{k,t} * PGFC\right) + \sum_{k=5}^{7}\left(\beta_k Y_{k,t} + \delta_k Y_{k,t} * PGFC\right) + \mu_i + \varepsilon_{it} \quad (12)$$

where $Bank_{it}$ indicates daily compounded returns for bank *i* at time *t*, μ_i is the bank fixed-effect, $X_2 = RRBefInc$, $X_3 = RRDayInc$, $X_4 = RRAftInc$; $Y_5 = RRBefDec$, $Y_6 = RRDayDec$, and $Y_7 = RRAftDec$ are defined as before. *LargeB*, *PubB*, *PartB*, and *PFGC* are dummy variables that are equal to 1 for large banks, public banks, participation banks and for post-global financial crisis period (after November 1, 2008), respectively.[19] Equation 12 allows us to see whether changes in RR have different impact on stock returns during and after global financial crisis. During this period the CBT has extensively used RR policy. The *RR* dummies for the panel model are defined over the event window $T \in [-5, 1]$. We estimate equations (9)-(12) using panel fixed effects and adjust the standard errors for autocorrelation and heteroskedasticity. The hypotheses for changes in RR are similar to those that we test using equation (8). In addition, we test the following hypotheses for RR changes and their interaction with dummy variables:

[16] Public banks are HALKB, and VAKBN whose majority of shares are state-owned
[17] Large banks are GARAN, ISCTR, YKBNK, VAKBN, AKBNK, and HALKB.
[18] "Participation bank" is the term for those banks that offer interest-free banking. Participation banks in our sample are Albaraka Turk Bank and Asya Katılım Bankası.
[19] To make sure that results about the large banks are not driven by the large public banks, we re-estimated the model by excluding the large public banks from the group of large banks. The results are qualitatively and quantitatively similar.

$$H_0 : \beta_i + \theta_i = 0 \qquad H_0 : \beta_j + \delta_j = 0$$
$$H_1 : \beta_i + \theta_i < 0 \qquad H_1 : \beta_j + \delta_j > 0 ,$$

where i = 2, 3, 4 and j = 5,6,7.

To summarize, while employing different methodologies, our main objective is to test the hypothesis that reserve requirements are a tax on banking activities, and the cost of this tax is partially borne by bank stockholders. The main channel here is that the regulatory changes about RR may affect the present value of the bank equities by altering the expected value of the cash flows. In this case, if the changes in RR are unanticipated and assuming that the markets are efficient, an increase in RR, for instance, would depress the bank share prices on the announcement day, or the day after if the investors further refine their estimates about the stock prices.[20] However, if the market players fully or partially anticipate these changes in advance, information about the new policy will be reflected in stock prices before the event date depending on how expectations are formed. Accordingly, one should also examine the pre-event dates to uncover the effects of the policy change.

4. Empirical Results

4.1 Banking Index Results

Table 5 presents the baseline Model (1) results for the all event windows, i.e., [-30, 1], [-29, 1],…, [-1, 1]. Results indicate a strong positive relationship between the banking sector index and ISE-100 index with the coefficient of 1.3 over the event window. The RR coefficient is negative over the entire window, which confirms the theoretical prediction. Except for a few cases, these coefficients are statistically significant at the conventional levels for event windows. For instance, when the RR ratio increases (decreases), on average, banking index return in the event window [-10,1] (that is in the 10 day period prior to the change in the reserve requirement) is 0.196 percentage points lower (higher) than other periods. In addition, the significance of RR coefficient is larger for narrower event windows, indicating an increased amount of information being revealed. The baseline model results for sectoral analysis provide evidence that the increases in RR have significant negative impact on bank equity prices implying that the cost due

[20] In our empirical analysis, we constrain the event window with one day after the announcements. While the impact of any news on the stock prices would be immediate, some remaining adjustment might occur on the day after, as the investors may have further information following the announcements.

to RR tax is partially shared by the bank stockholders.[21] As discussed before, Model (1) assumes that the effect of increases and decreases in RR are symmetric.

The results for Model (2), which examines whether the impacts of changes in RR differ during sub-event windows, are presented in Table 6. The results show that changes in RR are consistently pronounced on the event day and on the day after. There are some pre-event windows, however, in which increases in RR have significant negative impact on stock returns. These results imply that RR changes are partially anticipated, thus there may be information leakage or some revealed information through different central bank communication channels before the actual announcement is made. We see, however, significant corrections in the stock prices on the event day and the day after, as indicated by the magnitudes of coefficients. In addition, the results presented in Table 6 shed some light on the source of significance of aggregate RR indicators of Model (1) implying that most of the corrections in prices occur on the event day and the day after.

Table 7 reports the banking sector analysis results addressing the asymmetric effect of increases and decreases in RR. This model disentangles the direction of changes in RR, and also examines whether the impacts of changes in RR differ during sub-event windows. Results provide evidence that RR changes have an asymmetric effect on share prices. The first observation is that increases in RR have significant and negative impact on stock returns on the day of announcements, while the decreases in RR are significant on the day after. Secondly, the asymmetric effect of increases and decreases in RR are also observed before the announcement dates. While there are some significant negative results showing that increases in RR dampen the bank stock returns starting around 16 days before the announcement day, the decreases in RR affect the returns significantly in a limited number of pre-event windows.

Another important observation is that the magnitudes of the coefficients (in absolute term) for decreases in RR tend to be larger than those for increases in RR. One possible explanation is that increases in RR tend to be implemented more frequently and in smaller amounts than the decreases in RR. For instance, when global financial crisis started spreading to emerging economies, central banks took swift liquidity measures by lowering required reserve and policy rates. Thus, the CBT reduced the RR rates on TL and FX liabilities at once, by one and two

[21] The significant negative coefficient of required reserve dummy implies that decreases in RR have positive impact on share prices, thus increases in banking profits due to decreases in RR are also shared by the bank stockholders.

percent, respectively. However, as part of the monetary policy exit strategy in last quarter of 2010, the CBT increased the RR rates on TL liabilities to pre-crisis level by 0.5 percentage points with two hikes; and on FX liabilities the RR rates increased by 0.5 percentage points twice and then by one percent.

Results in Table 7 also indicate that there is substantial variation in the effects of changes in RR across the various subcomponents of direction of changes and the timing of events. In addition, the significant negative effect of increases in RR also reveal information about the market's belief that reserve requirements impound information about the stance of monetary policy confirming the linkage between monetary policy decisions and asset prices documented in the literature. On the other hand, the asymmetric effect could also be attributed to the market participants' heterogeneous beliefs about the duration and purpose of increases in RR and decreases.

The results for changes in RR and their linkages with remuneration of reserve balances are presented in Tables 8 through 10. The results in Table 8a indicate that the increase in RR have more observable significant effect on bank market values than the decrease in RR when the remuneration is taken into account. The coefficients of both increases in RR and decreases without remuneration have correct signs. However, the striking result here is that the effects of increases in RR vary markedly depending on whether the reserves are remunerated. First, the patterns of significance of increases in RR over event windows are not similar indicating that increases in RR without remuneration are mostly anticipated. The more important observation, however, is that the absolute sizes of the "RR increase" coefficients when the reserve balances are not remunerated are, on average, significantly larger than the coefficients when reserves are remunerated. These findings indicate that the market's response to increases in RR depends on to what extent the intermediation is lowered by remunerating the reserve balances. In other words, when reserves are not remunerated, the change in profits due to increases in RR alters shareholders' expected returns more than when the balances are remunerated, thus induced change in share prices are higher.

We expect the coefficient of decreases in RR to have a positive sign. In Table 8a, however, *RRDecIntPay* have several negative and significant coefficients. While the signs are not consistent with theoretical predictions, the negative coefficients may imply that the decreases in RR coupled with remuneration are indicative of structural problems in the banking system. Thus,

the market participants do not perceive the news of a decrease in RR necessarily as a positive signal for stock returns when reserves are remunerated.

The empirical results for changes in RR and remuneration covering foreign currency liabilities in Table 8b are partially consistent with RR changes on TL liabilities. The main difference here is that the coefficient of the decreases in RR when FX reserves are not remunerated is statistically significant and positive over the event window but only at 10 percent level while increases in RR without remuneration have similar pattern with Table 8a. However, the magnitude of the coefficients for increases in RR and decreases without remuneration vary in absolute term, indicating differences in market perception and economic environment in which these policies are being implemented.[22]

The estimation results incorporating the ratio of RR balances' returns to market asset returns ($RDif$) in Model (5) are presented in Table 9 and 10 for TL and FX reserves, respectively.[23] Results in Table 9 shows that when $RDif$ approaches to zero, an increase in RR significantly reduces the bank stock returns. The coefficient of $RRIncRDif\,(=RRInc\times RDif)$ is significantly positive for the intervals close to the event date implying that as the interest paid to the reserves approaches the market interest rate, the negative impact of RR increase on bank returns diminishes. Positive coefficients on *RRDec* are also consistent with the prediction that RR decreases have positive effect on stock returns when $RDif$ is close to zero. However, the coefficient of $RRDecRDif=(RRDec\times RDif)$ is significantly negative for the intervals close to the event date indicating that as the interest paid to the reserves increases, the positive impact of the RR decrease on bank returns decreases and that after a certain point this impact becomes negative, i.e., decreases in RR reduce bank returns. For example, in the event window $[-5,1]$, the coefficients of $RRDec$ and $RRDecRDif$ are 0.650 and -1.394 respectively. When the value of $RDif$ increases beyond 0.61,[24] a decrease in RR decreases the bank returns. Therefore, a decrease in RR normally increases the bank returns, but if the Central Bank is already paying an

[22] The coefficient of "RRIncIntPay" is not estimated in Table 8b due to multicollinearity.

[23] The interest rates paid on required reserve balances are documented for the period of 1988-2010, and the data are available from the authors upon request. Since the banking index data is only available after 1997, the sample periods for TL and FX reserves in model (5) are January 3, 1997- July 1, 2011 and December 30, 1998- July 1, 2011, respectively. To have comparable results for US$ and Euro, the analysis period for FX balances starts from the date on which Euro is started to be used as a convertible currency.

[24] Recall that marginal effect of a decrease on bank returns equals $\beta_4+\beta_5$Rdif (See Equation 5). When Rdif=0.61, the marginal effect becomes $\beta_4+\beta_5\times0.61$ which is statistically significant. This is true for all RDif$\geq$0.61.

interest to the reserves close to the market interest rates, the market perceives this decrease in the RR as a negative signal about the banks conditions and the bank returns decrease. [25] The results for FX required reserve changes with the ratio of interest rate on RR balances and USD Libor presented in Table 10 are largely similar to the results in Table 9.[26]

4.2 Individual Bank Results

Table 11 presents the results from estimating equations 6 to 8. The aggregate analysis carried thus far is, to some extent, confirmed when individual banks are taken into consideration. As we move from Models 6 to 8, the effect of RR changes are more pronounced since we see more significant effects of these changes on individual banks stock returns. For instance, the negative significant effect of changes in RR on bank market values are only observed in case of three banks in model 6, namely for ASYAB, TEBNK and VAKBN. Similar to aggregate analysis above for model 7, the RR changes are more effective on the event day or the day after as columns 6 and 7 indicate, and are effective for only ASYAB, TEBNK and VAKBN before the announcement.

Model 8 for individual bank analysis also provide some evidence on the asymmetric effect of changes in RR while this is less observed compared to the aggregate analysis. The effect of increases in RR on bank stock returns is consistently negative, except for one case, when coefficient estimates are significant. On the other hand, for decreases in RR, the sign of significant parameter estimates vary across banks. As discussed above, the theoretical prediction is that the coefficient for RR decreases is expected to be positive indicating that the associated tax reduction would increase the cash flows and therefore profits for a bank. The economic environment in which decreases in RR take place may not necessarily yield results that are consistent with the common prediction. For instance, if there is an overall economic distress, the effect of such an event may not be uniform across the banks as their business models and customer profiles are different. Hence, both negative and positive significant parameter estimates for decreases in RR across banks indicate heterogeneous structure in banks' balance sheets.

[25] The investors might think that the banking sector has structural or liquidity problems because even though the Central Bank has been paying an interest rate close to the market interest rate, it still sees a need to decrease the RR rate.

[26] Note that Table 9 and 10 are not fully comparable as parameter for '*RRIncIntDiff*' is not estimated due to multicollinearity of variables in Table 10.

4.3 Panel Data Results

Table 12 reports the results for panel data model that investigate the effect of changes in RR across time and cross-sectional units. In specifications (A) through (D), we define the different dummy variables based on characteristics of bank groups to examine whether the effect of RR changes differ across these groups. As discussed above, the CBT has been using required reserves as a main policy tool after the global financial crisis to mitigate any rise in macro-financial risk in the banking system. Specification (A) tests whether changes in RR have different effects on bank returns in pre- and post-crisis periods. Coefficient estimates for the extended model indicate that the effect of increases in RR on bank returns is larger after the crisis when compared to the pre-GFC. The reason might be that the increases in RR after GFC have been in considerable sizes and more frequent than before, and they were coupled with the elimination of remuneration for TL liabilities. Secondly, increases in RR in the framework of a new policy mix implemented by the Central Bank might have been perceived by the market participants as permanent which is expected to dampen the bank profits more than temporary changes. The impact of a decrease in RR is not significantly different for pre- and post-crisis periods. This is possibly because there are only two RR decrease events after the crisis.

Other specifications presented in Table 12 also indicate variation across bank groups and the size of banks. Large banks, participation banks, and public banks seem to be affected more adversely from increases in RR when compared to the other banks. The period of impact also seem to be different among bank groups. Large banks' returns decrease during the whole event-window, whereas participation banks' returns decrease pre- and post-event windows, and public banks' returns decrease on the event day only. Finally the impact of increases in RR are more pronounced than decreases as the significance of the joint hypothesis including $RRbefinc^{*}D_i$, $Dayinc0^{*}D_i$ and $RRaftinc^{*}D_i$ indicate. Results presented in this section on individual banks and bank groups provide some policy guidance in the sense that the Central Bank can have a clearer picture of how an increase in RR ratio affect banks with different characteristics such as size and business model.

5. Conclusions

Required reserves have recently been used as one of the main monetary policy tools in Turkey. In particular, this tool has been used more extensively to deal with the structural liquidity problems during the recent global financial crisis. On the other hand, in the post-crisis era, increases in RR have been more frequent, and the current level of RR rate is considerably higher compared to most other emerging and advance economies. The recent increases have been used to cope with the problems related to the surge in capital inflows, accelerated credit growth and the appreciation of domestic currency.

In this paper, we analyze one particular channel through which the RR policy affects banks. Specifically, we examine the reaction of banks' stock returns to the changes in the required reserve ratio to see whether bank shareholders bear the burden of the required reserves tax. We also address more subtle questions and provide a more disaggregated analysis on the predictability of changes in RR, the implications of remuneration of reserve balances on RR changes, and how the impact of those changes varies across different bank groups with different ownership, business model and size.

Analysis results provide evidence that increases in reserve requirements significantly lower bank returns indicating that stockholders share the burden of the required reserve tax. Required reserves changes are partially predicted by the investors before the actual announcement date, and increases and decreases in RR rates have an asymmetric effect on stock returns. In addition, there exists some heterogeneity across banks as reflected by differences in signs and magnitudes of the estimated coefficients. Finally, large and public banks bear a larger share of the tax, and the remuneration of reserves has important implications for the tax burden.

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Table 1: List of Banks and the Sample Period

Bank Name	Ticker	Start Date
Akbank	AKBNK	27-Jul-1990
Albaraka Türk	ALBRK	2-Jul-2007
Alternatifbank	ALNTF	4-Jul-1995
Asya Katılım Bankası	ASYAB	15-May-2006
Denizbank	DENIZ	4-Oct-2004
Finansbank	FINBN	5-Feb-1990
Fortis Bank (Dışbank)	FORTS	14-Sep-1990
Garanti Bankası	GARAN	7-Jun-1990
T. Halk Bankası	HALKB	11-May-2007
Iş Bankası (c)	ISCTR	5-Jan-1988
Şekerbank	SKBNK	11-Apr-1997
T.Ekonomi Bank	TEBNK	29-Feb-2000
Tekstilbank	TEKST	24-May-1990
T.S.K.B.	TSKB	6-May-1988
Vakıflar Bankası	VAKBN	21-Nov-2005
Yapı ve Kredi Bank	YKBNK	11-Jan-1988
Banking sector index	XBANK	3-Jan-1997

Table 2: Required Reserve Rates (%)

		Turkish Lira		Foreign Currency	
Comm. Number	Announc. Date	Demand Deposit	Time deposit/Other Liabilities	Demand Deposit	Time deposit/Other Liabilities
88/3	8/2/1988	17	17	20	20
88/4	9/12/1988	14	14	20	20
88/5, I/A-L	10/12/1988	25	14	25	20
89/1	5/12/1989	20	<3-month: 20 >= 3-month and <=1-year: 10 2-year VRD: 8 3-year VRD: 6 4-year VRD: 4 5-year VRD: 2	25	20
89/2	11/11/1989	20	1-month: 20 >= 3-month and <=1-year: 10 2-year VRD: 8 3 -year VRD: 6 4 -year VRD: 4 5 -year VRD: 2	25	20
90/1	5/1/1990	19	1-month: 19 >= 3-month and <=1-year: 9 2 and 3 -year VRD: 6 4 and 5 -year VRD: 2	25	20
1-H	8/17/1990			20	18
90/3, I-J	12/29/1990	17.5	1-month: 17.5 >= 3-month and <=1-year: 8.25 2 and 3 -year VRD: 6 4 and 5 -year VRD: 2	Jan. and Feb. 1991: 18.5 March 1991 & after: 17.75	1- month: Jan. and Feb. 1991: 18.5 March 1991 and after: 17.75 >1-month: Jan., 1991: 17.5, Feb. 1991: 16, March 1991 and after: 15
1-M	7/3/1991			17.75	1- month: 17.75 >1-month: 15
91/1, 1-N	7/13/1991	16	1-month: 16 >= 3-month and <=1-year: 7.5 2 and 3 -year VRD: 6 4 and 5 -year VRD: 2	17.5	1-month: 17.5 >1-month: 14.5
94/1, 1-Y	1/28/1994	0	0	0	0
94/2, I-A/A	2/10/1994	16	1-month: 16 >= 3-month and <=1-year: 7.5 2 and 3 -year VRD: 6 4 and 5 -year VRD: 2	17.5	1-month: 17.5 >1-month: 14.5
94/3, I-A/B	4/5/1994	16 MRR: 8	1-month: 16 >= 3-month and <=1-year: 7.5 2 and 3 -year VRD: 6 4 and 5 -year VRD: 2 Marginal RR: 8, and MRR for VRD: 0	17.5 MRR: 10	1-month: 17.5 >1-month: 14.5 Marginal RR: 10

(continued)

Table 2: Continued

		Turkish Lira		Foreign Currency	
Comm. Number	Announc. Date	Demand Deposit	Time deposit/Other Liabilities	Demand Deposit	Time deposit/Other Liabilities
94/4	8/12/1994	16 MRR: 8	1-month: 16 >= 3-month and <=1-year: 7.5 2 and 3 -year VRD: 6 4 and 5 -year VRD: 2 Marginal RR: 8		
95/1, I-A/G	1/27/1995	17 MRR: 9	1-month: 17 >= 3-month and <=1-year: 8.5 2 and 3 -year VRD: 7 4 and 5-year VRD: 3 Marginal RR: 9	18.5 MRR: 13	1-month: 18.5 >1-month: 15.5 Marginal RR: 13
96/1	7/22/1996		8		11
99/1	12/10/1999		6		11
2000/1	11/25/2000		4		11
2001/2	8/8/2001		4		11
2002/1	3/29/2002		6		11
2008/7	12/5/2008		6		9
2009/7	10/16/2009		5		9
2010/5	4/26/2010		5		9.5
2010/7	7/29/2010		5		10
2010/9	9/23/2010		5.5		11
2010/10	11/12/2010		6		11
2010/13	12/17/2010	8	1-month: 8, <=3-month: 7 <=6-month: 7 <1-year: 6 >=1-year: 5 Other liabilities: 8		11
2011/2	1/24/2011	12	1-month: 10,<=3-month: 9 <=6-month: 7 <1-year: 6 >=1-year: 5 Other liabilities: 9		11
2011/5	3/24/2011	15	1-month: 15,<=3-month: 13 <=6-month: 9 <1-year: 6 >=1-year: 5 Other liabilities: 13		11
2011/6	4/22/2011	16	1-month: 16 <=3-month: 13 <=6-month: 9 <1-year: 6 >=1-year: 5 Other liabilities: 13	12	Deposits:< 1-month to <1-year: 12 >=1-year: 11 Other liabilities: <1-year: 12 1 to 3-year: 11.5 >3-year: 11

Note: VRD indicates variable rate deposits. As of March 29, 2002, RR base is extended to include both deposit and other liabilities. MRR indicates marginal reserve requirement.

Table 3: Liquidity Requirement Rates

Panel a: Turkish Lira Liabilities

		Deposit			Other Liabilities		
Comm. Number	Announc. Date	Free deposit	Gov. Securities	Vault Cash	Free deposit	Gov. Securities	Vault Cash
9	07/01/1987	Min: 5	Max: 18				
10	09/16/1987	Min: 3	Max: 18	Max: 2			
11	12/16/1987	Min: 2	Max: 18	Max: 2, 2.5 or 3			
12	02/04/1988	Min: 2	Max: 22	Max: 2, 2.5 or 3			
14	09/12/1988	Min: 2	Max: 25	Max: 2, 2.5 or 3			
16	03/01/1991	Min: 2	Max: 30	Max: 2, 2.5 or 3			
17	01/24/1992	Min: 2.5	Max: 30	Max: 2.5 or 3			
18	05/30/1992	Min: 2	Max: 30	Max: 3			
1	01/28/1994	Min: 6	Max: 18				
3	02/10/1994	Min: 2	Max: 30	Max: 3			
4	04/05/1994	Min: 2 MLR* - Min: 8	Max: 30				
1	01/05/1995	Min: 2	Max: 30 MLR: 3		MLR: 8	MLR: 3	
2	01/27/1995	Min: 2	Max: 30 MLR: 3		MLR: 9	MLR: 3	
6	03/28/1996	Min: 2	Max: 30 MLR: 3		MLR: 9	MLR: 3	
96/1	07/22/1996		6		8	6	
99/2	12/10/1999	2	4	2	8	6	
2000/1	05/05/2000	2	4	2	8	6	
2000/3	11/25/2000	2	4	2	6	4	2
2002/2	03/29/2002	-	4	-	-	4	-
Panel b: Foregin Currency Liabilities							
Sayı: 1	01/28/1994	Min: 3					
Sayı: 3	02/10/1994						
Sayı: 4	04/05/1994	MLR- Min: 9					
Sayı: 1	01/05/1995		3		MLR: 9	MLR: 3	
Sayı: 2	01/27/1995		3		MLR: 12	MLR: 3	
Sayı: 6	03/28/1996		3		MLR: 12	MLR: 3	
96/1	07/22/1996		3		11	3	
99/2	12/10/1999		3		11	3	
2000/1	05/05/2000		3		11	3	
2000/3	11/25/2000		3		11	3	
2002/2	03/29/2002		1		-	1	

Notes: MLR stands for marginal liquididty requiremnts which is implemented for any additional liabilities. Liquidity requirement requlation is terminated as of 16.11.2005.

Table 4: Required Reserve Events and Remuneration

	Required Reserve			Remuneration	
Date	**TL**	**FX**	**TL&FX**	**TL**	**FX**
12/09/88	-1		-1	0	1
12/10/88	1	1	1	0	1
12/05/89	1		1	0	1
01/05/90	-1	-1	-1	0	1
17/08/90		-1	-1	0	1
29/12/90	-1	-1	-1	0	1
13/07/91	-1	-1	-1	0	1
24/01/92	1		1	0	1
30/05/92	-1		-1	0	1
28/01/94	-1	-1	-1	0	1
10/02/94	1	1	1	0	1
05/04/94	-1	-1	-1	0	1
05/01/95	-1	-1	-1	0	0
27/01/95	1	1	1	1	0
28/03/96	1		1	1	0
22/07/96	-1	-1	-1	0	0
05/05/00	1		1	0	0
25/11/00	-1		-1	0	0
08/08/01				1	0
29/03/02				1	1
05/12/08		-1	-1	1	0
16/10/09	-1		-1	1	0
26/04/10		1	1	1	0
29/07/10		1	1	1	0
23/09/10	1	1	1	0	0
12/11/10	1		1	0	0
17/12/10	1		1	0	0
24/01/11	1		1	0	0
23/03/11	1		1	0	0
21/04/11	1	1	1	0	0

Note: 1(-1) indicates increases (decreases) in required reserve rate and 1(0) indicates whether the required reserves are remunerated (or not).

Table 5: Sectoral Analysis-Baseline Model

Event Window	XU100		RR		R^2
	Coefficent	Std. errors	Coefficent	Std. errors	
[-30,1]	1.132***	(0.064)	-0.068**	(0.041)	0.92
[-29,1]	1.132***	(0.065)	-0.057*	(0.041)	0.92
[-28,1]	1.132***	(0.063)	-0.052	(0.043)	0.92
[-27,1]	1.131***	(0.065)	-0.052*	(0.040)	0.92
[-26,1]	1.131***	(0.065)	-0.057*	(0.041)	0.92
[-25,1]	1.132***	(0.065)	-0.049	(0.043)	0.92
[-24,1]	1.132***	(0.065)	-0.050	(0.043)	0.92
[-23,1]	1.132***	(0.065)	-0.061*	(0.046)	0.92
[-22,1]	1.133***	(0.065)	-0.077**	(0.043)	0.92
[-21,1]	1.133***	(0.065)	-0.091**	(0.046)	0.92
[-20,1]	1.133***	(0.065)	-0.096**	(0.045)	0.92
[-19,1]	1.133***	(0.063)	-0.095**	(0.050)	0.92
[-18,1]	1.134***	(0.065)	-0.113**	(0.050)	0.92
[-17,1]	1.134***	(0.063)	-0.130***	(0.054)	0.92
[-16,1]	1.135***	(0.064)	-0.153***	(0.048)	0.92
[-15,1]	1.134***	(0.065)	-0.127***	(0.049)	0.92
[-14,1]	1.134***	(0.065)	-0.122***	(0.050)	0.92
[-13,1]	1.134***	(0.063)	-0.131***	(0.053)	0.92
[-12,1]	1.134***	(0.065)	-0.140***	(0.053)	0.92
[-11,1]	1.133***	(0.063)	-0.167***	(0.055)	0.92
[-10,1]	1.133***	(0.065)	-0.196***	(0.054)	0.92
[-9,1]	1.132***	(0.065)	-0.216***	(0.057)	0.92
[-8,1]	1.131***	(0.065)	-0.216***	(0.061)	0.92
[-7,1]	1.132***	(0.065)	-0.187***	(0.065)	0.92
[-6,1]	1.132***	(0.065)	-0.209***	(0.070)	0.92
[-5,1]	1.133***	(0.065)	-0.208***	(0.079)	0.92
[-4,1]	1.133***	(0.065)	-0.223***	(0.079)	0.92
[-3,1]	1.133***	(0.065)	-0.220***	(0.094)	0.92
[-2,1]	1.132***	(0.063)	-0.242***	(0.090)	0.92
[-1,1]	1.131***	(0.063)	-0.266***	(0.110)	0.92

Note: This table reports results from estimating equation (1). Heteroskedasticity and autocorrelation adjusted standard errors are in parentheses. '***', '**' and '*' indicates significance level with one-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observation is 3617.

Table 6: Sectoral Analysis-Extended Model –I

Event Window	XU100		RRbef		Day0Signed		RRaft		R^2
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. err.	Coeff.	Std. Err.	
[-30,1]	1.133***	(0.063)	-0.040	(0.041)	-0.479**	(0.234)	-0.307*	(0.236)	0.92
[-29,1]	1.132***	(0.064)	-0.027	(0.041)	-0.480**	(0.234)	-0.310*	(0.235)	0.92
[-28,1]	1.132***	(0.065)	-0.021	(0.043)	-0.480**	(0.234)	-0.311*	(0.234)	0.92
[-27,1]	1.132***	(0.065)	-0.020	(0.042)	-0.480**	(0.234)	-0.312*	(0.234)	0.92
[-26,1]	1.132***	(0.065)	-0.024	(0.043)	-0.480**	(0.234)	-0.311*	(0.234)	0.92
[-25,1]	1.132***	(0.065)	-0.015	(0.045)	-0.481**	(0.234)	-0.313*	(0.234)	0.92
[-24,1]	1.132***	(0.065)	-0.019	(0.046)	-0.480**	(0.234)	-0.313*	(0.233)	0.92
[-23,1]	1.132***	(0.065)	-0.030	(0.046)	-0.480**	(0.234)	-0.312*	(0.233)	0.92
[-22,1]	1.133***	(0.065)	-0.046	(0.047)	-0.479**	(0.233)	-0.309*	(0.234)	0.92
[-21,1]	1.133***	(0.063)	-0.060	(0.049)	-0.478**	(0.233)	-0.307*	(0.235)	0.92
[-20,1]	1.133***	(0.065)	-0.061	(0.049)	-0.483**	(0.234)	-0.307*	(0.235)	0.92
[-19,1]	1.133***	(0.065)	-0.063	(0.050)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-18,1]	1.134***	(0.065)	-0.081*	(0.050)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-17,1]	1.134***	(0.065)	-0.098**	(0.051)	-0.484**	(0.234)	-0.317*	(0.233)	0.92
[-16,1]	1.134***	(0.064)	-0.122***	(0.051)	-0.484**	(0.234)	-0.318*	(0.234)	0.92
[-15,1]	1.134***	(0.065)	-0.091**	(0.050)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-14,1]	1.133***	(0.065)	-0.083*	(0.051)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-13,1]	1.134***	(0.063)	-0.089*	(0.055)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-12,1]	1.134***	(0.065)	-0.097**	(0.054)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-11,1]	1.133***	(0.063)	-0.124**	(0.056)	-0.483**	(0.234)	-0.317*	(0.233)	0.92
[-10,1]	1.133***	(0.065)	-0.155***	(0.057)	-0.483**	(0.234)	-0.318*	(0.233)	0.92
[-9,1]	1.132***	(0.065)	-0.175***	(0.060)	-0.483**	(0.235)	-0.318*	(0.232)	0.92
[-8,1]	1.132***	(0.065)	-0.170***	(0.066)	-0.483**	(0.235)	-0.317*	(0.232)	0.92
[-7,1]	1.132***	(0.065)	-0.126**	(0.072)	-0.482**	(0.234)	-0.317*	(0.232)	0.92
[-6,1]	1.133***	(0.065)	-0.145**	(0.081)	-0.483**	(0.234)	-0.317*	(0.232)	0.92
[-5,1]	1.133***	(0.065)	-0.131*	(0.092)	-0.482**	(0.234)	-0.317*	(0.233)	0.92
[-4,1]	1.133***	(0.065)	-0.134*	(0.100)	-0.482**	(0.234)	-0.317*	(0.233)	0.92
[-3,1]	1.132***	(0.065)	-0.100	(0.131)	-0.482**	(0.234)	-0.317*	(0.233)	0.92
[-2,1]	1.132***	(0.064)	-0.085	(0.135)	-0.482**	(0.234)	-0.316*	(0.233)	0.92
[-1,1]	1.132***	(0.063)	0.001	(0.204)	-0.482**	(0.234)	-0.316*	(0.233)	0.92

Note: This table reports results from estimating equation (2). Heteroskedasticity and autocorrelation adjusted standard errors are in parentheses. '***', '**' and '*' indicates significance level with one-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observations is 3617.

Table 7: Sectoral Analysis-Extended Model -II

Event Window	XU100		RRbefinc		Dayinc0		RRaftinc		RRbefdec		Daydec0		RRaftdec		R^2
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	
[-30,1]	1.133***	(0.059)	-0.030	(0.042)	-0.731***	(0.234)	-0.092	(0.183)	0.069	(0.091)	-0.273	(0.393)	0.959*	(0.655)	0.92
[-29,1]	1.132***	(0.059)	-0.022	(0.042)	-0.732***	(0.234)	-0.095	(0.182)	0.044	(0.088)	-0.275	(0.392)	0.958*	(0.653)	0.92
[-28,1]	1.132***	(0.060)	-0.012	(0.044)	-0.732***	(0.234)	-0.098	(0.181)	0.049	(0.092)	-0.274	(0.394)	0.959*	(0.653)	0.92
[-27,1]	1.132***	(0.062)	-0.013	(0.045)	-0.732***	(0.235)	-0.098	(0.181)	0.043	(0.088)	-0.275	(0.397)	0.958*	(0.655)	0.92
[-26,1]	1.132***	(0.061)	-0.016	(0.045)	-0.732***	(0.234)	-0.097	(0.181)	0.053	(0.087)	-0.275	(0.396)	0.958*	(0.653)	0.92
[-25,1]	1.132***	(0.063)	-0.015	(0.047)	-0.733***	(0.234)	-0.098	(0.182)	0.021	(0.101)	-0.275	(0.398)	0.958*	(0.656)	0.92
[-24,1]	1.132***	(0.063)	-0.018	(0.048)	-0.732***	(0.234)	-0.099	(0.181)	0.023	(0.106)	-0.275	(0.398)	0.958*	(0.657)	0.92
[-23,1]	1.133***	(0.062)	-0.027	(0.048)	-0.732***	(0.234)	-0.097	(0.181)	0.044	(0.103)	-0.275	(0.397)	0.958*	(0.657)	0.92
[-22,1]	1.133***	(0.064)	-0.041	(0.048)	-0.730***	(0.234)	-0.094	(0.181)	0.062	(0.110)	-0.274	(0.401)	0.958*	(0.659)	0.92
[-21,1]	1.134***	(0.064)	-0.053	(0.048)	-0.729***	(0.234)	-0.091	(0.182)	0.084	(0.100)	-0.273	(0.399)	0.959*	(0.661)	0.92
[-20,1]	1.134***	(0.064)	-0.055	(0.051)	-0.735***	(0.234)	-0.091	(0.182)	0.087	(0.105)	-0.273	(0.399)	0.959*	(0.661)	0.92
[-19,1]	1.134***	(0.063)	-0.042	(0.055)	-0.733***	(0.234)	-0.101	(0.179)	0.125	(0.103)	-0.271	(0.399)	0.961*	(0.661)	0.92
[-18,1]	1.134***	(0.063)	-0.060	(0.054)	-0.734***	(0.234)	-0.102	(0.179)	0.142*	(0.108)	-0.270	(0.398)	0.961*	(0.663)	0.92
[-17,1]	1.135***	(0.064)	-0.073*	(0.052)	-0.734***	(0.234)	-0.101	(0.179)	0.169*	(0.114)	-0.269	(0.400)	0.962*	(0.665)	0.92
[-16,1]	1.135***	(0.062)	-0.104**	(0.049)	-0.735***	(0.234)	-0.102	(0.179)	0.174*	(0.130)	-0.270	(0.398)	0.961*	(0.664)	0.92
[-15,1]	1.134***	(0.065)	-0.069*	(0.052)	-0.734***	(0.234)	-0.102	(0.179)	0.155*	(0.117)	-0.270	(0.402)	0.961*	(0.664)	0.92
[-14,1]	1.134***	(0.065)	-0.069	(0.055)	-0.734***	(0.234)	-0.102	(0.179)	0.123	(0.116)	-0.272	(0.402)	0.960*	(0.663)	0.92
[-13,1]	1.134***	(0.065)	-0.074	(0.059)	-0.734***	(0.234)	-0.102	(0.178)	0.134	(0.128)	-0.271	(0.401)	0.961*	(0.664)	0.92
[-12,1]	1.134***	(0.065)	-0.099**	(0.060)	-0.735***	(0.234)	-0.103	(0.179)	0.092	(0.127)	-0.273	(0.403)	0.959*	(0.662)	0.92
[-11,1]	1.134***	(0.064)	-0.109**	(0.062)	-0.735***	(0.234)	-0.103	(0.178)	0.169*	(0.120)	-0.273	(0.401)	0.959*	(0.663)	0.92
[-10,1]	1.133***	(0.064)	-0.145**	(0.065)	-0.736***	(0.234)	-0.104	(0.178)	0.186*	(0.128)	-0.275	(0.401)	0.958*	(0.661)	0.92
[-9,1]	1.132***	(0.064)	-0.157**	(0.068)	-0.736***	(0.234)	-0.104	(0.179)	0.228*	(0.141)	-0.277	(0.401)	0.956*	(0.657)	0.92
[-8,1]	1.132***	(0.064)	-0.178***	(0.072)	-0.737***	(0.234)	-0.105	(0.178)	0.149	(0.148)	-0.278	(0.401)	0.955*	(0.658)	0.92
[-7,1]	1.132***	(0.062)	-0.132**	(0.076)	-0.736***	(0.234)	-0.104	(0.178)	0.108	(0.189)	-0.276	(0.398)	0.957*	(0.656)	0.92
[-6,1]	1.132***	(0.064)	-0.149**	(0.090)	-0.736***	(0.234)	-0.104	(0.178)	0.134	(0.195)	-0.276	(0.401)	0.957*	(0.659)	0.92
[-5,1]	1.132***	(0.064)	-0.184**	(0.108)	-0.737***	(0.234)	-0.105	(0.179)	-0.024	(0.191)	-0.278	(0.399)	0.955*	(0.655)	0.92
[-4,1]	1.132***	(0.063)	-0.193*	(0.118)	-0.736***	(0.234)	-0.105	(0.179)	-0.040	(0.177)	-0.278	(0.398)	0.956*	(0.655)	0.92
[-3,1]	1.132***	(0.061)	-0.143	(0.155)	-0.735***	(0.234)	-0.104	(0.179)	-0.026	(0.261)	-0.277	(0.397)	0.957*	(0.653)	0.92
[-2,1]	1.131***	(0.060)	-0.244*	(0.150)	-0.737***	(0.234)	-0.105	(0.179)	-0.385***	(0.094)	-0.281	(0.389)	0.954*	(0.646)	0.92
[-1,1]	1.132***	(0.059)	-0.097	(0.256)	-0.735***	(0.234)	-0.103	(0.178)	-0.297*	(0.197)	-0.276	(0.390)	0.958*	(0.651)	0.92

Note: This table reports results from estimating equation (3). Heteroskedasticity and autocorrelation adjusted standard errors are in parentheses. '***', '**' and '*' indicates significance level with one-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observation is 3617.

Table 8a: Sectoral Analysis-Extended Model -III: TL Required Reserve Changes and Remuneration

Event Window	XU100		RRdecnointpay		RRdecintpay		RRincnointpay		RRincintpay		R^2
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	
[-30,1]	1.132***	(0.063)	0.093	(0.175)	-0.046	(0.119)	-0.100*	(0.057)	-0.056	(0.042)	0.92
[-29,1]	1.133***	(0.062)	0.088	(0.190)	-0.071	(0.125)	-0.088	(0.056)	-0.056	(0.037)	0.92
[-28,1]	1.133***	(0.062)	0.127	(0.180)	-0.083	(0.134)	-0.078	(0.056)	-0.046	(0.040)	0.92
[-27,1]	1.133***	(0.062)	0.182	(0.168)	-0.037	(0.124)	-0.076	(0.058)	-0.039	(0.045)	0.92
[-26,1]	1.132***	(0.062)	0.182	(0.174)	0.007	(0.128)	-0.076	(0.058)	-0.046	(0.042)	0.92
[-25,1]	1.133***	(0.065)	0.198	(0.175)	-0.046	(0.142)	-0.082	(0.059)	-0.034	(0.061)	0.92
[-24,1]	1.133***	(0.064)	0.204	(0.181)	-0.030	(0.143)	-0.076	(0.059)	-0.049	(0.053)	0.92
[-23,1]	1.133***	(0.064)	0.200	(0.193)	-0.005	(0.147)	-0.082	(0.059)	-0.082*	(0.046)	0.92
[-22,1]	1.134***	(0.065)	0.262	(0.199)	-0.032	(0.157)	-0.096	(0.069)	-0.088	(0.056)	0.92
[-21,1]	1.134***	(0.065)	0.237	(0.208)	-0.023	(0.163)	-0.105	(0.071)	-0.095	(0.060)	0.92
[-20,1]	1.133***	(0.065)	0.267	(0.197)	-0.014	(0.169)	-0.105	(0.067)	-0.073	(0.052)	0.92
[-19,1]	1.134***	(0.065)	0.263	(0.226)	-0.021	(0.178)	-0.091	(0.075)	-0.070	(0.060)	0.92
[-18,1]	1.133***	(0.063)	0.258	(0.264)	-0.005	(0.163)	-0.114	(0.075)	-0.069	(0.086)	0.92
[-17,1]	1.134***	(0.066)	0.305	(0.237)	0.012	(0.190)	-0.137**	(0.066)	-0.052	(0.059)	0.92
[-16,1]	1.134***	(0.065)	0.214	(0.292)	0.079	(0.184)	-0.171**	(0.068)	-0.060	(0.082)	0.92
[-15,1]	1.135***	(0.063)	0.336	(0.259)	0.014	(0.197)	-0.128**	(0.062)	-0.052	(0.053)	0.92
[-14,1]	1.136***	(0.062)	0.368	(0.249)	0.001	(0.200)	-0.127*	(0.065)	-0.065	(0.043)	0.92
[-13,1]	1.137***	(0.061)	0.412*	(0.231)	-0.039	(0.186)	-0.132*	(0.069)	-0.069	(0.045)	0.92
[-12,1]	1.137***	(0.061)	0.356	(0.271)	0.028	(0.220)	-0.166**	(0.066)	-0.069	(0.049)	0.92
[-11,1]	1.137***	(0.060)	0.504**	(0.216)	0.059	(0.225)	-0.174**	(0.070)	-0.068	(0.052)	0.92
[-10,1]	1.137***	(0.060)	0.589***	(0.214)	0.061	(0.246)	-0.210***	(0.065)	-0.096*	(0.051)	0.92
[-9,1]	1.137***	(0.058)	0.643***	(0.202)	0.038	(0.234)	-0.227***	(0.060)	-0.100*	(0.054)	0.92
[-8,1]	1.136***	(0.059)	0.572**	(0.236)	-0.032	(0.233)	-0.245***	(0.066)	-0.145*	(0.075)	0.92
[-7,1]	1.138***	(0.059)	0.613**	(0.261)	-0.155	(0.173)	-0.221**	(0.086)	-0.071	(0.057)	0.92
[-6,1]	1.138***	(0.059)	0.627**	(0.276)	-0.169	(0.187)	-0.237***	(0.090)	-0.014	(0.078)	0.92
[-5,1]	1.138***	(0.060)	0.659**	(0.299)	-0.345***	(0.115)	-0.262***	(0.092)	-0.072	(0.070)	0.92
[-4,1]	1.137***	(0.062)	0.625*	(0.319)	-0.433***	(0.102)	-0.288***	(0.092)	-0.103	(0.087)	0.92
[-3,1]	1.136***	(0.064)	0.617	(0.379)	-0.601***	(0.084)	-0.267**	(0.115)	-0.172	(0.111)	0.92
[-2,1]	1.135***	(0.065)	0.475	(0.573)	-0.519***	(0.100)	-0.392***	(0.095)	-0.085	(0.176)	0.92
[-1,1]	1.135***	(0.065)	0.877	(0.634)	-0.638***	(0.174)	-0.354**	(0.140)	-0.189	(0.286)	0.92

Note: This table reports results from estimating equation (4). Heteroskedasticity and autocorrelation adjusted standard errors are in parentheses. '***', '**' and '*' indicates significance level with two-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observation is 3617.

Table 8b: Sectoral Analysis-Extended Model -III: FX Required Reserve Changes and Remuneration

Event	XU100		RRdecnointpay		RRdecintpay		RRincnointpay		
Window	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	R^2
[-30,1]	1.135***	(0.061)	0.371*	(0.219)	0.202	(0.228)	-0.029	(0.046)	0.92
[-29,1]	1.133***	(0.062)	0.376*	(0.223)	0.164	(0.225)	-0.037	(0.048)	0.92
[-28,1]	1.132***	(0.063)	0.379*	(0.223)	0.152	(0.227)	-0.027	(0.048)	0.92
[-27,1]	1.131***	(0.063)	0.382*	(0.224)	0.034	(0.188)	-0.028	(0.049)	0.92
[-26,1]	1.131***	(0.063)	0.381*	(0.224)	0.017	(0.194)	-0.039	(0.050)	0.92
[-25,1]	1.131***	(0.063)	0.382*	(0.225)	-0.034	(0.212)	-0.031	(0.052)	0.92
[-24,1]	1.130***	(0.063)	0.384*	(0.226)	-0.048	(0.230)	-0.032	(0.051)	0.92
[-23,1]	1.131***	(0.063)	0.381*	(0.226)	-0.007	(0.216)	-0.044	(0.051)	0.92
[-22,1]	1.131***	(0.064)	0.381*	(0.226)	0.012	(0.216)	-0.048	(0.049)	0.92
[-21,1]	1.133***	(0.063)	0.375*	(0.223)	0.093	(0.162)	-0.063	(0.047)	0.92
[-20,1]	1.133***	(0.063)	0.376*	(0.223)	0.067	(0.182)	-0.058	(0.048)	0.92
[-19,1]	1.134***	(0.063)	0.374*	(0.222)	0.186	(0.158)	-0.056	(0.047)	0.92
[-18,1]	1.134***	(0.063)	0.371*	(0.223)	0.226	(0.179)	-0.064	(0.045)	0.92
[-17,1]	1.135***	(0.063)	0.370*	(0.223)	0.237	(0.191)	-0.060	(0.048)	0.92
[-16,1]	1.135***	(0.063)	0.371*	(0.223)	0.282	(0.233)	-0.067	(0.048)	0.92
[-15,1]	1.133***	(0.062)	0.376*	(0.222)	0.176	(0.158)	-0.062	(0.050)	0.92
[-14,1]	1.132***	(0.063)	0.379*	(0.225)	0.071	(0.098)	-0.061	(0.053)	0.92
[-13,1]	1.132***	(0.062)	0.379*	(0.221)	0.104	(0.117)	-0.064	(0.057)	0.92
[-12,1]	1.131***	(0.063)	0.381*	(0.224)	-0.017	(0.087)	-0.088*	(0.049)	0.92
[-11,1]	1.132***	(0.063)	0.380*	(0.223)	0.012	(0.101)	-0.115**	(0.046)	0.92
[-10,1]	1.132***	(0.062)	0.379*	(0.220)	-0.031	(0.114)	-0.147***	(0.042)	0.92
[-9,1]	1.132***	(0.063)	0.379*	(0.224)	0.050	(0.108)	-0.167***	(0.049)	0.92
[-8,1]	1.131***	(0.063)	0.380*	(0.224)	-0.000	(0.106)	-0.167***	(0.055)	0.92
[-7,1]	1.131***	(0.063)	0.382*	(0.224)	0.003	(0.120)	-0.126**	(0.060)	0.92
[-6,1]	1.131***	(0.063)	0.381*	(0.224)	0.086	(0.139)	-0.154**	(0.070)	0.92
[-5,1]	1.131***	(0.063)	0.382*	(0.224)	-0.117	(0.194)	-0.216***	(0.053)	0.92
[-4,1]	1.131***	(0.063)	0.380*	(0.225)	0.030	(0.176)	-0.244***	(0.052)	0.92
[-3,1]	1.133***	(0.061)	0.375*	(0.217)	0.359*	(0.195)	-0.238***	(0.050)	0.92
[-2,1]	1.131***	(0.063)	0.382*	(0.224)	-0.132	(0.086)	-0.223***	(0.069)	0.92
[-1,1]	1.131***	(0.063)	0.382*	(0.223)	0.055***	(0.019)	-0.216***	(0.054)	0.92

Note: This table reports results from estimating equation (4). Heteroskedasticity and autocorrelation adjusted standard errors are in parentheses. '***', '**' and '*' indicates significance level with two-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observation is 3617.

Table 9: Sectoral Analysis-TL Required Reserve Changes and Interest Differentials on Reserves

Event Window	XU100		RRInc		RRIncRDif		RRDec		RRDecRDif		R^2
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	
[-30,1]	1.132***	(0.064)	-0.109*	(0.059)	0.116	(0.137)	0.086	(0.173)	-0.186	(0.323)	0.92
[-29,1]	1.133***	(0.063)	-0.100*	(0.059)	0.127	(0.130)	0.079	(0.189)	-0.208	(0.348)	0.92
[-28,1]	1.133***	(0.063)	-0.095	(0.059)	0.160	(0.132)	0.116	(0.179)	-0.279	(0.343)	0.92
[-27,1]	1.133***	(0.064)	-0.094	(0.059)	0.183	(0.140)	0.173	(0.169)	-0.295	(0.330)	0.92
[-26,1]	1.132***	(0.063)	-0.093	(0.060)	0.171	(0.141)	0.174	(0.174)	-0.233	(0.335)	0.92
[-25,1]	1.133***	(0.065)	-0.095	(0.068)	0.174	(0.156)	0.188	(0.185)	-0.328	(0.358)	0.92
[-24,1]	1.133***	(0.065)	-0.092	(0.061)	0.174	(0.154)	0.194	(0.178)	-0.313	(0.357)	0.92
[-23,1]	1.133***	(0.065)	-0.094	(0.064)	0.111	(0.146)	0.190	(0.187)	-0.272	(0.370)	0.92
[-22,1]	1.134***	(0.065)	-0.100	(0.070)	0.046	(0.142)	0.251	(0.205)	-0.397	(0.375)	0.92
[-21,1]	1.134***	(0.065)	-0.107	(0.072)	0.036	(0.147)	0.226	(0.213)	-0.347	(0.390)	0.92
[-20,1]	1.134***	(0.065)	-0.104	(0.068)	0.027	(0.129)	0.256	(0.197)	-0.377	(0.396)	0.92
[-19,1]	1.134***	(0.065)	-0.091	(0.076)	0.032	(0.148)	0.251	(0.227)	-0.379	(0.433)	0.92
[-18,1]	1.134***	(0.065)	-0.115	(0.074)	0.069	(0.161)	0.247	(0.245)	-0.349	(0.444)	0.92
[-17,1]	1.134***	(0.065)	-0.137**	(0.067)	0.131	(0.135)	0.294	(0.238)	-0.393	(0.456)	0.92
[-16,1]	1.134***	(0.065)	-0.172**	(0.069)	0.173	(0.146)	0.208	(0.292)	-0.177	(0.522)	0.92
[-15,1]	1.135***	(0.063)	-0.129**	(0.062)	0.118	(0.123)	0.325	(0.260)	-0.431	(0.484)	0.92
[-14,1]	1.136***	(0.062)	-0.127*	(0.065)	0.095	(0.119)	0.356	(0.250)	-0.490	(0.476)	0.92
[-13,1]	1.137***	(0.060)	-0.133*	(0.069)	0.099	(0.125)	0.396*	(0.232)	-0.597	(0.441)	0.92
[-12,1]	1.137***	(0.061)	-0.167**	(0.067)	0.152	(0.125)	0.344	(0.273)	-0.431	(0.507)	0.92
[-11,1]	1.138***	(0.059)	-0.175**	(0.070)	0.167	(0.130)	0.493**	(0.217)	-0.597	(0.446)	0.92
[-10,1]	1.137***	(0.060)	-0.212***	(0.066)	0.184	(0.126)	0.577***	(0.215)	-0.709	(0.476)	0.92
[-9,1]	1.137***	(0.058)	-0.229***	(0.061)	0.206*	(0.125)	0.628***	(0.202)	-0.807*	(0.461)	0.92
[-8,1]	1.136***	(0.059)	-0.247***	(0.067)	0.168	(0.155)	0.555**	(0.237)	-0.798	(0.491)	0.92
[-7,1]	1.138***	(0.059)	-0.223**	(0.088)	0.240	(0.162)	0.601**	(0.262)	-1.047**	(0.449)	0.92
[-6,1]	1.138***	(0.059)	-0.240***	(0.091)	0.351*	(0.187)	0.614**	(0.276)	-1.084**	(0.487)	0.92
[-5,1]	1.138***	(0.059)	-0.266***	(0.094)	0.310*	(0.177)	0.650**	(0.299)	-1.394***	(0.456)	0.92
[-4,1]	1.137***	(0.062)	-0.293***	(0.094)	0.312*	(0.188)	0.618*	(0.319)	-1.486***	(0.472)	0.92
[-3,1]	1.136***	(0.065)	-0.273**	(0.123)	0.191	(0.247)	0.614	(0.404)	-1.738***	(0.569)	0.92
[-2,1]	1.136***	(0.065)	-0.404***	(0.098)	0.518**	(0.260)	0.470	(0.573)	-1.418*	(0.836)	0.92
[-1,1]	1.135***	(0.065)	-0.369**	(0.147)	0.347	(0.378)	0.875	(0.634)	-2.207**	(0.919)	0.92

Note: This table reports results from estimating equation (5). Robust standard errors in parentheses. '***', '**' and '*' indicates significance level with two-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observation is 3613.

Table 10: Sectoral Analysis- FX Required Reserve Changes and USD Interest Differentials on Reserves

Event Window	XU100		RRInc		RRDec		RRDecIntDiff		R^2
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	
[-30,1]	1.152***	(0.056)	-0.021	(0.044)	-0.010	(0.157)	4.849	(3.180)	0.93
[-29,1]	1.146***	(0.056)	-0.028	(0.048)	0.013	(0.160)	3.827	(3.427)	0.93
[-28,1]	1.143***	(0.057)	-0.018	(0.048)	0.010	(0.179)	3.902	(4.399)	0.93
[-27,1]	1.142***	(0.058)	-0.019	(0.046)	0.075	(0.158)	-0.483	(2.809)	0.93
[-26,1]	1.142***	(0.058)	-0.031	(0.046)	0.087	(0.154)	-1.247	(2.711)	0.93
[-25,1]	1.143***	(0.057)	-0.023	(0.048)	0.152	(0.118)	-4.713**	(2.326)	0.93
[-24,1]	1.137***	(0.058)	-0.023	(0.046)	0.221**	(0.108)	-8.202	(6.091)	0.93
[-23,1]	1.138***	(0.058)	-0.035	(0.047)	0.241**	(0.105)	-7.670	(5.662)	0.93
[-22,1]	1.139***	(0.059)	-0.039	(0.043)	0.249**	(0.103)	-7.381	(5.611)	0.93
[-21,1]	1.141***	(0.059)	-0.054	(0.040)	0.272***	(0.098)	-5.653	(3.973)	0.93
[-20,1]	1.140***	(0.059)	-0.049	(0.042)	0.265***	(0.101)	-6.711	(5.284)	0.93
[-19,1]	1.143***	(0.058)	-0.048	(0.038)	0.274***	(0.091)	-2.704	(1.855)	0.93
[-18,1]	1.144***	(0.058)	-0.056*	(0.033)	0.332***	(0.113)	-3.421*	(2.016)	0.93
[-17,1]	1.145***	(0.058)	-0.052	(0.034)	0.349***	(0.128)	-3.614	(2.241)	0.93
[-16,1]	1.144***	(0.058)	-0.059*	(0.034)	0.417**	(0.170)	-4.458*	(2.687)	0.93
[-15,1]	1.143***	(0.058)	-0.054	(0.035)	0.275**	(0.114)	-2.747	(2.247)	0.93
[-14,1]	1.142***	(0.058)	-0.053	(0.041)	0.132**	(0.066)	-1.002	(1.914)	0.93
[-13,1]	1.143***	(0.058)	-0.055	(0.047)	0.179*	(0.104)	-1.570	(2.382)	0.93
[-12,1]	1.142***	(0.058)	-0.079**	(0.037)	-0.002	(0.103)	0.632	(2.497)	0.93
[-11,1]	1.142***	(0.058)	-0.105***	(0.036)	0.034	(0.162)	0.188	(3.225)	0.93
[-10,1]	1.142***	(0.058)	-0.138***	(0.032)	-0.040	(0.216)	1.082	(3.858)	0.93
[-9,1]	1.141***	(0.059)	-0.158***	(0.040)	0.108	(0.210)	-0.743	(3.820)	0.93
[-8,1]	1.142***	(0.058)	-0.158***	(0.043)	0.041	(0.143)	0.092	(2.946)	0.93
[-7,1]	1.142***	(0.058)	-0.117***	(0.043)	0.059	(0.159)	-0.119	(3.108)	0.93
[-6,1]	1.141***	(0.058)	-0.144**	(0.061)	0.270	(0.203)	-2.722	(3.646)	0.93
[-5,1]	1.144***	(0.058)	-0.205***	(0.049)	-0.244	(0.263)	3.702	(4.008)	0.93
[-4,1]	1.142***	(0.058)	-0.234***	(0.049)	0.346*	(0.204)	-3.642	(3.759)	0.93
[-3,1]	1.144***	(0.058)	-0.228***	(0.045)	0.358*	(0.206)	0.151	(3.165)	0.93
[-2,1]	1.141***	(0.057)	-0.213***	(0.060)	0.352*	(0.205)	-5.841*	(3.067)	0.93
[-1,1]	1.141***	(0.057)	-0.205***	(0.040)	0.355*	(0.206)	-3.634	(2.503)	0.93

Note: This table reports results from estimating equation (5). Robust standard errors in parentheses. '***', '**' and '*' indicates significance level with two-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. Number of observation is 3116.

Table 11: Individual Bank Analysis- Baseline and Extended Models

	Model 1		Model 2				Model 3							R^2	# of Obs
	XU100	RR	XU100	RRBef	Day0Sig.	RRAft	XU100	RRBefInc	DayInc0	RRAftInc	RRBefDec	DayDec0	RRAftDec		
AKBNK	0.879***	-0.045	0.879***	-0.132	-0.053	0.397	0.878***	-0.425*	-0.631**	0.221	-0.217	-0.639	-0.606	0.42	5,218
	(0.044)	(0.222)	(0.044)	(0.263)	(0.398)	(0.527)	(0.044)	(0.323)	(0.310)	(0.445)	(0.399)	(0.761)	(1.039)		
ALBRK	0.664***	-0.083	0.664***	-0.116	0.179	-0.180	0.666***	-0.096	0.176	-0.494*	0.205	-0.180	-1.070***	0.37	1,007
	(0.042)	(0.163)	(0.042)	(0.159)	(0.364)	(0.350)	(0.042)	(0.175)	(0.428)	(0.358)	(0.383)	(0.709)	(0.309)		
ALNTF	0.882***	-0.098	0.882***	-0.136	-0.287	0.284	0.882***	-0.200	-0.021	-0.276	-0.020	0.957**	-1.679**	0.31	3,988
	(0.038)	(0.253)	(0.038)	(0.339)	(0.341)	(0.552)	(0.038)	(0.388)	(0.422)	(0.565)	(0.705)	(0.425)	(0.962)		
ASYAB	1.021***	-0.340**	1.021***	-0.302*	-0.331	-0.538*	1.021***	-0.426***	-0.328	-0.702**	-0.164	0.370	-0.090	0.48	1,293
	(0.047)	(0.198)	(0.047)	(0.215)	(0.405)	(0.344)	(0.047)	(0.102)	(0.503)	(0.404)	(0.903)	(0.307)	(0.170)		
DENIZ	0.700***	0.203	0.699***	0.191	0.981	-0.519	0.700***	-0.099	1.200	-1.009	-1.305*	-0.057	-1.400*	0.15	1,697
	(0.080)	(0.300)	(0.080)	(0.329)	(0.943)	(0.767)	(0.081)	(0.298)	(1.164)	(0.834)	(0.821)	(0.323)	(0.947)		
FINBN	0.814***	0.345**	0.815***	0.270	-0.109	1.177*	0.814***	0.079	-0.994*	-0.272	-0.477**	-0.856	-2.755**	0.35	5,315
	(0.030)	(0.173)	(0.030)	(0.214)	(0.523)	(0.766)	(0.030)	(0.330)	(0.607)	(0.379)	(0.284)	(0.749)	(1.370)		
FORTS	0.913***	0.356	0.913***	0.324	1.357*	-0.487	0.913***	0.413	2.206*	-1.057	-0.226	-0.415	-0.146	0.34	5,088
	(0.032)	(0.325)	(0.032)	(0.416)	(0.910)	(0.788)	(0.032)	(0.612)	(1.508)	(1.228)	(0.561)	(1.005)	(0.978)		
GARAN	1.039***	0.102	1.039***	0.307	0.611	-1.435**	1.038***	-0.311*	-0.437***	-1.158**	-1.046**	-1.866*	1.771	0.46	5,249
	(0.029)	(0.215)	(0.029)	(0.286)	(0.643)	(0.762)	(0.029)	(0.220)	(0.136)	(0.602)	(0.458)	(1.286)	(1.484)		
HALKB	1.294***	-0.209	1.293***	0.039	-0.769**	-0.888**	1.290***	0.098	-0.935***	-0.328	0.171	0.068	3.109***	0.67	1,043
	(0.034)	(0.189)	(0.034)	(0.194)	(0.335)	(0.514)	(0.035)	(0.197)	(0.338)	(0.350)	(0.555)	(0.950)	(1.152)		
ISCTR	1.031***	-0.205	1.031***	0.037	-0.921*	-0.696*	1.031***	-0.159	-0.698	-1.094**	-0.265	1.183	0.233	0.34	5,863
	(0.035)	(0.233)	(0.035)	(0.219)	(0.672)	(0.459)	(0.035)	(0.231)	(0.608)	(0.647)	(0.365)	(1.102)	(0.601)		
SKBNK	0.759***	0.418	0.759***	0.529	0.346	-0.068	0.756***	-0.103	-0.376	-0.850**	-2.381	-2.471**	-2.229**	0.22	3,538
	(0.050)	(0.554)	(0.050)	(0.618)	(0.506)	(0.620)	(0.050)	(0.150)	(0.314)	(0.482)	(2.033)	(1.113)	(1.099)		
TEBNK	0.900***	-0.433**	0.900***	-0.450**	-0.251	-0.529*	0.901***	-0.073	-0.530	-0.093	1.557***	-0.610	1.810***	0.34	2,839
	(0.045)	(0.224)	(0.045)	(0.272)	(0.541)	(0.382)	(0.045)	(0.254)	(0.628)	(0.360)	(0.338)	(0.972)	(0.687)		
TEKST	0.864***	-0.119	0.864***	-0.299	-0.208	0.869*	0.865***	0.098	0.305	0.091	1.019	1.142	-2.303**	0.25	4,490
	(0.042)	(0.277)	(0.042)	(0.417)	(0.634)	(0.587)	(0.042)	(0.327)	(0.559)	(0.410)	(0.959)	(1.647)	(1.261)		
TSKB	0.757***	0.404**	0.757***	0.295	1.141*	0.211	0.757***	0.325	1.304	-0.795*	-0.263	-0.962*	-1.309*	0.23	5,420
	(0.032)	(0.238)	(0.032)	(0.311)	(0.746)	(0.582)	(0.032)	(0.568)	(1.305)	(0.517)	(0.227)	(0.607)	(0.944)		
VAKBN	1.265***	-0.284**	1.266***	-0.230**	-0.820***	-0.019	1.265***	-0.289**	-0.990***	-0.000	0.010	0.152	0.111	0.71	1,413
	(0.025)	(0.137)	(0.025)	(0.130)	(0.308)	(0.267)	(0.025)	(0.157)	(0.349)	(0.249)	(0.130)	(0.261)	(0.868)		
YKBNK	1.117***	-0.144	1.117***	-0.163	-0.271	0.074	1.117***	-0.292**	-0.834**	0.069	0.023	-0.342	-0.079	0.44	5,476
	(0.031)	(0.198)	(0.031)	(0.175)	(0.641)	(0.452)	(0.031)	(0.138)	(0.486)	(0.539)	(0.331)	(1.202)	(0.760)		

Note: This table reports results from estimating equation (6) to (8). Heteroskedasticity and autocorrelation adjusted standard errors are in parentheses. '***', '**' and '*' indicates significance level with one-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. R-squares are equal at two digit level for all models, thus it is reported once.

Table 12: Panel Analysis - Extended Model

	(A1)	(A2)	(B1)	(B2)	(C1)	(C2)	(D1)	(D2)
	After Crisis		Large Bank		Participation Bank		Public Bank	
VARIABLES	Parameters	Joint Test	Parameters	Joint Test	Parameters	Joint Test	Parameters	Joint Test
XU100	0.918***		0.918***		0.918***		0.918***	
	(0.011)		(0.011)		(0.011)		(0.011)	
RRBefInc	0.048		0.040		-0.074		-0.085	
	(0.310)		(0.127)		(0.095)		(0.094)	
RRBefInc*D	-0.180	-0.132**	-0.323**	-0.283***	-0.178	-0.252**	-0.060	-0.145
	(0.316)		(0.160)		(0.145)		(0.173)	
RRDayInc	0.310		0.332		-0.129		-0.012	
	(0.690)		(0.298)		(0.217)		(0.215)	
RRDayInc*D	-0.556	-0.247**	-1.118***	-0.786***	0.083	-0.046	-1.105***	-1.117***
	(0.707)		(0.347)		(0.391)		(0.351)	
RRAftInc	-1.102**		-0.486***		-0.471***		-0.509***	
	(0.481)		(0.199)		(0.164)		(0.164)	
RRAftInc*D	0.802*	-0.300***	0.011	-0.476**	-0.115	-0.586**	0.279	-0.231
	(0.497)		(0.302)		(0.308)		(0.293)	
RRBefDec	-0.371**		-0.130		-0.246*		-0.247*	
	(0.200)		(0.239)		(0.159)		(0.160)	
RRBefDec*D	0.425*	0.054	-0.223	-0.354	0.273	0.027	0.298	0.051
	(0.293)		(0.301)		(0.527)		(0.276)	
RRDayDec	-0.338		-0.327		-0.391		-0.346	
	(0.419)		(0.360)		(0.317)		(0.317)	
RRDayDec*D	-0.083	-0.421	-0.080	-0.407	0.676*	0.285	-0.469	-0.815
	(0.539)		(0.621)		(0.511)		(0.577)	
RRAftDec	-0.614*		-1.392***		-0.493*		-0.625**	
	(0.463)		(0.445)		(0.358)		(0.350)	
RRAftDec*D	0.346	-0.268	1.892***	0.499	-0.260	-0.752	3.057***	2.432
	(0.637)		(0.665)		(0.639)		(1.158)	
R-squared	0.336		0.337		0.336		0.336	

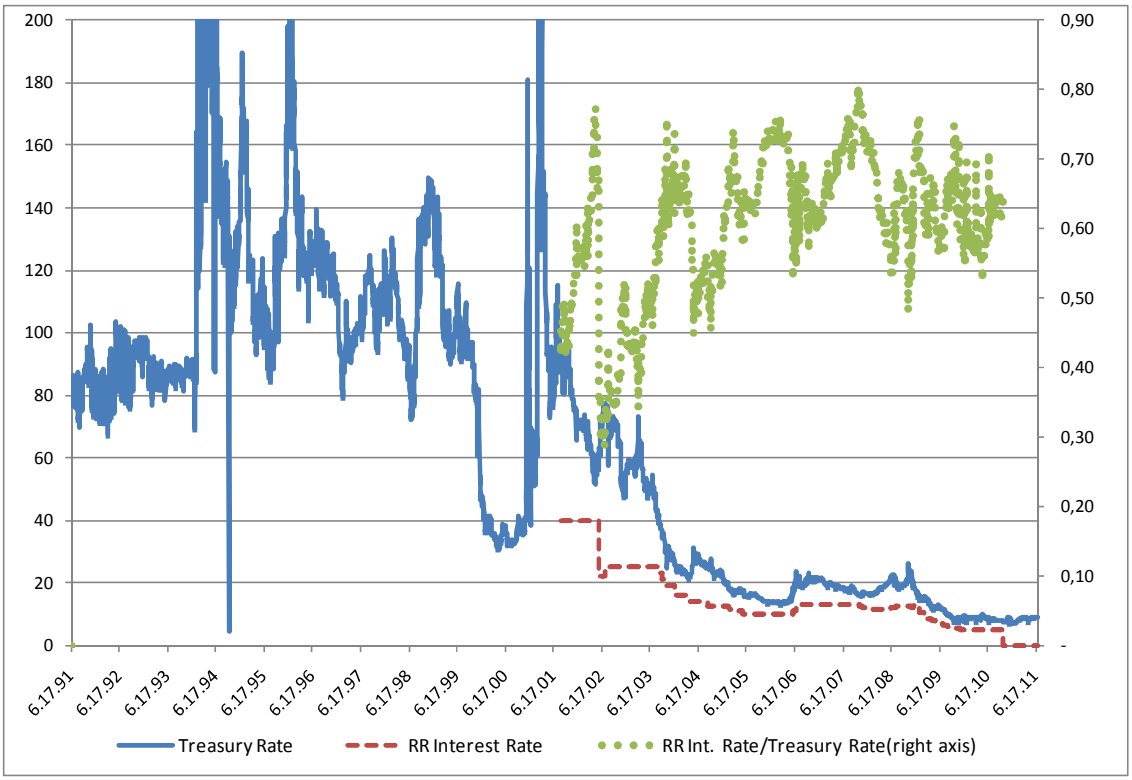
Note: This table reports results from estimating equation (9) to (12). Robust standard errors in parentheses. '***', '**' and '*' indicates significance level with one-sided test at p<0.01, <0.5 and p<0.10, respectively. Constant term is included but not reported. 'D' indicates the dummy variable used in each specification which are 'After Crisis', 'Large Banks', 'participation Banks' and 'Public Banks' as discussed in the text. Column under 'Joint Test' indicates test statistics for joint hypothesis of interaction term parameter plus the parameter of relevant variable. Number of observation is 58,937 for all specifications.

Appendix

Table A1: FX Required Reserve Interest Rates (%)

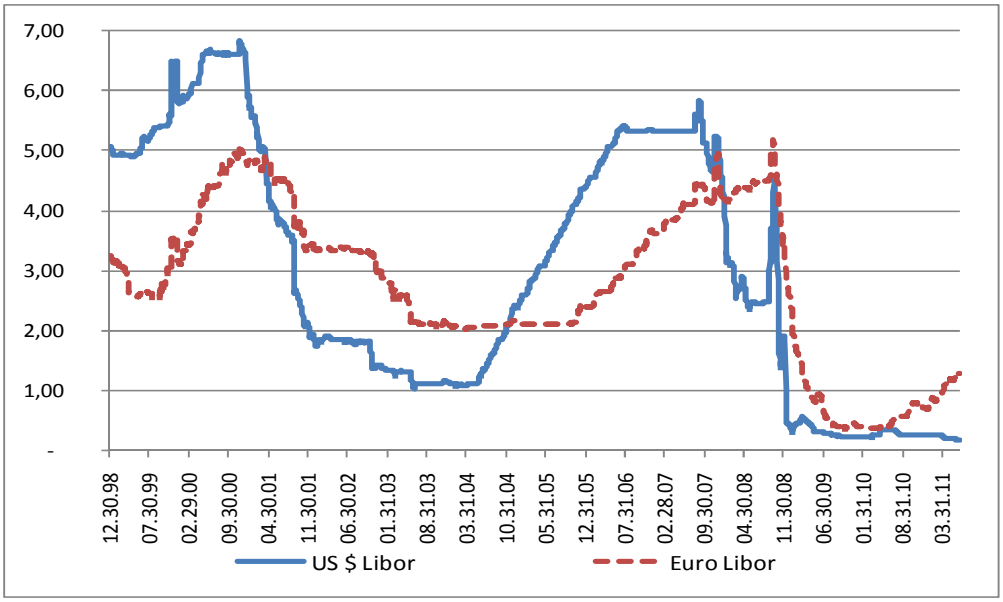
Date	US Dollar	German Mark	French Franc	Dutch Florin	Swiss Franc	Date	US Dollar	German Mark	French Franc	Dutch Florin	Swiss Franc
Sep-88	6.23	3.56	5.72	4.03	2.53	Nov-91	2.50	4.50	4.41	4.56	3.94
Oct-88	6.14	3.56	5.67	4.08	2.25	Dec-91	2.38	4.59	4.78	4.53	3.94
Nov-88	4.06	2.31	3.88	2.59	1.72	Jan-92	2.03	4.69	5.07	4.81	3.91
Dec-88	4.69	2.50	4.00	2.63	2.41	Feb-92	2.00	4.69	4.94	4.69	3.63
Jan-89	4.53	2.59	4.22	2.81	2.28	Mar-92	1.97	4.69	4.88	4.69	3.63
Feb-89	4.53	2.81	4.31	3.09	2.50	Apr-92	2.00	4.72	4.94	4.69	4.34
Mar-89	4.94	3.38	4.69	3.47	2.91	May-92	1.84	4.81	4.97	4.66	4.25
Apr-89	4.53	2.91	4.22	3.16	2.75	Jun-92	1.84	4.72	4.88	4.66	4.56
May-89	4.84	3.03	4.22	3.34	3.22	Jul-92	1.81	4.75	4.94	4.69	4.47
Jun-89	4.75	3.41	4.34	3.59	4.06	Aug-92	1.56	4.75	5.00	4.72	4.22
Jul-89	4.63	3.38	4.59	3.56	3.69	Sep-92	1.56	4.78	5.03	4.81	3.75
Aug-89	4.28	3.38	4.44	3.48	3.44	Oct-92	1.47	4.25	6.00	4.28	3.28
Sep-89	4.38	3.44	4.44	3.50	3.56	Nov-92	1.50	4.34	4.81	4.28	2.94
Oct-89	4.47	3.72	4.69	3.78	3.75	Dec-92	1.94	4.38	4.75	4.38	3.00
Nov-89	4.25	3.94	5.06	4.06	3.78	Jan-93	1.56	4.34	5.00	4.20	2.88
Dec-89	4.28	3.97	5.19	4.16	3.78	Feb-93	1.44	4.22	6.13	4.13	2.63
Jan-90	4.16	4.03	5.53	4.28	4.50	Mar-93	1.41	4.22	5.75	4.03	2.69
Feb-90	4.06	3.91	5.28	4.28	4.75	Apr-93	1.47	4.03	5.06	3.78	2.50
Mar-90	4.09	4.03	5.13	4.34	4.47	May-93	1.44	3.75	4.00	3.72	2.50
Apr-90	4.13	3.84	5.03	4.09	4.56	Jun-93	1.47	3.78	3.88	3.47	2.47
May-90	4.19	3.94	4.75	4.13	4.56	Jul-93	1.47	3.81	3.59	3.28	2.44
Jun-90	4.03	3.92	4.81	3.97	4.31	Aug-93	1.47	3.41	4.69	3.22	2.22
Jul-90	4.09	3.97	4.94	3.97	4.41	Sep-93	1.47	3.25	3.50	3.22	2.28
Aug-90	3.94	3.97	4.81	4.03	4.38	Oct-93	1.47	3.34	3.47	3.16	2.25
Sep-90	3.97	4.02	4.91	4.09	4.09	Nov-93	1.47	3.13	3.34	3.00	2.19
Oct-90	4.06	4.09	4.91	4.09	3.88	Dec-93	1.66	3.06	3.31	2.84	2.25
Nov-90	3.88	4.06	4.88	4.03	3.94	Jan-94	1.50	3.03	3.22	2.81	2.09
Dec-90	4.38	4.50	4.88	4.34	4.41	Feb-94	1.44	2.94	3.13	2.59	1.94
Jan-91	4.50	4.69	4.66	4.94	4.41	Mar-94	1.66	2.97	3.03	2.66	2.00
Feb-91	3.34	4.31	4.88	4.41	3.96	Apr-94	1.72	2.75	3.00	2.66	1.97
Mar-91	3.41	4.44	4.59	4.44	4.03	May-94	1.84	2.63	2.84	2.59	1.84
Apr-91	3.09	4.00	4.59	4.53	4.25	Jun-94	2.06	2.50	2.69	2.47	1.88
May-91	2.94	4.38	4.53	4.44	4.16	Jul-94	2.13	2.38	2.63	2.41	1.88
Jun-91	2.88	4.34	4.56	4.44	3.94	Aug-94	2.13	2.41	2.63	2.34	2.06
Jul-91	2.94	4.38	4.81	4.50	3.91	Sep-94	1.37	1.41	1.58	1.43	1.20
Aug-91	2.84	4.41	4.66	4.44	3.81	Oct-94	1.43	1.39	1.58	1.46	1.09
Sep-91	2.75	4.44	4.56	4.53	3.94	Nov-94	0.95	0.94	1.05	0.96	0.70
Oct-91	2.63	4.47	4.56	4.53	3.97						

Figure A1: TL Required Reserve (RR) Interest Rates, Benchmark Treasury Rates, and Their Proportion



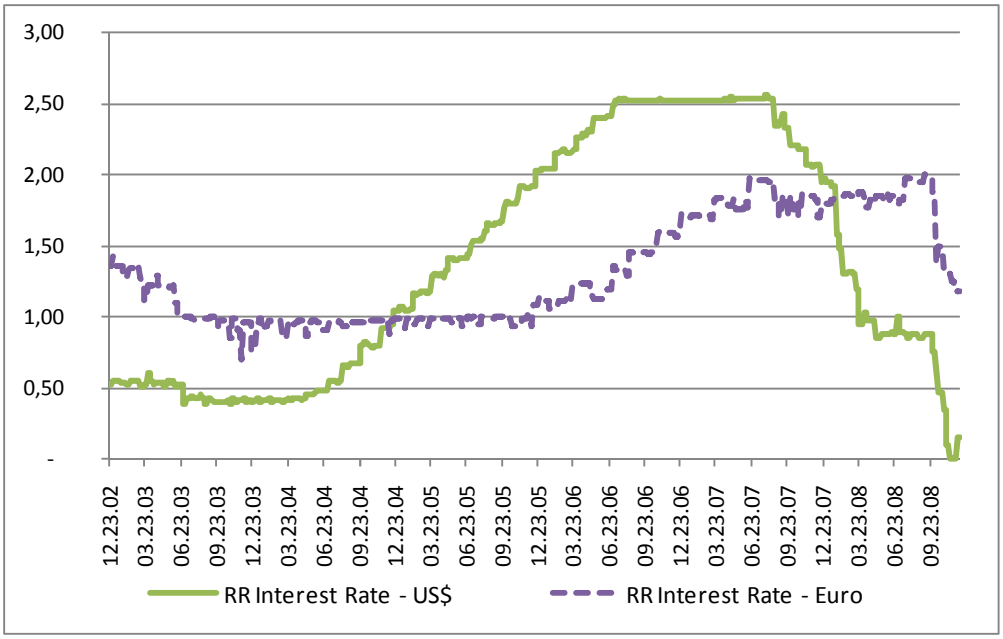
Sources: CBT and Istanbul Stock Exchange.
Notes: Treasury rate is the benchmark Turkish Treasury bill or government bond rate which is the compounded rate of the security with highest volume on any day.

Figure A2: US$ Libor and Euro Libor



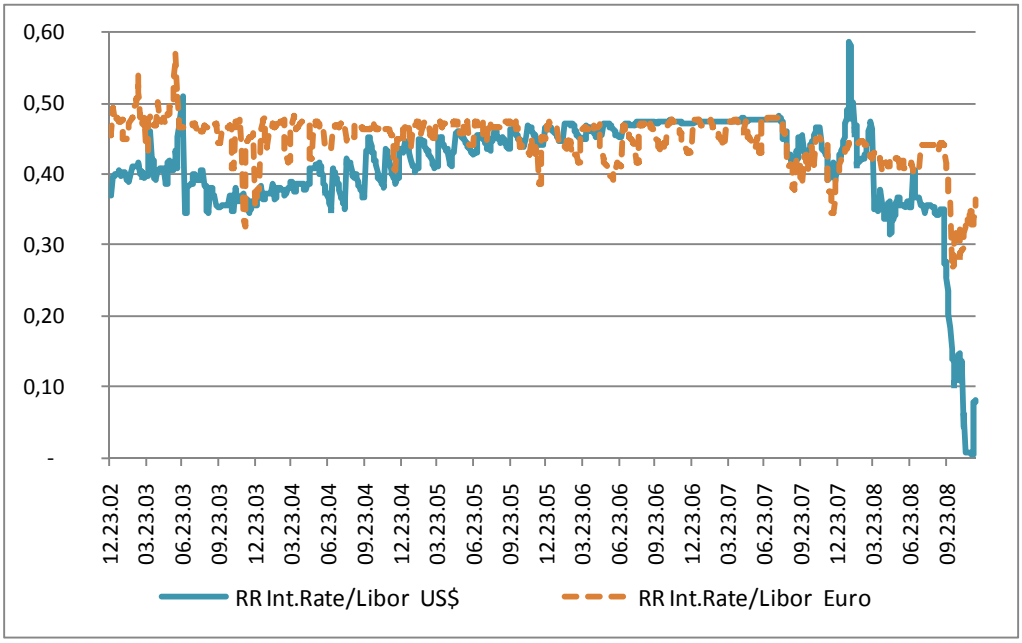
Sources: CBT and Bloomberg
Notes: US$ and Euro Libor rates are one-month rates.

Figure A3: FX Required Reserve (RR) Interest Rates



Source: CBT

Figure A4: proportion of FX Required Reserve (RR) Interest Rate and Libor



Sources: CBT and Bloomberg
Notes: US$ and Euro Libor rates are one-month rates.