IV. Special Topics

V.1 FX Short Positions of Corporate Sector Firms

Summary

The excessive volatility in exchange rates observed in recent periods has raised a question about the risks of FX short positions of firms. This study offers an examination of these risks based on different data sets. Data suggest that the share of firms with FX debt in the total number of firms has decreased in recent years and the total FX borrowing has increasingly concentrated in large firms. Meanwhile, on the part of firms that borrow predominantly in FX and have low or no export revenue, there has been little inclination to hold FX assets to hedge against the exchange rate risk. Firms with a high FX short position have low import ratios and their FX debt is largely of a long term nature. This is believed to constrain the short-term effects of exchange rate volatilities on firms. In addition, firms have been categorized in groups based on the ratio of the short-term FX short position to total short-term liabilities with a view to identifying the extent of the short-term effects of exchange rate volatilities on firms. According to this categorization, the number of firms whose cash flows may significantly change due to exchange rate movements corresponds to 7 percent of total firms and these firms are relatively smaller-sized firms. In other words, the liquidity positions of large firms with a high FX short position are subject to a moderate level of sensitivity to exchange rate volatility.

IV.1.1 Introduction

Excessive volatility in exchange rates observed in recent periods have raised a question about the risks of FX short positions of firms for the corporate sector and indirectly for the banking sector. In this study, the exchange rate risk that firms in Turkey bear is analyzed with two different data sets (BAT-Risk Center data, FX positions of firms in the scope of CBRT Sectoral Balance Sheets). In this framework, the study includes views on issues such as FX loan use and FX short positions of firms and the capability of firms to cover exchange rate risk-based losses.

Findings suggest that 95 percent of a total of approximately 550 thousand firms included in the analyses do not have any FX debt. Moreover, a large portion of total FX loans are used by large firms that are considerably small in number and these loans are mainly long-term loans. On the other hand, approximately 4500 firms, whose financial information is obtained based on a breakdown by currency unit in the scope of CBRT Sectoral Balance Sheets, have been categorized and analyzed according to the ratio of net FX positions to net sales.

Finally, firms have been categorized in 4 groups according to their short-term FX short positions to total short-term liabilities to assess the sensitivity of firms' liquidity position to the exchange rate. The analyses reveal that the number of firms whose cash flows may significantly change due to exchange rate movements corresponds to 7 percent of total firms in the sample.

IV.1.2 FX Loan Debt of Corporate Sector Firms

Data compiled by the BAT-Risk Center present almost all loans extended by the domestic banking system in a breakdown of firms, currency units and maturities. Firms' borrowings from abroad are also included in this data set as these loans are intermediated by domestic banking system. The sum of all FX loans of firms in the data set is very close to the amount of firm FX loans calculated from banks' balance sheets.[5,6]

The Risk Center data cover almost all the FX loans on a firm basis but the Center's database do not include any data regarding the financial structure of firms. The database includes information on loan's area of use only. For this reason, deriving from these data, it is not possible to identify the FX short positions of firms and to what extent they have a natural hedge. Hence, statistics produced from this database offer general information about FX indebtedness. Statistics produced from the database of the Risk Center that cover credit information of approximately 550 thousand firms as of end-2014 are summarized below.

5 However, because data regarding loans in which the total credit utilization and/or amount of credit limit remains below a specified level are consolidated and then reported, a firm-based breakdown of low-amount credit utilization is not available. Therefore, the total of firm-based TL loans in the data set is below the total TL credit volume of Turkey's banking system.

6 FX loan figures analyzed in this study consist of loans extended in FX and FX-indexed loans extended in TL.

Taking all the firms in the database, the share of the number of firms having FX debt in the total number of firms has been on the decline and stands at around 5 percent according to the latest data (Chart IV.1.1). Considering that the data set covers a large number of micro firms, this ratio has been calculated as approximately 14 percent for only 192 thousand firms having a total debt of more than TL 50 thousand.

To get a breakdown in terms of firm size, firms have been categorized into 5 groups according to their total credit balances with the assumption that this can be an indicator of firm size. In this categorization, limit values for total indebtedness have been determined as TL 1 million, TL 10 million, TL 50 million and TL 150 million for each group, respectively. In the scope of the analysis, the following variables have been produced for these groups:

1. The share of FX indebted firms,

2. The share of total FX loans of the group in total FX loans,

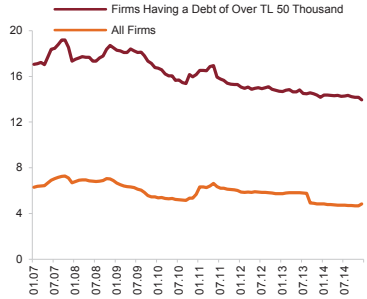
3. Debt dollarization ratios of firms using FX loans,

4. The ratio of long-term FX loans to the total credit balance.

Moreover, to get an insight into the change in variables in time, the same statistics have also been calculated for end-2010 in addition to end-2014.

The first indicator used in the analysis identifies how common the FX credit utilization is on the basis of firm size, whereas the second indicator identifies the quantitative distribution of total FX loans extended by the banking system (including loans directly obtained by firms from abroad) according to firm size groups (where total indebtedness used as a proxy for firm size). Debt dollarization ratios have been calculated as an indicator for the sensitivity of firms' balance sheets to exchange rate risk,[7] under the assumption that firms' credit accounts for a sizable portion of firms' total liabilities. Finally, the data regarding the maturity structure of loans has been produced to understand how long it takes firms to feel the effects of exchange rate movements.

Chart IV.1.1
The Ratio of Firms with FX Debt According to BAT- Risk Center Data (Percent)



Source: BAT – Risk Center, (Latest Data: 12.14)

7 According to 2013 balance sheet data of firms included in the scope of the CBRT Sectoral Balance Sheets study, the ratio of total liabilities to total assets is approximately 70 percent.

Table IV.1.1
The Number of Firms Having FX Debt and Their Debt Dollarization Ratios According to the Total Indebtedness Level (Percent)

Total Indebtedness Level	(1) The Number of Firms in the Group/ Total Number of Firms	(2) The Number of Firms Using FX Loans / The Number of Firms in the Group	(3) FX Debt of Firms in the Group / Total FX Debt	(4) Debt Dollarization Ratio of Firms Using FX Loans	(5) Long-Term Share of FX Debt
			2010		
Below 1 Million	90.9	5.0	1.6	67.8	49.1
1-10 Million	7.8	45.4	11.4	63.1	53.9
10-50 Million	1.0	84.7	21.1	78.5	68.6
50-150 Million	0.2	92.1	21.1	84.5	78.8
Above 150 Million	0.1	96.4	44.8	84.2	82.0
			2014		
Below 1 Million	84.2	3.8	0.6	71.5	55.0
1-10 Million	13.4	28.3	6.8	62.4	49.4
10-50 Million	1.9	71.9	16.7	73.0	63.7
50-150 Million	0.4	89.5	17.9	81.8	75.6
Above 150 Million	0.2	94.9	57.9	86.2	82.5

On the basis of the grouping according to firms' total loan debt, firms with a higher amount of total loans are significantly more inclined to use FX loans (Table IV.1.1, Column 2). Accordingly, a large portion of the total FX loans is used by large firms that are considerably small in number relative to the size of the sample and this share is significantly higher compared to 2010 (3). On the other side, debt dollarization ratios reveal that firms with FX credit tend to have more than half of their total credit in FX. This tendency seems to be strengthen as the firm size grows (4).

An analysis of the maturity structure of FX and total loans as of 2014 (5) reveals that FX loans of large firms that have the largest share in total FX loans are mainly long-term loans. For the firms with a total loan debt of less than TL 10 million, nearly half of FX debt is composed of short-term loans. In general, the prevalence of longer-terms in FX loans is a favorable development as it means that the depreciations in the TL will have limited effects in the short run.

IV.1.3 Firms According to FX Revenues

The extent of the effect of the depreciation in TL on firms varies depending mainly on the level of the natural hedge they have. The Risk Center data analyzed in the previous section do not provide information about to what extent firms have a natural hedge against exchange rate risk. Hülagü and Yalçın (2014) assessed the exchange rate riskiness of firms based on the FX-denominated debt/exports ratio of approximately 9

thousand firms by consolidating the Sectoral Balance Sheets and the Risk Center data. In this section of the study, FX assets and liabilities of firms were studied and the extent of the exchange rate risk that these firms bear was analyzed by using a sample of the same data set composed of around 4500 firms.

In Hülagü and Yalçın's (2014) study, FX-denominated loans in the Risk Center was used as a proxy for total FX liabilities. As FX assets of firms were not reported by all the firms in the sample, firms' export revenues were assumed to be the only means of hedging against FX liabilities. Their study suggests that debt dollarization ratios of particularly the small and medium sized firms have dropped over time. Firms with high FX debt that do not have any export revenue operate predominantly in sectors such as manufacturing, energy, construction and tourism and the FX debt of these firms is largely composed of long-term loans. Moreover, with a medium-term perspective, these firms have registered a high rate of foreign exchange profit in times of strong TL and these profits have significantly offset the foreign exchange losses in times of depreciations in the TL. On the other hand, the fact that some firms operating especially in sectors such as energy, construction and tourism price their sales in FX in the domestic market is believed to constrain the exchange rate riskiness of those firms.[8]

Table IV.1.2
Main Balance Sheet Indicators Based on the Ratio of Firms' Net FX Position to Net Sales
(2010, 2013)

Risk Level* Net FX / Net Sales	(1) Number of Firms	(2) Exports / Gross Sales	(3) Imports / Gross Sales	(4) Net Exports / Net Sales	(5) Debt / Equity	(6) Debt Dollarization	(7) FX Long-Term Share	(8) Current Ratio	(9) Return on Assets (RoA)
2010									
>0.01	552	0.22	0.11	0.11	1.91	0.41	0.40	7.04	0.08
[-0.39,0.01)	3198	0.09	0.06	0.03	4.62	0.30	0.54	2.34	0.06
[-1.47,-0.39)	258	0.14	0.16	-0.03	8.71	0.85	0.75	2.12	0.01
<-1.47	249	0.06	0.06	0.00	10.63	0.89	0.91	2.03	-0.01
2013									
>0.01	447	0.24	0.17	0.07	1.72	0.52	0.50	4.37	0.11
[-0.39,0.01)	3612	0.06	0.07	-0.01	5.93	0.24	0.65	1.92	0.05
[-1.47,-0.39)	199	0.19	0.18	0.01	6.94	0.82	0.62	1.87	-0.01
<-1.47	251	0.03	0.04	-0.02	9.43	0.94	0.91	1.36	-0.04

*Moving down the Table, the exchange rate risk level increases.

8 As an addition, firms' FX data are also compiled in the scope of the Sectoral Balance Sheets study. However, every firm's FX data is not accessible at a reliable level. In this respect, the consistency of firms' FX data has been cross-checked with balance sheet and income statement data. In the study, information belonging to 4510 firms having a reliable level of data according to the cross-check was used.

Table IV.1.3
Breakdown of Firms with a High Exchange Rate Risk by Sectors

Sector	Number	Percent	Number	Percent
	2010		2013	
Agriculture	2	0.8	2	0.8
Mining	0	0	2	0.8
Manufacturing	26	10.44	17	6.77
Energy	44	17.67	67	26.69
Water Supply	0	0	1	0.4
Construction	51	20.48	41	16.33
Trade	21	8.43	10	3.98
Transportation	15	6.02	11	4.38
Tourism	35	14.06	53	21.12
Informatics	6	2.41	1	0.4
Holding companies	19	7.63	15	5.98
Real Estate	12	4.82	15	5.98
Professional Activity	2	0.8	3	1.2
Administrative Support	13	5.22	7	2.79
Health	1	0.4	5	1.99
Other	0	0	1	0.4
Total	249		251	

Different from the study of Hülagü and Yalçın (2014), this study employs detailed information regarding the FX positions of firms included in the Sectoral Balance Sheets since 2006. The ratio of firms' net FX positions to net sales was used as a criterion of exchange rate riskiness and accordingly firms are divided into percentiles.[9]

According to the findings of the study, exports/ total sales ratios of firms drop (2 and 4) as the net FX short position increases (i.e. as you move down the Table IV.1.2). This observation is consistent with the finding of Hülagü and Yalçın (2014) which shows that a significant number of highly FX indebted firms have no export revenues. As new information, figures imply that firms with no or limited export revenues which have mainly FX debt have showed little inclination to hold FX assets. Also, firms with a high FX short position have low import ratios (3). Moreover, the weighted average debt dollarization ratio of firms, which are in the upper 5th percentile according to their ratios of net FX short positions to net sales, is very high (6). This ratio has climbed from 89 percent to 94 percent in the last 3-year period. Although these firms' debt / equity ratios are high (5), the maturities of loans are longer compared to the average maturity (7). Yet, their liquidity indicators (current ratio, (8)) are less favorable relative to other firms. Imports of the firms in the same percentile are at a modest level, which may be deemed a positive factor in terms of the exchange rate risk. Lastly, profitability ratios of firms bearing high exchange rate risk are also at relatively low levels.

Consistent with the study of Hülagü and Yalçın (2014), 251 firms standing in the upper 5th percentile in terms of net FX short positions, operate in sectors such as energy, tourism and construction (Table IV.1.3).

IV.1.4 The FX Short Position and the Liquidity of Firms

The depreciation of TL create adverse effects in the balance sheets of firms with FX short positions. For instance, in

9 Table 2 shows firms in percentiles of 1 percent, 5 percent, 10-90 percent and 95 percent.

such firms, the equity capital amount will decrease and the ratio of financial expenses to profit will significantly increase following the negative exchange rate shock. These negative changes in balance sheets may occur regardless of the maturity of FX liabilities or even whether the firm with FX debt has FX revenues. Even if the firm has long-term FX debt and is able to cover this debt with export revenues in a few years, the depreciation in TL may negatively affect the balance sheet outlook. On the other hand, the maturity of FX loans is important in terms of the short-term effects of the depreciation in TL. In cases where the FX debt is composed of adequately long term loans, even if the firm's equity turns into negative and/or the profit before financial expenses drops below financial expenses in the short run, this may not have any reflections on firms' cash flows in the short term. Therefore, unless the firm faces a liquidity problem in the short term, it might have enough time to absorb the adverse effects of depreciation (such as adjusting its prices). In cases where FX liabilities are of a short term nature, even if the firm's equity and profitability are strong, it may have difficulties due to the rise in short-term cash outflows triggered by the depreciation in TL.

In this context, to better understand the implications of exchange rate movemnets on firms' liquidity position, we analyzed firms' short-term net FX liquidity position and the relative importance of this in firms' total liquidity position. Since the analysis focuses only on exchange rate-related risks, it is centered upon the extent of the impact of exchange rate movements on firms' liquidity instead of the over all liquidity risk that firms bear.

Accordingly, a criterion has been devised to show the sensitivity of firms' liquidity position to the exchange rate. Firms have been categorized into 4 groups based on the ratio of short-term FX short position to short-term total liabilities. In this categorization, firms having no short-term net FX position or having FX long position are included in the first group, whereas other three groups are composed of firms in which the ratio of net FX position to short-term loans is higher than zero percent

and lower than 25 percent, between 25 percent and 50 percent, and higher than 50 percent, respectively.[10]

Table IV.1.4
Riskiness of Firms Based on Short-Term FX Position
(Median Value, 2013)

Net Short-Term FX Pos. / Short-Term Loans	(1) The Number of Firms in the Group/ Total Number of Firms	(2) Net Volume of Sales (Million TL)	(3) Current Ratio	(4) Short-Term Debt / Net Sales (Percent)	(5) Profit/Net Sales (Percent)
<0	84.3	14.5	1.3	45.0	1.4
(0, 0.25]	8.8	26.0	1.2	54.8	1.5
(0.25, 0.50]	3.5	32.8	1.1	58.3	0.5
>0.50	3.4	20.8	1.0	84.9	-0.8

Figures in Table IV.1.4 indicate that approximately 84 percent of the firms in the sample will not be negatively affected by a sudden depreciation in TL in the short run, whereas nearly 9 percent will be influenced moderately (1). The number of firms whose cash flows may significantly change depending on exchange rate movements corresponds to 7 percent of the number of total firms. Excluding the last group, there is a correlation between the susceptibility to exchange rate risk and the firm size in (2), whereas the riskiest group is composed of relatively smaller firms. These firms are also in a disadvantageous position in terms of other liquidity indicators (4,5).

Previous analyses show that FX loans are concentrated rather in large firms. However, in terms of short term cash flows, relatively smaller firms are found to be more vulnerable to a depreciation of TL. This finding is consistent with the previous analysis utilizing Risk Center data, which implies that a greater share of larger firms' FX loans are in long-term.

10 It is possible to materialize what these ratios mean for firms' liquidity with an example. In case of a 20 percent depreciation in TL, short-term lliabilities of a firm whose short term net FX position to total short-term liabilities ratio is 25 percent (in other words, cash outflows expected in the short run) will increase by 5 percent.

IV.2. The 2008-2009 Global Financial Crisis and the Credit Channel

Summary

During the 2008-2009 global financial crisis, capital inflows to emerging market economies considerably weakened and accordingly there were significant fluctuations in the real economic activity and financial aggregates. Also named "sudden stop" in the literature, this development was analyzed in a number of studies by using macro data. However, as far as it is known, the number of studies analyzing the sudden stop at a micro level by using bank-firm data is limited. This study presents an analysis of the impact of the sudden stop on the credit channel in Turkey via detailed micro data from banks-firms. Empirical findings suggest that banks which had concentrated mainly on external funding before the crisis and specifically have a high amount of external debt, cut their loan supply more. Moreover, banks with a high level of loan portfolio exchange rate risk and banks with a high liquidity ratio also curbed their loans more. As for banks having a high capital adequacy ratio, the decline in the loans they extended was smaller as they were stronger when the 2008-2009 global crisishit. The study also shows that the decline in the loan level was related to firms' balance sheets as well. For instance, the contraction in the loan market had a bigger effect on small and highly indebted firms. The effect of this contraction shock in loan supply was smaller for firms concentrating on exports or having a high amount of fixed assets.

IV.2.1 Introduction

During the 2008-2009 global financial crisis, capital inflows that are very important for emerging market economies decelerated and there were even capital outflows from these economies. Also named "sudden stop" in the literature of emerging market economies, this development was analyzed in a number of studies (Mendoza, 2006; Korinek and Mendoza, 2014). Sudden stops usually start with a strong reverse movement in capital inflows to emerging market economies and continue with severe capital outflows from these economies. In addition, external borrowing conditions get harder under

these circumstances and emerging market economies cannot obtain external funding. This leads to stagnation and fragility in a country's economy. Mendoza and Terrones (2012) claim that this situation increases the fragility of particularly the banking sector in emerging market economies.

The 2008-2009 global financial crisis can also be referred to as the banking crisis because the banking sector experienced great difficulties in that period. Contractions in the banking sector caused loan supply to be largely curbed. This also affected the real economy to a great extent, leading to problems in the access of firms to loans and urging firms to delay their planned investment decisions.

This case called the "credit channel" in the literature may vary according to bank types and firm types. Firms with limited access to financial markets are more sensitive to these shocks due to information asymmetry (Mishkin, 1995; Bernanke and Gertler, 1995). Economic impacts of the credit channel vary depending on firm types (Gertler and Gilchrist, 1994; Kashyap et al., 1994) and bank types (Kashyap and Stein, 2000). Khwaja and Mian (2008) find that there is a higher decline in the loans of small firms in the face of negative shocks. Iyer et al. (2014) show that small banks reduce their loan supply more in times of crisis.

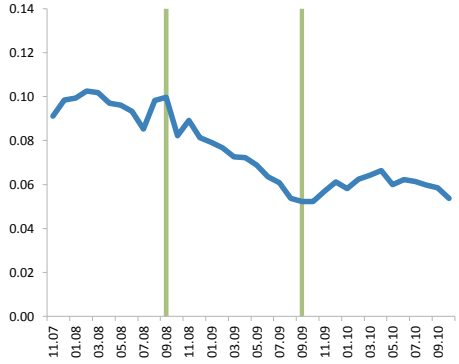
The 2008-2009 global financial crisis can be seen as an external negative sudden stop shock for Turkey. In that period, there was a sharp decline in commercial loan growth (Chart IV.2.1). Moreover, banks' external loans also dropped rapidly (Chart IV.2.2).

This box presents an analysis of the effects of this external negative sudden stop shock on the loan supply via firms'-banks' loan growth data at the micro level and in a transaction basis. In particular, reactions of the banks, which had a high amount of external loans before the crisis, to external shocks have been analyzed. The hypothesis of the study was that banks had difficulty in accessing external financing during the global crisis and consequently their loan supply decreased. The result of the study confirm the hypothesis.

Chart IV.2.1
Commercial Loan Growth

Source: CBRT

Chart IV.2.2
External Loans / Total Assets Ratio



Source: CBRT

IV.2.2 Data and Methodology

Three different data sets were used in the study. These are data from the Banks Association of Turkey - Risk Center that include loan information at the firm-bank level, the CBRT data that cover many different variables such as banks' balance sheets and income statements and lastly the CBRT sectoral balance sheet data composed of detailed balance sheets and income statements of approximately 10 thousand firms. Loan information belonging to firms-banks was matched with sectoral balance sheets and bank data. The data set consists of a total of 48 thousand firm-bank observations, 40 banks and approximately 9 thousand firms. Loans extended to these firms constitute approximately 60 percent of total loans. In this respect, the representativeness of the sample is very high. Table IV.2.1 shows descriptive statistics.

Table IV.2.1
Descriptive Statistics

	Number of Observations	Average	Minimum	Median	Maximum	St. Deviation
Loan Growth	47302	-0.33	-13.23	-0.15	7.50	1.79
The Ratio of Loans That the Firm Obtains from the Related Bank to Its Total Loans	46159	0.32	0.00	0.19	1.00	0.32
Ratio of the Bank's External Loans	40	0.14	0.00	0.12	0.53	0.13
Loan Portfolio Exchange Rate Risk of the Bank	40	0.40	0.03	0.41	0.98	0.24
Capital Adequacy Ratio of the Bank	40	0.31	0.12	0.17	0.98	0.26
Total Assets of the Bank (log)	40	15.09	11.83	15.31	18.28	2.00
Liquidity Ratio of the Bank	40	0.19	0.05	0.11	0.62	0.17
Non-Performing Loan Ratio of the Bank	40	0.02	0.00	0.02	0.07	0.02
Return on Assets Ratio of the Bank	40	0.02	-0.02	0.02	0.05	0.01
Total Assets of the Firm (log)	9218	9.64	6.37	9.58	13.66	1.41
Number of Employees in the Firm (log)	8902	4.22	0.00	4.19	7.70	1.43
Ratio of the Firm's Total Loans to Total Assets	9218	0.65	0.07	0.67	1.26	0.24
Ratio of the Firm's Fixed Assets to Total Assets	9218	0.26	0.00	0.21	0.91	0.23
Exports/Sales Ratio of the Firm	9093	0.15	0.00	0.00	0.99	0.27

This data set also includes information on the number of banks that the firm works with and the amount of loans extended to the firm by each one of these banks. This comprehensive data set makes it possible to analyze the effects of the negative external shock on loan supply through a decomposition of supply and demand effects. For example, using this data set, we can identify for the same firm how change in credit supply differs across different types of banks, e.g. banks with a high ex-ante exposure to sudden stop may be willing to cut back lending more. The sharp fall in loan growth in the period between September 2008 and September 2009 points to the sudden stop in September 2008. In this framework, the data set, which was initially a panel data set, was converted to a cross-section data set for the pre-crisis period and the crisis period to

solve the potential endogeneity problems between firm growth and loan demand. In other words, the analysis of firm-bank loan growth between September 2008 and September 2009 was based on bank information belonging to the September 2008 period and firm information belonging to 2008.

In the study, the following model was used to analyze the effects of the negative sudden stop shock on firms' loan growth.

$$KB_{ib} = \beta_0 + \beta_1 BYDBO_b + \beta_2 W_b + \beta_3 BYDBO_b * X_i + \beta_4 LS_{ib} + \alpha_i + \varepsilon_{ib},$$

Here, KB_{ib} shows the loan growth of the firm i in the bank b between September 2008 and September 2009, $BYDBO_b$ shows the ratio of bank b's external loans in the September 2008 period to its total assets, W_b shows the bank-specific variables of the bank b in September 2008, X_i shows the firm-specific variables of the firm i in September 2008, LS_{ib} shows the ratio of the loans that the firm i obtained from the bank b to the firm's total loans, α_i shows the fixed effect variable of the firm i and ε_{ib} shows the residual term.

The loan portfolio exchange rate risk, the capital adequacy ratio, total assets, the liquidity ratio, the non-performing loan ratio and the return on assets ratio were used as bank-specific variables.

The loan portfolio exchange rate risk varies depending on (i) the amount of FX revenues of the firms to which banks extended FX loans (measured as the weight of exports in firms' total sales), and (ii) the share of FX loans in banks' total loans. For instance, for bank b, the loan portfolio exchange rate risk was calculated using the following formula:

$$\text{Loan Portfolio Exchange Rate Risk}_b = \left\{\left(1 - \frac{Exports}{Sales}_i\right) x\ FX\ Loan_{ib} \Big/ \sum_i FX\ Loan_{ib}\right\}\ x\ \left\{\sum_i FX\ Loan_{ib} \Big/ \sum_i Loan_{ib}\right\}$$

Total assets, the total number of employees, the ratio of total loans to total assets, the ratio of fixed assets to total assets and the Exports/Sales ratio were used for firm-specific variables.

IV.2.3 Results

Table IV.2.2 displays three different estimation results. The first model covers all firm-bank loans, whereas the second model addresses firms which have a loan relationship with at least two banks. In the third model, on the other hand, variables specific to other banks were also added as control variables. The constant term and the firm fixed effect variables were included in all regressions. As seen in the results, banks with a high level of external loans before the crisis curbed their loans more. The estimated coefficient was statistically significant at 1 percent level. Here, as the demand side was controlled with firm fixed effects, it was possible to decompose the supply-side effect of the sudden stop.

Table IV.2.2
Loan Growth and Bank-Specific Variables

	Loan Growth		
	1	2	3
Bank's External Loan Ratio	-1.077***	-1.077***	-0.786***
	(0.110)	(0.102)	(0.129)
Loan Portfolio Exchange Rate Risk			-0.463***
			(0.072)
Capital Adequacy Ratio			0.577***
			(0.219)
Total assets			0.025***
			(0.009)
Liquidity Ratio			-0.682***
			(0.166)
Non-Performing Loan Ratio			0.131***
			(0.010)
Return on Assets Ratio			-0.071***
			(0.019)
The Ratio of Loans That the Firm Obtains from the Related Bank to Its Total Loans			-0.936***
			(0.030)
Constant Term	-0.070***	-0.074***	-0.294**
	(0.013)	(0.013)	(0.144)
Number of Observations	46,734	40,619	39,873
The Number of Banks That the Firm Works with >1	No	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes
Adjusted R^2	0.13	0.10	0.14

Note: ***, **, * refer to levels of significance of 1%, 5% and 10%, respectively. Standard errors have been grouped at a bank level (cluster).

The unfavorable and significant effect of banks' external loans on firms' loan growth did not change even when the bank-specific control variables were added. The effect of banks' loan portfolio exchange rate risk on loan growth was negative and statistically significant at 1 percent level. Banks with a high level of loan portfolio exchange rate risk cut their loan supply more to avoid further exposure to exchange rate risk. Larger banks, banks having a higher capital adequacy ratio or a high non-performing loan (NPL) ratio during the pre-crisis period reduced their loan supply only moderately in the sudden stop period. Larger banks and banks having a higher capital adequacy ratio issue more loans. Banks with a high NPL ratio had to extend more loans to collect their loans. Banks having a high liquidity ratio and a return on assets ratio tightened their loan supply

more. This development may imply that banks having a higher amount of liquidity preferred to hold a higher amount of liquid assets in their portfolios during the crisis period.

Table IV.2.3
Loan Growth and Firm-Specific Variables

	1	2	3	4	5
Bank's External Loan Ratio (BELR)	-5.336***	-2.154***	-0.678***	-1.095***	-0.811***
	(0.907)	(0.481)	(0.161)	(0.224)	(0.175)
Total Assets of the Firm x BELR	0.459***				
	(0.087)				
The Number of Employees in the Firm x BELR		0.339***			
		(0.099)			
Ratio of Total Loans to Total Assets x BELR			-0.088**		
			(0.042)		
Ratio of Fixed Assets to Total Assets x BELR				1.609***	
				(0.568)	
Exports/Sales Ratio x BELR					1.230**
					(0.597)
Constant Term	-0.411**	-0.456**	-0.474**	-0.444**	-0.441**
	(0.186)	(0.187)	(0.186)	(0.186)	(0.186)
The Number of Observations	23,403	22,740	23,403	23,403	23,307
The Number of Banks That the Firm Works with >1	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.15	0.15	0.14	0.14	0.14

Note: ***, **, * refer to levels of significance of 1%, 5% and 10%, respectively. Standard errors have been grouped at a bank level (cluster).

Table IV.2.3 presents results obtained after adding the firm-specific variables. Firms which have a high amount of total assets or a high number of employees recovered from the contraction in the credit market more easily than small firms (the fall in the loan amount was moderate for these firms). This result strongly supports the hypothesis that it was more challenging for small firms to access loans especially in the crisis period. In this period, the value of collaterals also declined and banks re-valued collaterals. Firms with more collaterals (fixed asstes) were affected less by this shock. Firms with a high exports/sales ratio were also affected less, which shows that banks were selective. Conversely, the contractionary shock had a bigger impact on firms with a high total loans/total assets ratio and heavily indebted firms had difficulty in obtaining financing during the crisis period. In general terms, the supply shock affected the small and indebted firms with a lower amount of collaterals the most.

IV.2.4 Conclusion

This study presents an analysis of the impacts of the sudden stop in the 2008-2009 global financial crisis on the credit channel in Turkey by using micro data at bank-firm level. Consequently, banks with a high level of external loans before the crisis cut their loan supply more. Banks having a high level of loan portfolio exchange rate risk and banks having a high liquidity ratio also reduced their loans more. As for banks having a high capital

adequacy ratio, the decline in the loans they extended was more moderate. On the other hand, the contraction in the loan market had a bigger effect on small and heavily indebted firms. The effect of this contraction shock in loan supply was rather limited for firms concentrating on exports and firms having a high amount of fixed assets.

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IV.3. Testing Macroprudential Policy with Micro Data: The Effect of Loan-to-Value Restrictions on Car Sales in Turkey

Summary

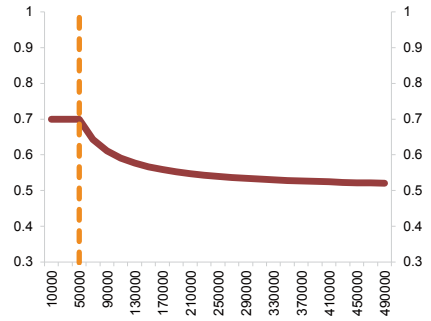
This study analyzes the effect of loan-to-value restriction on automobile loans using primary market car sales in Turkey. The impact of the policy is identified through varying nature of the loan-to value restriction for different prices. Car sales in the high price-range category dropped significantly after the introduction of the new arrangement.

IV.3.1 Introduction

In November 2013, the Banking Regulation and Supervision Agency announced the new arrangements governing consumer loans that took effect on 1 February 2014. The Regulation that the BRSA put into effect introduced limitations on the number of installations applied to personal loans for various sectors. Moreover, an overall maturity limitation as well as loan-to-value ratio were introduced for automobile loans. The objective of these arrangements is to "help household indebtedness develop in a healthier way and contribute to achieving high and stable growth in the Turkish economy".

The LTV ratio introduced with this regulation varies according to the price of the vehicle. Defined in figures, the upper limit for the vehicle loan amount shall be 70 percent of the total value of vehicles with a billing value up to TL 50,000; for vehicles with a billing value above 50.000, the loan limit will be 70 percent for the TL 50,000 part of the billing value and 50 percent for the amount exceeding 50,000 TL. Therefore, the loan amount that can be drawn for vehicles decreases gradually as the price of vehicle increases. As shown in Chart IV.3.1, the LTV, which is 70 percent, converges to 50 percent for vehicles with higher prices. This study evaluates the impact of the LTV implementation introduced for automobile loans.

Chart IV.3.1
LTV According to Prices of Automobiles



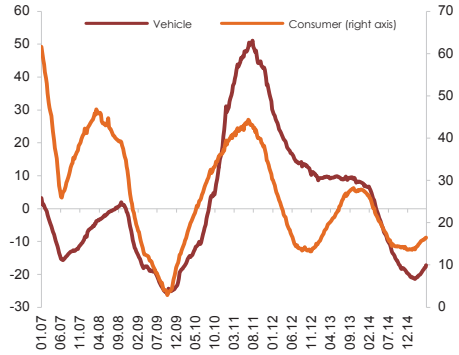
Source: CBRT

IV.3.2 Implementation in Other Countries and Policy Impacts

Globally, the LTV is usually implemented for housing loans. In several Asian countries like Hong Kong, Singapore and China, policy makers are implementing the LTV without being referred to as a macroprudential measure. Studies based on these countries reveal that the LTV measures taken for housing loans have proved to be effective. The analysis by Funke and Paetz (2012) on Hong Kong housing markets indicated that cyclical loan-to-value policy decreased the possibility of the formation of a bubble in housing markets and contained the effect of the volatility in housing prices on the real economy. According to Igan and Kang's (2011) study on the Korean housing markets for the 2001-2010 period, tightening in the LTV and debt-to-income ratio (DTI) decreased buying and selling activities in housing markets at a significant rate. Following the tightening, buying and selling activities declined within 3 months and deceleration of prices takes up to 6 months. The reaction of price movements to LTV tightening is stronger. Wong, Fong, Li and Cho (2011) assessed the effectiveness of the LTV policy using panel data for 13 countries and found that in countries implementing the LTV policy, fall in prices significantly diminishes the effect of the delinquency rate in housing loans. Kuttner and Shim (2013) used a panel data for 57 countries to assess the impact of various macroprudential measures on housing loans and concluded that LTV and DTI policies had a significant impact in decreasing the housing loan growth.

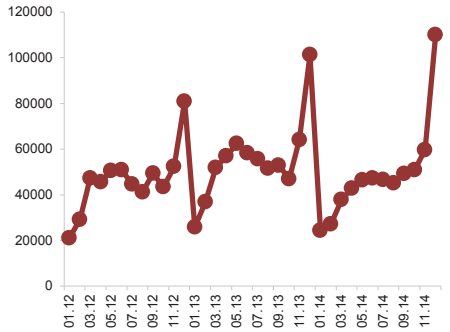
Although more limited compared to the LTV implementation in housing loans, LTV limitation in automobile loans is used in several countries as well. In June 2012, Bank Indonesia introduced LTV ratios ranging between 70-80 percent for automobile loans to decrease automobile loan delinquency ratios. After the implementation, first the annual growth rate of automobile loans decreased and then it became negative. In 2014, two years after the LTV implementation, automobile loan growth reassumed the pre-limitation rates. The Central Bank of Brazil raised capital adequacy ratios of automobile loans in 2010 to achieve a healthier credit growth rate. As an outcome of the regulation, the share of automobile loans

Chart IV.3.2
Automobile and Consumer Loans
(Annual Percentage Change)



Source: CBRT

Chart IV.3.3
Monthly Sales of New Automobiles
(Units)



Source: Automotive Distributors Associations (ADA)

with a maturity longer than 5 years in overall automobile loans decreased. Likewise, the Monetary Authority of Singapore introduced LTV implementation for automobile loans to reduce inflation and slow credit growth. According to the regulation, 60 percent of the value of automobiles with a price up to USD 20,000 and 50 percent of the value of automobiles with a price higher than 20,000 shall be paid in cash. Six months after the implementation, the automobile loans credit stock decreased by USD 1 billion and according to the latest data, the annual growth rate of auto loans is minus 20 percent. These country experiences suggest that the chances of the BRSA's measures towards automobile loans being effective are high. As illustrated in Chart IV.3.2, after the implementation, while the growth rate of consumer loans is positive, the stock value of automobile loans has decreased.

IV.3.3 Data

This study used primary dealers' monthly car sales data from the Automotive Distributors Association (ADA). The data set includes information about the make, model, segment, version, equipment, engine size, transmission type, fuel type, engine capacity and country of manufacture. The detailed sub-categories facilitate detecting the details of vehicles sold to the consumers. The data set for 2014 comprises 42 makes, 362 models and 2972 unique car models. Ten percent of these automobiles were manufactured in Turkey. An analysis of the monthly sales figures reveals that December had the highest sales figures (Chart IV.3.3). By annual cumulative figures, 556,276 automobiles were sold in 2012; 664,653 in 2013 and 587,196 automobiles were sold in 2014. The price data reflect prices by end-2014 and the prices were retrieved from the price lists announced on the companies' web sites. When price data and car sales data for 2014 are matched and automobiles with 0 sales are excluded, 1148 unique car models remain in the data set.

IV.3.4 Empirical Findings

The objective of this study was to discover whether there has been a significant change in car sales since the inception

of the BRSA's regulation on automobile loans. The following estimation model has been used for this purpose:

$$\Delta SG_i = \beta_0 + \beta_1 logP_i + \beta_2 P_{i50} + \beta_3 P_{i50} logP_i + X_i + Y_i + \varepsilon_i$$

Here, the dependent variable, ΔSG_i, is defined as the percentage change in sales growth for a particular car model. The calculation is based on the logarithm of the total sales of 9 months from February to October.[11]

The $logP_i$ variable represents the end-2014 price of each unique car model. Although it is quite possible that since the inception of the policy the prices have changed due to several factors such as changes in domestic demand, credit conditions, exchange rates etc., we argue that it will not directly affect our results since the LTV policy by BRSA discriminates the credit availability for different price ranges in a certain way. Pi_{50} is an indicator variable defining automobiles with a price higher than TL 50,000 $Pi_{50} logP_i$ is the main variable of interest which tests the additional impact on the relation between automobile prices and sales growth for passenger cars with a price higher than TL 50,000. This definition is based on the BRSA's implementation which stipulates a higher LTV ratio for automobiles with a price higher than TL 50,000. A negative coefficient for this variable implies a decline in sales driven by an increased LTV ratio. The constant variable represents factors that equally affected sales growth for all car models in 2014. The price variable represents the change in sales growth for different price values.

X_i includes the initial sales shares of car models based on their make and segment and the change in this data within the time period defined by the regression. The objective of using these variables is to control excessive volatility based on each particular car model. Y_i denotes the make, segment, domestic/foreign manufacture distinction and engine size. These variables control the impact of price changes that might occur due to supply shocks on car sales.

This model is estimated for car models whose price data is available and which were sold on the market in 2012, 2013 and

11 The BRSA's arrangement was announced in November 2013 and took effect ion 1 February 2014, therefore data for November, December and January have been excluded.

2014. To enhance the precision of the model, automobiles with a price tag higher than TL 500,000 were excluded. The model is estimated by using the weighted least squares method. The weight of each original automobile is based on sales of the respective car in 2014. Accordingly, outlier observations for automobiles in the 10 percent percentile of the total sales distribution were excluded.

Table IV.3.1 shows the results of our main model. In the first column, the model is estimated by price and volatility variables. Accordingly, there is a positive correlation between the price of the automobile and the change in sales growth. Meanwhile, a negative coefficient for the constant variable indicates a decline in the sales growth. The variable that we used to measure the impact of the Regulation is negative and significant. Accordingly, a price increase of 1 percent for cars with a price higher than TL 50,000 decreases sales growth by 2.5 percent. In the second column, the constant variables of make and segment were included. Albeit with some decline, the coefficient of the main variable is negative and significant. In the last column, the model is estimated based on the total sales from February through December. The additional impact over TL 50,000 is positive but insignificant.

Table IV.3.1
Regression Results

	(1)	(2)	(3)
1-Logprice	3.336***	2.862***	-0.192
	(0.842)	(0.927)	(1.108)
2-Price>50	27.493***	22.353**	-9.154
	(9.381)	(10.192)	(12.854)
3-Price>50*Logprice	-2.584***	-1.998**	0.889
	(0.866)	(0.950)	(1.200)
4-Constant	-37.12***	-33.58***	0.901
	(9.098)	(9.972)	(11.915)
5-Volatility Factors	Yes	Yes	Yes
6-Fixed Effects		Yes	Yes
7-No of Observations	469	469	514

To analyze the impact of the Regulation over time, sales in 2014 were divided into three periods: 1- Change in 4 month total sales growth through February-May, 2- Change in 4 month total sales growth through June- September, 3- Change in 3 month total sales growth through October-December. Table IV.3.2 shows the results for these three periods. The policy effect is significant only in the February-May period. In this period, a price rise of 1 percent for cars with a price higher than TL 50,000 led to a 4 percent fall in the sales growth. This result suggests

that the impact of the policy was stronger in the first couple of months, however the impact diminished as of mid-year.

Table IV.3.2
Regression Results

	(1)	(2)	(3)
1-Logprice	4.106***	2.126	-0.045
	(1.564)	(1.352)	(1.120)
2-Price>50	43.674***	14.945**	5.671
	(16.605)	(15.450)	(13.079)
3-Price>50*Logprice	-4.111***	-1.313	-0.435
	(1.573)	(1.423)	(1.214)
4-Constant	-45.17***	-24.508*	0.396
	(16.801)	(14.626)	(12.141)
5-Volatility Factors	Yes	Yes	Yes
6-Fixed Effects		Yes	Yes
7-No of Observations	337	365	373

Lastly, we estimate the impact of the BRSA Regulation on car sales groth using using the model predictions. This analysis is based on predicted values estimated using the sales data for February-September. First, the model, the definition of which is provided below, was estimated, and then β_2 and β_3 values were equaled to zero to exclude the policy impact.

$$\Delta SG_{it} = \beta_0 + \beta_1 logP_i + \beta_2 P_{i50} + \beta_3 P_{i50} logP_i + X_i + Y_i$$

The difference between these two estimations identifies the additional impact of the policy for each car. To calculate the total impact, the sales volume of the cars in the respective period was used as weight. We find that of the 59 percent drop in sales growth change for cars with prices higher than 50.000 TL, 19 percent is due to the policy. Note that by design we estimate the effect of the additional downpayment restriction gradually increasing after 50.000 TL.

IV.3.5 Conclusion

In this study, the impact of the Regulation involving the downpayment requirement introduced by the BRSA for automobile loans on primary market car sales was evaluated. The BRSA introduced higher ratios of downpayment requirement for cars with higher prices. The results confirm that the decline in sales growth was was higher for cars with higher prices.

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IV.4. Is There a Housing Bubble or a Quality Boom in Turkey? Evidence from Hedonic Price Adjustment

Summary

In the 2010-2014 period, housing prices increased more than 50 percent in Turkey, which raises concerns over a potential property bubble. This increase is widespread across the country where prices are even doubled in some regions. Our study performs a hedonic price adjustment for the housing market in Turkey, where we control for the price effects of increases in observed house characteristics in time. Results show significant increases in quality of houses sold, which in turn suggests that identifying all the price increase as real appreciation may be misleading. In particular, we estimate that one fourth of nominal price changes stems from quality improvements.

IV.4.1 Introduction

Housing market is inherently heterogeneous in terms of its characteristics. Because of the heterogeneity, property prices are affected not only by the location of the house, but also by other characteristics of the dwelling like gross area of use, number of rooms, and heating type. Even the prices of two flats having the same quality of construction in the same building can vary depending on the floor level and/or the view the flat has. Due to rapid changes in household preferences and improvements in technology, differences occur in quality across such properties and it may be challenging to control these differences because of high heterogeneity. Therefore, changes in property prices can reflect pure price changes as well as changes in quality of houses. Increase in a property price index might result from at least one of these two factors, hence identifying big changes as a bubble may be misleading if the main driver of the increase is the latter.

Several approaches have been proposed in the literature to distinguish these two factors, such as hedonic methods,

repeat-sales methods and hybrid methods.[12] The hedonic price model is first developed by Griliches (1961, 1971) and Rosen (1974). Later, hedonic regression method has been extensively used to measure the effect of observed characteristics of a property on property price as well as price effects of quality changes.[13] Hedonic methods, on the other hand, include time dummy and characteristic prices approaches. In this study, we propose a residential property index by using the hedonic method with characteristics prices approach which considers price of a good as a bundle of its characteristics.[14]

As part of our study, appraised value of the house is used as the dependent variable whereas other characteristic variables such as type of dwelling, parking lot, structure of construction are used as the explanatory variables in our regressions for each stratum and period. According to regression results, the most important variable that effect housing price is gross area of use that is followed by quality of construction, elevator and security service, respectively. Besides, year of construction, number of bedrooms, bathrooms and balconies are also statistically significant variables for most of the strata. Indexes for each stratum are produced according to average characteristics kept constant in the base period January 2012 and estimations obtained from the regression analyses. Our results show that residential property prices in Turkey has increased by 75.2 percent from 2010 to February 2015, while 17.0 percentage point of this increase has been caused by the quality changes in property characteristics and the rest has been caused by pure price changes. Even though some discrepancies across regions are observed, one fourth of nominal price increases can be attributed to quality improvements in general.[15]

12 Since houses in Turkey still don't have unique ID, repeat-sales method is not applicable. On the other hand, quality changes often occur for the exact same house and hence repeat-sales method is still prone to the same issue. Therefore, we use another widely accepted method that is hedonic prices.

13 For more detailed information, please refer to Straszheim (1973, 1974), Wilhelmsson (2008) and Widlak and Tomczyk (2010).

14 As the time dummy variable method uses one regression for all periods, it requires new regression estimation for every new incoming data in every period and requires a backward looking revision. On the other hand, statistical agencies prefer characteristics prices mainly because of its simplicity as well as the fact that the time dummy approach needs revisions in past data every time new data arrives (Eurostat, 2011).

15 In the Turkish case, using the same dataset we have in this paper, Kaya (2012) employs the time dummy approach in analyzing Turkish housing market for the period between December 2010 and June 2012. Her findings suggest that of the 18.9 percent change in property prices, pure price changes contribute to 6.2 percent whereas we compute that as 14.5 percent by using the characteristic prices approach.

IV.4.2 Data and Methodology

House Price Index for Turkey (THPI) by CBRT Statistics Department is compiled from valuation reports prepared by real estate appraisal companies at the stage of approval of individual housing loans extended by banks. In this study, we use monthly THPI data which cover the period from January 2010 to February 2015. Mentioned dataset is rich in variety of observable property characteristics.[16] This rich dataset enables us to identify shadow prices of each quality component and to compute pure price changes by keeping average characteristics constant.

THPI uses the (geographically) "Stratified Median Price Method" to measure price movements in Turkish housing market.[17] In the current THPI implementation, properties are grouped together to form homogenous strata and the median unit price for each stratum is weighted by number of residential properties sold to reach the overall price index. In this analysis, we use the same strata and weights that are used for THPI for aggregating the strata to produce the hedonic house price index.

In particular, our log-linear regression model to obtain estimates of willingness to pay the different characteristics of a house is as follows:[18]

$$lnp_n^t = \beta_0^t + \sum_k \beta_k^t z_{nk}^t + \varepsilon_n^t, \quad \forall\, i, t, \qquad (1)$$

where p^t_n, is the price of property n at time t, z^t_{nk} is characteristic k of the property. β^t_k is willingness to pay for the characteristic and ε^n_t is the error term of the regression. Then, we run separate regressions for all periods and keep estimates of regression coefficients, $(\widehat{\beta^t_k})$. To compute fixed-characteristics prices, we use $(\widehat{\beta^t_k})$ along with average characteristics for the base period, $(\overline{z^k_0})$. From this perspective, average characteristics for the base period resemble "standardized property with fixed

16 In particular, dataset has information about buildings including location (city, sub-city, neighborhood and block information), year of construction, quality of construction, availability of an elevator and a 24/7security service. Moreover, it also has information about the apartment in the building such as gross area of use, heating type, and number of rooms, bathrooms and balconies.

17 For detailed information, see the "Methodological Information on the House Price Index" at CBRT website, www.tcmb.gov.tr

18 For alternative models and characteristics please see Eurostat (2011).

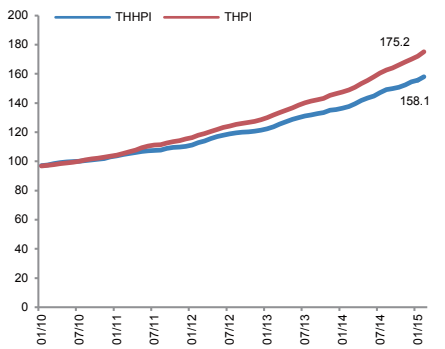
characteristics". In other words, the Hedonic House Price Index for Turkey (THHPI) is calculated by keeping the quality constant in base period.[19]

$$P_i^t = \frac{exp(\widehat{\beta_0^t})exp\left[\Sigma_k \beta_k^t \overline{z_0^k}\right]}{exp\,(\widehat{\beta_0^0})exp\left[\Sigma_k \beta_k^0 \overline{z_0^k}\right]}. \qquad (2)$$

IV.4.3 Regression Results

An example of the results of the regression equation (1) applied to each stratum and period is shown in Table IV.4.1. According to results given in the table, keeping other physical characteristics constant, a 100 square meters larger house is 50 percent more expensive than average. For this stratum, security is another important characteristic, meaning that if a house receives a 24/7 security service within a gated community then one would expect its price to be 33.3 percent higher on average. On the other hand, higher quality houses are valued at a 10.9 percent higher price on average while an elevator in the building adds 13.3 percent to its value.

Chart IV.4.1
THPI and THHPI Comparison
(January 2010 – February 2015)



As is the case with THPI, regression results for the HHPI are weighted by using the number of houses sold in the related stratum in the previous year registered by the General Directorate of Land Registry and Cadaster (LRC). Then, THHPI is produced for the 26 regions at NUTS-2 level as well as for Turkey in general. Chart IV.4.1 shows that, THHPI has increased by 58.1 percent while THPI has increased by 75.2 percent in almost five years.[20] These findings suggest that, 17.0 percentage point of the increase is emerged from quality improvements in housing characteristics in Turkey. In real terms, the increase in THHPI in the 5-year period has become 33.8 percent, one half of real increase can be attributed to quality improvements and the rest can be attributed to pure price changes.

General tendency of hedonic prices in the three largest cities in Turkey, i.e. Istanbul, Ankara and Izmir, diverges the same pattern by January 2013, but following this period, prices

19 In order to avoid effects of potential problems in initial data points on the whole index, we carefully choose January 2012 as the base period (t = 0) to construct our hedonic price index. As a robustness check, we also computed a similar index with 2012=100 but differences are negligible.

20 THHPI is rebased into 2010 from January 2012 to make a comparison with THPI.

in Istanbul show a faster pace and dissociated from the others (Chart IV.4.2). Over the last five years, the highest increase is seen in Istanbul by 90.3 percent, while increases in Ankara and Izmir are noted as 51.1 and 61.2 percent, respectively. These numbers are not surprising because respective official THPI increases are 116.7, 57.2 and 72.5. For these three largest cities, quality change is observed 20.6, 3.1 and 8.7 percentage points respectively.

Chart IV.4.2
Hedonic Price Indices for Three Turkish Metropolitans
(January 2010 – February 2015)

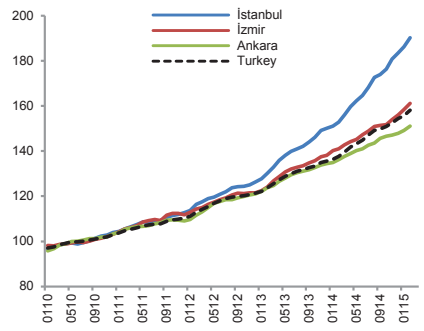


Table IV.4.1
Sample Hedonic Regression Result

Characteristics	Coefficients
Gross Area of Use	0.005 (0.000)***
Quality of Construction	0.109 (0.022)***
Year of Construction	0.003 (0.001)**
Number of Rooms	0.033 (0.017)**
Number of Bathrooms	0.084 (0.029)***
Number of Balconies	0.071 (0.017)***
Security Service	0.333 (0.032)***
Heating	0.118 (0.045)***
Elevator	0.133 (0.028)***
Constant Term	5.655 (2.040)***
Number of Observations	621

Notes: (1) Dependent variable $\ln P_t^i$ is the logarithm of the appraisal value in Turkish liras. (2) The numbers in parenthesis are standard errors while (**) and (***) denotes significance at 5% and 1% level, respectively. (3) Quality of construction is a dummy variable equal to 1 for higher quality houses and 0 for lower. (4) Security service is a dummy variable equal to 1 if the house resides in a gated community. (5) Heating denotes central heating and wall hung gas boiler systems. (6) Elevator denotes whether the building has an elevator or not. (7) Sample regression covers Küçükçekmece that is one of the sub-cities of Istanbul with one quarter data.

IV.4.4 Conclusion

Property price movements are monitored closely for financial stability because houses are considered as the largest part of household wealth. Quality improvements occur in the housing market mostly due to rapid changes in household choices, technology and innovation. Therefore, calculating quality adjusted indexes would contribute to conduct more reliable analyses.

Since Turkish house price index computed by CBRT does not distinguish quality changes and pure price increases, we construct a quality adjusted property price index by using hedonic regression. According to our results, one fourth of nominal property price increase can be attributed to quality improvements in general.

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IV.5. Federal Reserve Policies and the Banking Sector's External Borrowing

Summary

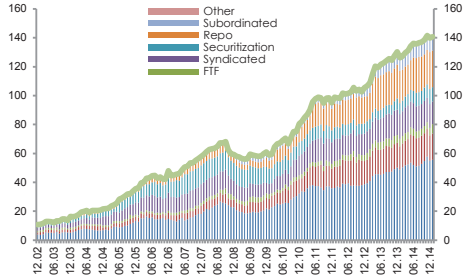
This study presents an analysis of the effect of the changes in the Fed's balance sheet size as an indicator of monetary expansion - in other words, the expansionary monetary policies on the external loans and loan types of banks operating in Turkey. The analysis shows that expansionary monetary policies significantly increase external loans, while the largest effects in terms of loan types are seen in credit, repo, deposit, syndicated and securitization groups, respectively. Moreover, small banks with a weak capital structure and relatively low ratios of return on assets and liquid assets which cannot adequately borrow in periods when the global liquidity is rather scarce are able to borrow more under easing liquidity conditions driven by the monetary expansion.

V.5.1 Introduction

Financial integration has deepened as global banks and financial institutions have significantly improved their international activities especially over the last twenty years. The consequences of increased globalization and integration in the banking sector have triggered various discussions. An important number of these discussions focuses on the effects of fund flows from advanced economies to emerging economies. Particularly until the emergence of the global financial crisis in the third quarter of 2008, the inclusion of foreign banks in the domestic banking system was inarguably believed to bring some advantages in terms of the rebalancing of domestic markets and more efficient use of sources. However, this process completely reversed during the crisis period and fragilities in global financial markets spilled over to emerging economies due to acute changes in fund flows.

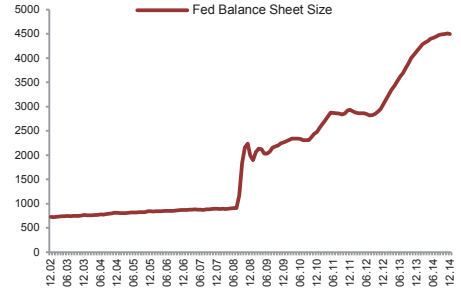
Fund flows to emerging economies, including Turkey, may be in the form of direct investments, portfolio investments, bank loans and debt securities. There were significant upswings in capital inflows to emerging countries in Asia, Latin America and Europe especially up to 2007. However, critical declines

Chart IV.5.1
Composition of Banks' External Loans
(Billion TL)



Source: CBRT, BRSA

Chart IV.5.2
Fed's Balance Sheet Size
(Billion TL)



Source: Fed

were registered in all fund types during the 2008 crisis. The most severe decline among loan types was seen in international bank loans (Cetorelli and Goldberg, 2011). Therefore, the IMF's World Economic Outlook report released in April 2009 stated that the global links between banks played a great role in the transmission of the global crisis to emerging economies (World Economic Outlook (WEO), 2009).

From 2002 to this date, there has been a regular uptrend in the external loans of banks operating in Turkey. In this period, the total external loans of the banking sector increased approximately by a factor of thirteen, jumping from USD 10.8 billion in December 2002 to USD 139.9 billion as of end-2014.[21] However, during the global crisis, the uptrend in external loans was negatively affected and external loans contracted by 17.8 percent (Chart IV.5.1).[22]

To mitigate the effects of the global financial crisis that broke out in 2008, in the framework of the conventional monetary policy theory, central banks of emerging economies cut interest rates at first but these measures proved inadequate, so they decided to start a quantitative easing process. As the leading actor during this period, the Federal Reserve (Fed) employed non-conventional monetary policy measures and injected an abundant amount of liquidity to the markets, buttressing these measures also with various asset purchase programs (Table IV.5.1). After these steps, the balance sheet size of the Fed - an indicator of monetary expansion - reached record-high levels (Chart IV.5.2).

In sum, effects of the non-conventional expansionary monetary policy measures that the Fed introduced during and after the global financial crisis on capital flows to emerging economies and the external debt of the banking sector in these economies have been an increasingly important subject of debate in the recent period. This special topic offers a summary of the results of Alper et. al.'s (2015) study that deals

21 Securities issues abroad have not been included in the study.

22 They decreased from USD 68.11 billion in September 2008 to USD 55.99 billion as of April 2009.

with the effects of the Fed's balance sheet size (which changes significantly due to expansionary monetary policies) on the external debt of banks operating in Turkey.

Table IV.5.1
Quantitative Easing Packages Announced by the Fed

Date	Federal Reserve Policies	Announcement
November 2008	QE 1	The 1st Quantitative Easing Package that included a Treasury securities purchase of USD 600 billion
March 2009	QE 1 Extension	As a continuation of the QE 1, a mortgage-backed securities purchase of USD 750 billion and a Treasury securities purchase of USD 300 billion
November 2010	QE 2	The 2nd Quantitative Easing Package that included a Treasury securities purchase of USD 600 billion in total, with monthly Treasury securities purchases of USD 75 billion
September 2011	Operation Twist	The Maturity Extension Program that aimed to replace USD 400 billion of Treasury securities with remaining maturities of 3 years or less with an equal amount of Treasury securities with remaining maturities of 6 years to 30 years
June 2012	Operation Twist Extension	The purchase, as well as the sale and redemption, of an additional USD 267 billion in Treasury securities, in the framework of the Maturity Extension Program
September 2012	QE 3	The 3rd Quantitative Easing Package that included a mortgage-backed securities purchase at a pace of USD 40 billion per month and a Treasury securities purchase at a pace of USD 45 billion per month, amounting to a monthly securities purchase of USD 85 billion in total
May 2013	QE 3	Announcement by the Fed Governor Ben Bernanke that the quantitative easing would be reduced until the end of 2013 and might be terminated in 2014
October 2014	QE 3	Termination of the QE3

IV.5.2 Data Set and Methodology

The analysis conducted via the fixed effect panel data methodology is based on data covering the December 2002-December 2014 period obtained from 19 deposit banks that have an important role in the sector.[23] The direction and the extent of the effect of the Fed's balance sheet policies or expansionary monetary policies on external loans received by these banks were analyzed. The following model was used in the analysis: One-period lagged explanatory variables were included in the regression.

$$L_{icb,t} = \beta_0 + \beta_1(FED)_{t-1} + \beta_2(TR\_Macro)_{t-1} + \beta_3(Bank)_{i,t-1} + \gamma_i + \alpha_c + \delta_b + \varepsilon_i$$

$L_{icb,t}$: the logarithmic value of the external debt in loan type b that bank i obtained from country c in time t

FED_{t-1}: the logarithmic value of the Fed's balance sheet size in time t-1

$(TR\_Macro)_{t-1}$: value of the macro indicators of Turkey's economy in time t-1

$(Bank)_{i,t-1}$: value of bank-based variables in time t-1

γ_i: Fixed effect of bank i

α_c: Fixed effect of country c

δ_b: Fixed effect of loan type b

23 Covers 96.21 percent of the total asset size of the banking sector as of December 2014.

IV.5.3 Empirical Findings

In all regressions in Table IV.5.2, the Fed's asset size is used as the basic variable. The first model does not include any fixed effect, whereas fixed effects were controlled on a time, borrower bank, lender country and loan type basis, respectively, in other models. In the fifth regression in which all fixed effects were included in the model, all shocks seen in country-based supply and loan types were controlled. In this respect, this model allows for a decomposition of supply and demand variables. An increase in the Fed's balance sheet triggers a strong rise in the external loans of the banking sector. This effect was found statistically significant at a 1 percent level.

Table IV.5.2
Fed Balance Sheet Policy and Banks' External Loans

Dependent Variable:	Logarithmic Value of Banks' External Loans					
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Log(Fed Asset Size)	0.81***	1.40***	1.66***	1.93***	2.03***	0.23
	(0.13)	(0.19)	(0.19)	(0.18)	(0.17)	(0.28)
Constant Term	3.97***	0.11	-2.46*	-1.81	-1.79	7.38***
	(0.81)	(1.24)	(1.29)	(1.23)	(1.16)	(1.75)
Fixed Effect	No	Time	Time and Bank	Time, Bank, Country	Time, Bank, Country, Loan Type	Time, Bank, Country, Loan Type
The Number of Observations	89,636	89,636	89,636	89,636	89,636	89,636
R^2	0.01	0.01	0.09	0.38	0.55	0.59

In Table IV.5.3, the Fed's balance sheet size as well as the macroeconomic indicators related to Turkey's economy that have the potential to affect the external loans of banks and the bank-based indicators were included in the analysis as the control variable, respectively. The constant term and fixed effects on a borrower bank, lender country and loan type basis were included in the model in all regressions. Likewise, the positive effect the Fed's balance sheet size on banks' external loans is significant at a 1 percent level. The symbols of all indicators used as a control variable in the models are in the expected direction. According to the results of the seventh regression in which all variables were analyzed together, in addition to the Fed's balance sheet size, the real effective exchange rate and the BIST overnight interest rate also affect banks' external loans. The appreciation of the TL and the hike in interest rates put an upward pressure on banks' external loans. Large banks and banks with a high level of return on assets borrow more. Moreover, banks having a higher amount of loans in their portfolios borrow more from abroad. While banks with a high NPL ratio borrow less, there is a negative relation

between deposits and external borrowing. All these relations are significant at a 1 percent level.

Table IV.5.3
Fed Balance Sheet Policy and Banks' External Loans

Dependent Variable:	Logarithmic Value of Banks' External Loans						
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(Fed Asset Size)	1.17***	0.20***	0.10**	0.12**	0.19***	0.19***	0.30***
	(0.03)	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)
TR Macro Variables							
Real GDP Growth	0.01***	0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inflation	-0.02***	-0.01***	-0.00*	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Real Effective Exchange Rate	0.01***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BIST Overnight Interest Rate	0.03***	0.01**	0.01*	0.01*	0.01*	0.01*	0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Bank-Based Variables							
Log(Real Asset Size)		0.48***	0.51***	0.50***	0.49***	0.49***	0.37***
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Credits/Assets		1.35***	1.22***	1.31***	1.19***	1.42***	1.20***
		(0.11)	(0.11)	(0.12)	(0.12)	(0.22)	(0.22)
Deposits/Assets			-1.15***	-1.06***	-0.98***	-1.01***	-1.18***
			(0.13)	(0.14)	(0.14)	(0.14)	(0.15)
Return on Assets				0.03***	0.02***	0.02***	0.03***
				(0.01)	(0.01)	(0.01)	(0.01)
NPL Ratio					-0.07***	-0.06***	-0.06***
					(0.02)	(0.02)	(0.02)
Liquid Assets/Assets						0.00	0.00
						(0.00)	(0.00)
Capital/Assets							-1.80***
							(0.31)
Constant Term	2.81***	2.89***	3.78***	3.70***	3.52***	3.35***	4.48***
	(0.24)	(0.30)	(0.32)	(0.33)	(0.33)	(0.37)	(0.40)
Fixed Effect	ICB [24]	ICB	ICB	ICB	ICB	ICB	ICB
Number of Observations	89,013	88,138	88,138	84,500	84,500	84,500	84,500
R^2	0.54	0.55	0.55	0.55	0.55	0.55	0.55

Table IV.5.3 shows that the Fed's balance sheet size balance sheet size affect banks' external loans in a positive direction but does not include any answer as to which loan type is affected to what extent. Therefore, for each loan type, a dummy variable was added to the seventh regression in Table IV.5.3. Moreover, to see the marginal effect of the Fed's balance sheet size, the Fed's balance sheet size variable was included in the model in an interaction with the dummy variable for each loan type (Table IV.5.4).[25] Loans were excluded as the control group. B_6 - B_9 coefficients show the extent of the effect of changes in the Fed's balance sheet size on deposit, syndicated, securitization and repo types, respectively, compared to credits. The increases in the Fed's balance sheet size boost the external borrowing on the basis of loan types. Credits, repo, deposit, syndicated and securitization types are affected, respectively.

In Table IV.5.5, these results were statistically tested. The first test determined whether the interactive variables were significant together or not. According to the test result, the null hypothesis was rejected and it was concluded that the changes in the Fed's asset size affected types of bank loans at different

Table IV.5.4
Fed Balance Sheet Policy and Banks' External Loans

	Dependent Variable: Logarithmic Value of Banks' External Loans Independent Variables	(1)
B_1	Log(Fed Asset Size)	0.90***
		(0.07)
	Dummy Variables for Loan Types	(0.31)
B_2	Deposit	0.11
		(0.47)
B_3	Syndicated	6.84***
		(0.29)
B_4	Securitization	7.84***
		(0.82)
B_5	Repo	2.74***
		(0.81)
	Interactive Dummy Variables	
B_6	Log(Fed Asset Size)*Deposit	-0.47***
		(0.07)
B_7	Log(Fed Asset Size)*Syndicated	-1.09***
		(0.05)
B_8	Log(Fed Asset Size)*Securitization	-1.14***
		(0.13)
B_9	Log(Fed Asset Size)*Repo	-0.34***
		(0.13)
B_0	Constant Term	2.39***
		(0.44)
	TR Macro Variables	Yes
	Bank-Based Variables	Yes
	Fixed Effect	İCB
	Number of Observations	82,929
	R^2	0.56

Table IV.5.5
Sensitivity of Banks' External Loans to Fed Policies

	Null Hypothesis	F Value	p-value
1	$B_6 + B_7 + B_8 + B_9 = 0$	70,16	0,0000
2	$B_2 + B_6 = 0$	87,35	0,0512
3	$B_3 + B_7 = 0$	572,22	0,0000
4	$B_4 + B_8 = 0$	95,11	0,0000
5	$B_5 + B_9 = 0$	12,19	0,0005

24 Denotes the fixed effect in the bank, the creditor country and the loan type.

25 Types of banks' external debt are: credits, deposits, credits for external trade finance, syndicated, securitization, repo and subordinated loans. Subordinated loans were not included in the analysis because they did not exist before December 2008. Credits for external trade finance were included in the credits category as they were low in amount.

Table IV.5.6
Fed Balance Sheet Policy and Banks' External Loans

Dependent Variable: Logarithmic Value of Banks' External Loans Independent Variables	(1)
Log(Fed Asset Size)	2.43*** (0.34)
Bank-Based Variables	
Log(Real Asset Size)	1.18*** (0.15)
Credits/Assets	1.94*** (0.21)
Deposits/Assets	-1.00*** (0.13)
Return on Assets	0.79*** (0.17)
NPL Ratio	-0.03*** (0.01)
Liquid Assets/Assets	0.07*** (0.02)
Capital/Assets	16.84*** (4.53)
Interactive Dummy Variables	
Log(Fed Asset Size)*Log(Real Asset Size)	-0.13*** (0.02)
Log(Fed Asset Size)*(Capital/Assets)	-2.86*** (0.74)
Log(Fed Asset Size)*(Return on Assets)	-0.13*** (0.03)
Log(Fed Asset Size)*(Liquid Assets/Assets)	-0.01*** (0.00)
Constant Term	-9.85*** (2.04)
TR Macro Variables	Yes
Fixed Effect	ICB
Number of Observations	94,861
R^2	0.55

levels. In four other tests, the significance of these changes was tested for each loan type. According to the results, the effect on each loan type was significant.

Table IV.5.6 shows the channels through which the Fed's balance sheet size variable affects banks' external loans. To this end, the interaction of the Fed's balance sheet size variable with bank-based variables was respectively included in the seventh regression in Table IV.5.3. Changes in the Fed's balance sheet size more heavily and positively affect the small banks with a weak capital structure and relatively lower ratios of return on assets and liquid assets. Considering that an increase in the Fed balance sheet or a monetary expansion leads to a global liquidity glut, these banks, which cannot obtain external loans as much as they wish in times of a liquidity squeeze, have better access to external loans in a conjuncture created by the global liquidity increase. In this respect, they are affected at a higher level by the monetary expansion.

IV.5.4 Conclusion

This special topic presents a quest to find the answers as to how the changes in the Fed's balance sheet size - expansionary monetary policies in other words - affect the external loans and loan types of banks operating in Turkey and what these channels of influence are. Accordingly, it was found that expansionary monetary policies boosted external loans and the largest effects in terms of loan types were seen in credit, repo, deposit, syndicated and securitization groups, respectively. Moreover, small banks with a weak capital structure and relatively low ratios of return on assets and liquid assets which cannot adequately borrow in periods when the global liquidity is rather scarce were affected more in a positive direction under easing global liquidity conditions.

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IV.6. The New Monetary Policy Framework and the Interest Rate Transmission Mechanism

Summary

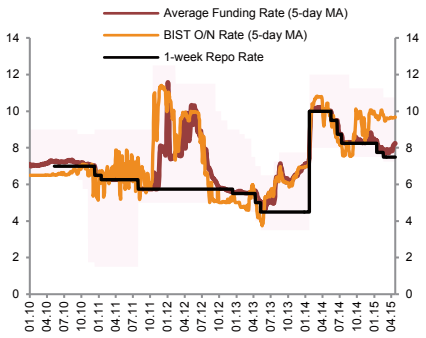
In the aftermath of the global crisis, many central banks in emerging economies designed unconventional policies and intensively employed macroprudential tools to mitigate the trade-off between price stability and financial stability and reduce macrofinancial risks. In this episode, the Central Bank of Turkey also formulated a policy mix composed of the interest rate corridor, the one-week repo rate, reserve requirements, FX interventions and the liquidity policy. This study offers an analysis of the effects of the new policy instruments on loan and deposit rates, using bank-level data. The empirical findings suggest that policy stance reflects a combination of interest rate policy components and required reserves.

IV.6.1 Introduction

The CBRT used various policy instruments in the post-crisis period to contain the negative effects of the increased volatility in capital flows on the domestic economy. The use of more than one instrument simultaneously for price stability and financial stability purposes calls for a re-evaluation of conventional channels in the monetary transmission mechanism. In this respect, it is critical to understand how monetary policy instruments in particular affect the bank behavior. In this special topic, the effects of the CBRT's monetary policy instruments on loan and deposit rates are analyzed.

The CBRT's policy instruments can be categorized into three groups as short-term interest rates, the reserve requirement policy and the liquidity policy. The CBRT's active funding policy plays a central role in the determination of short-term interest rates. For example, if the liquidity is solely provided via the one-week repo rate, then the BIST overnight interest rate and the weighted average funding rate will materialize around the one-week repo rate. However, if a large portion of the liquidity need is provided via the overnight lending rate, then the funding rate and the BIST overnight interest rate will be close to the upper end of the CBRT's interest rate corridor. Depending on

Chart IV.6.1
Short-Term Interest Rates
(Percent)



Source: CBRT

the funding composition of the CBRT, it is possible to reduce or increase the spread between the BIST interest rate and the CBRT funding rate. Both the BIST interest rate and the CBRT funding rate may affect the loan and deposit behaviors of banks. One of the objectives of this study is to analyze the relative effects of BIST interest rates and CBRT interest rates on banks' pricing of loans and deposits, and to provide further evidence on the monetary policy transmission mechanism.

The reserve requirement (RR) ratio and the Reserve Options Mechanism (ROM) have been the other instruments widely used by the CBRT in the post-2010 period. The reserve requirement policy of the CBRT differs from a standard RR policy because of the changes in the remuneration and the introduction of ROM. The remuneration of required reserves and the ROM have an indirect effect on banks' intermediation costs and the effective RR ratios. The effective RR ratio does not change significantly over time in standard practices, whereas it may change both at bank level and over time in Turkey depending on the ROM utilization ratio. The variations in RR both across banks and through time facilitate the empirical identification of the effect of RR policies.[26]

IV.6.2 Data and Methodology

Bank level data is used in the study to analyze the relation of the policy mix with loan and deposit rates. As the transition to the new policy mix was a gradual process, there is not a precise starting date for it. Yet, the date June 2010, in which the CBRT began to frequently refer to financial stability in its policy texts, was taken as the starting period for the sample and the period between June 2010 and December 20014 is covered. For this period, data from 19 deposit banks having a significant weight in the sector is used. As of end-2014, the share of these banks in the loan market and the deposit market is 88 percent and 91 percent, respectively. Hence, the sample used in the study offers an adequate representation for the banking sector and the monetary policy transmission mechanism.

26 For further details, please see Alper, Binici, Demiralp, Kara and Özlü (2014).

Loan rates were analyzed separately for commercial and consumer loans. In addition, flow data on loan and deposit rates are used to obtain more timely reactions of policy measures in the analyses. Flow rates indicate the interest rates on newly-opened loan and deposit accounts and are actually in weekly frequencies. Because some macro variables in the analyses are announced on a monthly basis, all data were converted to monthly frequency data by taking the averages of loan and deposit rates and other daily market data. For this reason, data in the econometric analyses are in monthly frequency.

To observe the sensitivity of loan and deposit rates to monetary policy variables, the following dynamic panel model is estimated:

$$ir_{it} = \beta_0 + \mu_i + \beta_1 ir_{i,t-1} + \beta_2 PR_t + \beta_3 X_{it} + \beta_4 Y_t + \varepsilon_{it} \qquad (1)$$

Here, ir_{it} consists of commercial loans, consumer loans and the deposit rate alternatively, PR_t consists of short-term interest rates (upper end of the corridor, lower end of the corridor, average funding rate, one-week repo rate, BIST overnigt interest rate), X_{it} is composed of bank level variables such as the reserve requirement ratio and the non-performing loan ratio, and Y_t is composed of macro and financial indicators for internal or external factors such as inflation, exchange rate, confidence index, which are indicators representing dynamics related with loan supply and demand.

In the period analyzed, there were evident changes in reserve requirement ratios - one of the variables used in the model estimation. The policy developments that triggered the changes in reserve requirement ratios are summarized as follows: the termination of the remuneration of required reserves, the expansion of the scope of required reserves, the diversification of reserve requirement ratios on a maturity basis, the introduction of the facility to hold some percentage of TL required reserves in FX with the reserve options mechanism (ROM) and lastly, the restart of the remuneration of required reserves after October 2014.[27] Due to these implementations, reserve requirement

27 For a more detailed analysis, please see Alper et al. (2014).

ratios significantly differed across time and bank level, which provided important advantages in decomposing the effects of required reserves in econometric analyses.

Taking into account all these developments, the following equation is used to calculate the bank level effective reserve requirement ratio in the period analyzed:

$$RR^c \approx RR\frac{i_d - i_{rr}}{i_d}[x * i_d + (1-x) * ROC * i_{FX})]\,/i_d \qquad (2)$$

Here, RR^c refers to the effective/cost-driven reserve requirement ratio, *RR* refers to the reserve requirement ratio announced by the central bank, i_d refers to the deposit rate, i_{rr} refers to the interest rate applied to required reserves, x refers to the share of TL required reserves, *(1-x)* refers to the share of required reserves held in FX or gold, *ROC* refers to the weighted average reserve options coefficient i_{FX} and refers to the FX-denominated borrowing cost.

The generalized method of moments (GMM) is used as the method for model estimation. This method is used to solve the endogeneity problem originating from the consideration of the gradual adjustments in interest rates and the use of a lagged dependent variable as the explanatory variable.[28]

IV.6.3 Empirical Findings

Analysis results for the dynamic panel model are shown in Table IV.6.1 - IV.6.3. An overall picture of the results suggests that the effect of the policy variables that the CBRT actively uses (short-term interest rates and the reserve requirement ratio) on both deposit and loan rates is positive and statistically significant.

Table IV.6.1 offers a summary of deposit rate analyses. Findings of the analyses shown in columns 1-4 reveal that short-term interest rates have a significant effect on the deposit rate and banks' sensitivity to the CBRT weighted average funding

28 To address the instrument prolification problem arising from the fact that the time dimension is bigger than the number of banks in the sample, the lagged values of the dependent variable used in estimations are limited. For related discussions, please see Roodman (2009).

rate is relatively higher when they are pricing the deposit rate. In fact, according to the analysis results in columns 5 and 6, the funding rate has the highest coefficient among other short-term interest rates that have a significant effect on the deposit rate. In addition, required reserves also have a statistically significant effect on deposit rates. Banks are expected to raise deposit rates in times of an increase in required reserves as they are inclined to obtain more long-lasting funding sources in such periods. As a matter of fact, Alper et al. (2014) indicate that for banks, the short-term funding received from the central bank is not a full substitute for deposit. Exchange rate, inflation and risk premium indicators are also macro aggregates affecting the deposit rate. Although the results suggest that the CBRT overnight lending rate also has a statistically significant effect on the deposit rate, the coefficient is much smaller compared to other policy variables.

Table IV.6.1
Deposit Rates

	(1)	(2)	(3)	(4)	(5)	(6)
1. $i_{t,t-1}$	0.770***	0.567***	0.646***	0.736***	0.535***	0.541***
	(0.007)	(0.021)	(0.016)	(0.014)	(0.024)	(0.023)
2. $RR^{C}_{i,t}$	0.051***	0.063***	0.019***	0.027***	0.047***	0.049***
	(0.006)	(0.009)	(0.007)	(0.005)	(0.009)	(0.010)
3. 1-Week Repo Rate$_t$	0.154***				-0.030	
	(0.010)				(0.020)	
4. Average Funding Rate $_t$		0.387***			0.379***	0.359***
		(0.023)			(0.027)	(0.022)
5. BIST Overnight Interest Rate $_t$			0.254***			
			(0.013)			
6. CBRT Overnight Lending Rate $_t$				0.152***	0.042***	0.028***
				(0.011)	(0.016)	(0.010)
7. BIST Overnight Rate – CBRT Funding Rate Spread$_t$					0.094***	0.105***
					(0.021)	(0.018)
8. Δ USD/TL $_{t-1}$	0.028***	0.019***	0.021***	0.023***	0.016***	0.017***
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
9. Δ EMBI_Turkey $_{t-1}$	0.002***	0.002***	0.001***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
10. Inflation $_{t-1}$	0.159***	0.088***	0.075***	0.099***	0.072***	0.083***
	(0.012)	(0.015)	(0.013)	(0.011)	(0.011)	(0.015)
11. Constant Term	-0.592***	-0.124	0.480***	-0.170*	0.207	0.142
	(0.105)	(0.153)	(0.121)	(0.092)	(0.170)	(0.184)
12. Number of Observations	1045	1045	1045	1045	1045	1045

Note: Analysis Period is June 2010 – December 2014. Dynamic panel model is estimated with one-step system GMM. Standard errors are given in parenthesis and adjusted for eteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Results of the commercial loan rate analysis are reported in Table IV.6.2. Results for commercial loan rates indicate that funding and BIST overnight interest rates affect commercial loan rates, with the BIST overnight interest rate having a stronger impact. In model estimations in which the funding rate and the overnight market interest rate-funding rate spread are used jointly, the second variable, especially, has a statistically significant and larger positive effect. This observation suggests that the commercial loan rate's pricing behavior is very sensitive to the short-term interest rate in the interbank money market. On the other hand, consistent with the findings in Alper et al.(2014), the reserve requirement policy has a significant effect on commercial loan rates. In addition, the risk premium (EMBI-interest rate spread) and the economic sentiment variable

taken from the Business Tendency Survey also have a significant effect in the expected direction.

Table IV.6.2
Commercial Loan Rates

	(1)	(2)	(3)	(4)	(5)	(6)
1. i_{t-1}	0.888***	0.858***	0.821***	0.858***	0.777***	0.820***
	(0.036)	(0.037)	(0.034)	(0.044)	(0.040)	(0.037)
2. $RR^{C}_{L,t}$	0.065***	0.064***	0.037***	0.042***	0.022	0.022*
	(0.014)	(0.014)	(0.014)	(0.013)	(0.014)	(0.013)
3. 1-Week Repo Rate $_{t}$	0.123***				-0.009	
	(0.027)				(0.041)	
4. Average Funding Rate $_{t}$		0.216***			0.135**	0.135**
		(0.036)			(0.057)	(0.053)
5. BIST Overnight Interest Rate$_{t}$			0.235***			
			(0.035)			
6. CBRT Overnight Lending Rate $_{t}$				0.186***	0.074	0.074
				(0.042)	(0.050)	(0.054)
7. BIST Overnight – CBRT Funding Rate Spread $_{t}$					0.264***	0.276***
					(0.079)	(0.075)
8. Δ Overall Economic Sentiment $_{t-1}$	-0.036***	-0.035***	-0.035***	-0.032***	-0.035***	-0.034***
	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)
9. Δ USD/TL $_{t-1}$	0.040***	0.036***	0.023*	0.031**	-0.003	0.020
	(0.013)	(0.014)	(0.013)	(0.014)	(0.020)	(0.013)
10. Δ EMBI_Turkey $_{t-1}$	0.004*	0.004*	0.004**	0.005**	0.007***	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
11. Inflation $_{t-1}$	0.089**	0.020	0.001	0.007	-0.036	-0.003
	(0.045)	(0.043)	(0.046)	(0.044)	(0.050)	(0.044)
12. Δ $NPL^{commercial}_{L,t-1}$	0.083	0.104	0.115	0.078	0.049	0.104
	(0.096)	(0.096)	(0.092)	(0.093)	(0.090)	(0.090)
13. Constant Term	-0.555*	-0.393	0.240	-0.415	1.437***	0.369
	(0.329)	(0.308)	(0.308)	(0.282)	(0.525)	(0.326)
14. Number of Observations	1045	1045	1045	1045	1045	1045

Note: Analysis Period is June 2010 – December 2014. Dynamic panel model is estimated with one-step system GMM. Standard errors are given in parenthesis and adjusted for eteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

Consumer loan analyses are shown in Table IV.6.3. Consumer loans are expected to give a lagged and slow reaction to the policy changes and the changes in macroeconomic conditions, depending on the differences in maturity and market structures. Therefore, one-period lagged values of policy rates were used in consumer loan rate analyses. Both the funding rate and the BIST overnight interest rate are influential in consumer loan rates. The slope of the yield curve, the non-farm unemployment rate and the consumer confidence index are macro variables affecting consumer loan rates.

Table IV.6.3
Consumer Loan Rates

	(1)	(2)	(3)	(4)	(5)	(6)
1. i_{t-1}	0.893***	0.876***	0.871***	0.865***	0.871***	0.872***
	(0.037)	(0.040)	(0.044)	(0.040)	(0.044)	(0.042)
2. $RR^{C}_{L,t-1}$	0.152***	0.170***	0.136***	0.148***	0.121***	0.122***
	(0.031)	(0.030)	(0.025)	(0.028)	(0.027)	(0.027)
3. 1-Week Repo Rate $_{t-1}$	-0.010					
	(0.058)					
4. Average Funding Rate $_{t-1}$		0.206***			0.274***	0.284***
		(0.079)			(0.105)	(0.086)
5. BIST Overnight Interest Rate $_{t-1}$			0.317***			
			(0.084)			
6. CBRT Overnight Lending Rate $_{t-1}$				0.132**	0.014	
				(0.061)	(0.073)	
7. BIST Overnight Rate – CBRT Funding Rate Spread$_{t-1}$					0.388***	0.392***
					(0.143)	(0.144)
8. 5-Year Market Interest Rate-BIST Interest Rate Spread $_{t-1}$	-0.053	0.107	0.282**	0.070	0.288**	0.286**
	(0.074)	(0.088)	(0.113)	(0.082)	(0.115)	(0.114)
9. Δ Non-Farm Employment Ratio $_{t-1}$	1.498***	1.412***	1.503***	1.352***	1.509***	1.515***
	(0.337)	(0.315)	(0.319)	(0.310)	(0.319)	(0.320)
10. Δ USD/TL $_{t-1}$	0.036**	0.030**	0.016	0.035**	0.015	0.015
	(0.014)	(0.015)	(0.017)	(0.014)	(0.017)	(0.017)
11. Δ Consumer Confidence Index $_{t-1}$	-0.05***	-0.05***	-0.054***	-0.056***	-0.053***	-0.053***
	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
12. Inflation $_{t-1}$	0.177***	0.176***	0.107*	0.172***	0.098	0.099
	(0.047)	(0.055)	(0.064)	(0.051)	(0.064)	(0.065)
13. Constant Term	-0.298	-1.798	-2.011**	-1.218	-1.689	-1.668
	(1.093)	(1.203)	(0.979)	(0.990)	(1.265)	(1.273)
14. Number of Observations	1045	1045	1045	1045	1045	1045

Note: Analysis Period is June 2010 – December 2014. Dynamic panel model is estimated with one-step system GMM. Standard errors are given in parenthesis and adjusted for eteroskedasticity. *** p<0.01, ** p<0.05, * p<0.1.

IV.6.4 Conclusion

Findings of the study show that multiple policy rates used by the CBRT are instrumental in driving the bank's interest rate behavior. The interbank overnight interest rate and the CBRT

average funding rate play a main role in banks' pricing of both loan and deposit rates. Although they have qualitatively similar effects, the quantitative effects of these two policy variables on loan and deposit rates differ significantly. Deposit rates are mainly affected by the CBRT funding rate, whereas the interbank money market interest rate; i.e., the CBRT's liquidity policy, plays a more determining role in loan rates (commercial loan rates in particular). These findings suggest that the interest rate and liquidity policies of the CBRT should be seen as mutually complementary instruments in the current monetary policy framework.

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IV.7. Determinants of Real Sector Firms' Borrowing Costs in Turkey

Summary

This note studies determinants of real sector firms' borrowing costs in Turkey, using transaction-based loan-level data. The results suggest that firm borrowing costs move in tandem with the short-term interest rates and confirm transmission of policy rates to lending rates. Moreover, the results suggest that firm characteristics such as indebtedness (leverage ratio), asset size, age, liquid asset position and business efficiency affect borrowing costs.

IV.7.1 Introduction

One of the channels in which the monetary policy influences demand conditions and real economic activity is the credit channel by which the policy instruments (such as the policy rate, required reserves and macroprudential measures) affect the credit supply, medium and long-term interests and thus borrowing costs. The existence of this channel relies on the fact that firms are subject to paying an external financing premium proportionate to the vulnerability of their balance sheets, as asymmetric information problem exists between firms and funders, and the monetary policy's ability to influence this premium (borrowing cost). Meanwhile, the monetary policy can influence corporate borrowing constraints by affecting asset prices and thus companies' balance sheets. In this framework, it is important to analyze the impact of policy instruments on corporate borrowing costs and firm-specific and other macro-economic factors.

Empirical and theoretical literature both present many factors affecting corporate borrowing costs. As there are only limited studies on this issue for Turkey, it would be appropriate to start with factors cited in studies carried for other countries:

Leverage Ratio. A rise in firm's indebtedness may indicate that the firm might have difficulty in paying back its debts in the future. As such, a firm will then be regarded as high-risk, and may have to bear higher costs while borrowing. For instance,

financial accelerator models pioneered by Bernanke, Gertler and Gilchrist (1999), define the leverage ratio (ratio of debts to equity capital) as the primary factor affecting borrowing costs. The empirical literature also suggests that an increased level of company indebtedness or leverage ratio pushes up borrowing costs (Aivazian et. al, 2005; Whited and Wu, 2006; Lu et. al, 2010; Mizen and Tsoukas, 2012).

Age. *A* common argument in financial literature is that companies with a longer history are more resilient to macroeconomic as well as firm-specific developments (Gertler, 1988; Oliner and Rudebusch, 1992). Thus, older firms may have the opportunity to borrow with more favorable credit conditions compared to new companies. As older firms have a long-established lending-borrowing relationship with banks, banks have wider knowledge about these firms and can follow them more closely and effectively which decreases the asymmetrical information problem and thus corporate borrowing costs (Bharath et. al, 2009).

Size. Various studies have shown that small companies are faced with more serious asymmetrical information problem and thus are exposed to higher financing constrains while borrowing; similarly, large companies are able to borrow at lower costs (Gertler and Gilchrist, 1994; Whited and Wu, 2006; Hennessy and Whited, 2007; Mizen and Tsoukas, 2012).

Liquid/ Fixed Assets. There are empirical findings that firms that have low liquid assets or low sales growth rates are regarded as high-risk firms by the banking sector and are exposed to higher borrowing costs (Love, 2003; Whited and Wu, 2006). However, the firm's financing constraints are alleviated if the firm has fixed assets that it can present as collateral (Kiyotaki and Moore, 1997). Similarly, a rise in the price of the fixed assets that the firm presents as collateral may decrease borrowing costs for the firm (Iacoviello, 2005).

Growth Potential. A firm that has a growth potential in the medium/long term is likely to experience fewer difficulties in paying back its debts and therefore to borrow with more

favorable credit conditions. A rise in the firm's stocks or a rise in the ratio of the market value to book value of the firm are indicators of the growth potential of the firm.

Business Efficiency. The way a firm handles its liabilities, claims and stocks is a good indicator of the riskiness of the firm. For instance, firms which are capable of collecting their claims and paying their debts rapidly and effectively, and turning over their inventories rapidly, are firms with high productivity ratios. These firms are expected to borrow with more favorable credit conditions.

Macroeconomic Factors. During periods of boom, companies are able to borrow with lower costs thanks to these factors (such as a rise in company assets, rise in asset prices and in collateral values, high growth potential of companies) and an increase in credit supply. Moreover, during periods of capital inflows, credit supply increases and corporate borrowing costs decrease as banks can find external funds with lower costs in these periods. Lastly, a rise in policy rates, which is an important factor in banks' funding costs, squeezes credit supply and pushes corporate borrowing costs higher.

Other Factors. Another factor affecting corporate borrowing costs is the balance sheets of banks and cost of finding funds (Kashyap and Stein, 2000; Gertler and Karadi, 2011; Gertler and Kiyotaki, 2011). The overall corporate quality level, binding power of debt contracts, rights of funders, effective and rapid implementation of legal regulations, existence of a central authority that can provide information sharing among banks about the strength of borrowers' balance sheets are other factors affecting corporate borrowing costs (Qian and Strahan, 2007).

In this study, the real sector firms' borrowing costs are studied, by using bank-firm credit contracts for firms listed on the BIST and firms' balance sheet data in light of the above-mentioned literature. Specifically, borrowing costs for short-term TL-denominated cash credits with/without collateral and the factors affecting these costs were analyzed. Generalized

methods of moments-GMM were used to estimate dynamic panel models in different specifications and the validity of the results were tested with respect to various aspects.

IV.7.2 Data Set and Methodology

The data set is constructed by merging the consolidated balance sheet and income statement data of non-financial sector firms listed in the BIST for the period between 2003Q1 and 2014Q4 and the CBRT's data set on bank credits. As the data is transaction based, we aggregate the data set. For instance, firms borrow from various banks in different account types in different amounts and maturities, in cash (in different currencies) or non-cash. In this study, only the short-term TL-denominated loans (with weighted average maturity of longer than 90 days and shorter than 366 days) with/without collateral are studied. The loan rates were then aggregated across banks weighted with the principal to obtain firm-specific borrowing costs (interest rate).

Table IV.7.1 presents descriptive statistics on the variables in the data set.

Table IV.7.1
Descriptive Statistics
(2003Q1-2014Q4)

	Average	Median	St. Deviation	Minimum	Maximum	No. of Observations
Borrowing Cost	15,11	13,5	7,61	5,91	53,25	4870
Leverage Ratio	0,50	0,.48	0,26	0,07	1,95	11454
Total Assets (milion TL)	4,43	1,.04	11,79	0,01	135,16	11464
Liquid Assets/ Total Assets	0,34	0,.34	0,20	0,00	0,77	11464
Age (Quarter- Year)	32,57	33,75	14,94	0,25	103,75	11464
Sales Growth	0,01	0,01	0,08	-0,25	0,32	9474
Market Value/ Book Value	1,80	1,31	1,57	-0,10	10,27	10811
ΔPrice of Stocks	0,01	0,02	0,20	-1,31	0,50	10508
Inventory Turnover	9,71	5,44	11,77	1,13	71,20	9449
Accounts Receivable Turnover	9,17	5,50	12,60	1,47	157,69	9803
Accounts Payable Turnover	8,80	6,89	6,98	1,42	56,37	9739
ΔReal GDP	4,77	5,45	4,98	-16,15	11,90	48
ΔPortfolio Flows/GDP	0,78	0,52	1,87	-0,94	11,91	48
3-month indicative interest rate	15,99	12,56	7,48	6,82	44,97	48

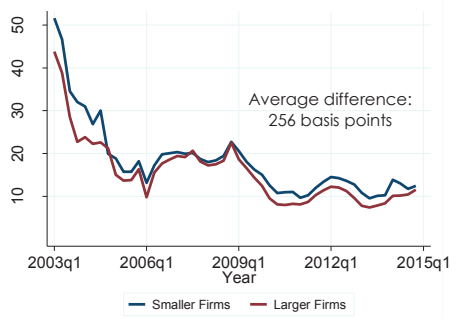
In order to draw an overall picture of the data set, it would be helpful to present the course of aggregated corporate borrowing costs in the respective period (2003-2014) (Chart IV.7.1).[29] Borrowing costs, which dropped rapidly in the first quarters of 2003, increased moderately as of mid-2005 and reached the highest level at the end of 2008. Borrowing costs, which continued to decline gradually till the end of 2010

Chart IV.7.1
Firm Borrowing Costs
(Percent, Short-term, TL, Aggregated)

Source: BIST, CBRT, Authors' calculations

29 Corporate borrowing costs have been aggregated by weighing with principle of credits and a single interest rate has been calculated for each period.

Chart IV.7.2a
Firm Borrowing Costs – Preliminary Findings – Size of the Company (Percent, Short-term, TL, Aggregated)



Source: BIST, CBRT, Authors' calculations

Chart IV.7.2b
Firm Borrowing Costs – Preliminary Findings – Impact of the Leverage Ratio (Percent, Short-term, TL, Aggregated)

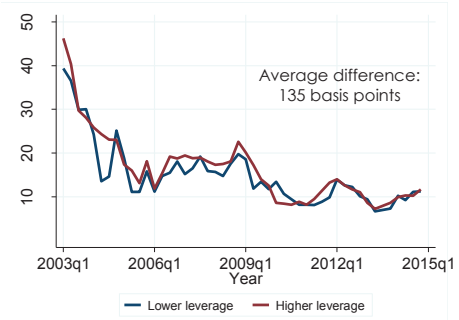
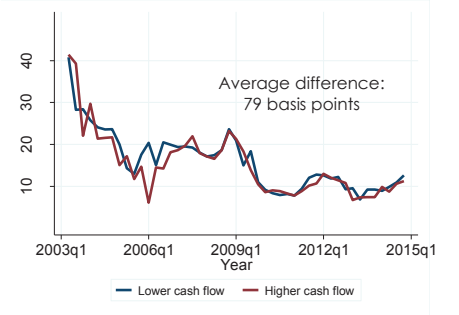
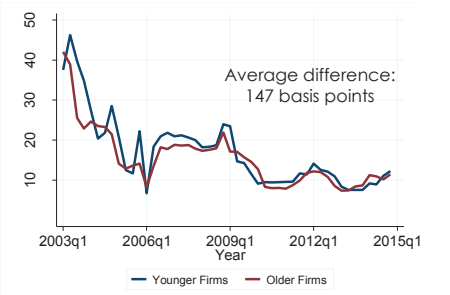


Chart IV.7.2c
Corporate Borrowing Costs – Preliminary Findings – Impact of Cash Flow (Percent, Short-term, TL, Aggregated)



Source: BIST, CBRT, Authors' calculations

Chart IV.7.2d
Corporate Borrowing Costs – Preliminary Findings – Impact of the Age of the Company (Percent, Short-term, TL, Aggregated)



Source: BIST, CBRT, Authors' calculations

in tandem with capital inflows, domestic macroeconomic developments and economic policies, increased in 2011 when tightening policies were implemented and assumed an upward trend again recently due to capital outflows and tight policies.

Before moving on to the econometric model established for analyzing corporate borrowing costs, we would like to present some preliminary findings pertaining to the impact of the potential factors discussed in the second part. Chart IV.7.2a shows borrowing costs of companies in the upper 25 percent-tranche ("large" companies) and companies in the lower 25 percent-tranche ("small" companies). Similarly, borrowing costs of high/low leverage companies, high/low capital flow companies and old/new companies are compared in Chart IV.7.2b-c-d. The preliminary data suggest that old and large companies which at the same time have low leverage ratios and high capital flows bear lower borrowing costs.

IV.7.3 Empirical Results

The dynamic panel model below has been estimated, in light of the literature mentioned in the second part, to analyze the potential factors affecting firm borrowing costs:

$$\text{Borrowing Cost}_{i,t} =$$

$$\beta_1 \log(\text{Total Assets})_{i,t} + \beta_2 \frac{\text{Fixed Assets}}{\text{Total Assets}_{i,t}} + \beta_3 \log(\text{Age})_{i,t} +$$

$$\beta_4 \Delta\text{Sales}_{i,t} + \beta_5 \frac{\text{Market Value}}{\text{Book Value}}_{i,t} + \beta_6 \Delta \text{ Stock Prices}_{i,t} +$$

$$\beta_7 \text{ Productivity}_{i,t} + \beta_8 \Delta\text{Real GDP}_t + \beta_9 \Delta \frac{\text{Portfolio Flows}}{\text{GDP}}_t +$$

$$\beta_{10}\ 3-\text{month indicative interest rate}_t + \rho \text{ Borrowing Cost}_{i,t-1} + \gamma_i + \varepsilon_{i,t}$$

The results can be summarized as follows:

(1) higher leverage ratios translate into higher borrowing costs,

(2) large companies can borrow with lower interest rates,

(3) older companies can borrow with lower costs,

(4) companies with a growth potential (companies with increasing stock prices or market value) can borrow with lower interest rates,

(5) even when company-specific variables are controlled, real economic growth makes a downward impact on borrowing costs, and finally,

(6) a rise in short-term indicative interest rates (a rise in the market interest rate that is sensitive to monetary policy decisions) increases firm borrowing costs.

A rise in the fixed assets decreases borrowing costs; however, the decrease appears to be insignificant in some regression specifications. A rise in portfolio flows also decreases borrowing costs. However, the impact of portfolio flows is not significant when other factors are taken into account.[30]

IV.7.4 Conclusion

This note studies factors affecting borrowing costs of firms listed on the BIST by using micro data. The results are compatible with the literature and suggest that company-specific factors such as leverage ratio, size of the company, age of the company, and the growth potential of the company affect borrowing costs. Finally, it is observed that a rise in short-term indicative interest rate makes an upward impact on corporate borrowing costs. The impact of developments on the credit supply side and other policy instrument will be analyzed in a future study.

Table IV.7.2
Dependent Variable: Firm Borrowing Cost
(Percent)

Independent Variables	System GMM	System GMM	System GMM	System GMM	System GMM
Borrowing Cost$_{t-1}$	0.804***	0.805***	0.788***	0.768***	0.535***
	(0.044)	(0.044)	(0.046)	(0.048)	(0.068)
Borrowing Cost$_{t-2}$	0.013	0.014	0.039	0.058	-0.020
	(0.048)	(0.048)	(0.049)	(0.049)	(0.037)
Leverage Ratio	0.860***	0.825***	0.773***	0.879***	1.636***
	(0.255)	(0.232)	(0.236)	(0.282)	(0.467)
Log(Total Assets)		-0.099**	-0.081**	-0.093**	-0.174**
		(0.039)	(0.039)	(0.036)	(0.069)
Liquid Assets/ Total Assets		-0.319	-0.634*	-0.576*	-0.456
		(0.320)	(0.328)	(0.336)	(0.536)
Log(Age)		-0.276***	-0.343***	-0.176	-0.478**
		(0.101)	(0.131)	(0.121)	(0.203)
Sales Growth			-0.753	-0.168	-0.334
			(0.917)	(0.974)	(0.899)
Market Value/ Book Value				-0.052	-0.076*
				(0.042)	(0.045)
ΔPrice of Stocks				-2.559***	-0.997***
				(0.301)	(0.301)
Inventory Turnover				0.003	0.024***
				(0.005)	(0.008)
Accounts Receivable Turnover				0.022***	0.006
				(0.004)	(0.006)
Accounts Payable Turnover				0.007	-0.053***
				(0.009)	(0.015)
ΔReal GDP					-3.459**
					(1.408)
ΔPortfolio Flows/GDP					-0.541
					(2.066)
3-month indicative interest rate					0.437***
					(0.046)
Constant Term	1.690***	4.130***	4.159***	3.551***	4.497***
	(0.334)	(0.833)	(0.884)	(0.828)	(1.355)
No. of Observations	3,530	3,530	3,289	3,174	3,174
No. of Firms	224	224	212	207	207
AR(2)-p	0.61	0.62	0.54	0.54	0.16
AR(3)-p	0.41	0.41	0.54	0.61	0.84
Hansen-p	0.71	0.70	0.71	0.87	0.88
No. of Instruments	228	231	225	230	233

30 In order to test the validity of the results, the panel model has been estimated by also using fixed effect least squares method, bias-correctedleast squares dummy variable method and difference GMM model. Main findings are by and large robust to such specifications. For further detail, please refer to Altunok and Fendoğlu (2015).

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IV.8. Competitive Structure of the Turkish Banking System

Summary

In a highly competitive banking system, banking services are offered to the customers in a cheaper and more effective way. Moreover, competition contributes to financial stability and rapid monetary policy transmission. In this study, competition in the Turkish banking sector was estimated for each month for a period of more than 10 years and the impact of external financing on competition in the banking system was analyzed. The result of the analysis suggests that external financing induces competition in the banking sector; the banks using the highest amount of external financing compete with other banks to transfer these funds to loans whereas the impact of external financing on competition weakened after the 2008 financial crisis.

IV.8.1 Introduction

In countries like Turkey, where financial activities are predominantly carried out by banks, the competitive structure of the banking system is crucial for the banks to carry out the functions effectively. It is widely accepted that the barriers behind the the competitive structure of the banking system may bring about problems such as high interest rates, moral hazard and adverse selection problems and thus affect the real economy negatively. In markets with more intense competition, these problems would be eliminated to a great extent and customers would have access to high quality services at cheaper cost. A positive correlation is expected between increased competition and growth in the banking system (Levine et. al, 2000; Cetorelli and Gambera; 2001; Collender and Shaffer, 2003; Valverdie et. al, 2003). Competition also contributes to establishment of the financial stability and faster operation of the monetary transmission mechanism (De Jonghe and Vander Vennet, 2008; Schaeck et. al, 2009; Berger et. al, 2009; Turk Ariss, 2010, van Leuvensteijn et. al, 2011). Monitoring the market structure of the banking system and obtacles to more competitive structure has been one of the influential

policy tools recently under the consideration that competition has positive contribution to growth and financial stability.

In this study, first the competitive structure of the Turkish banking system will be estimated by employing the Boone indicator and the impact of external financing on competition will be analyzed. To this end, first the methods analyzing the competitive structure of the banking system in the literature will be presented. Next, the Boone indicator used in estimating the level of competition in the banking system will be described briefly. After discussing the findings, the study will be summarized.

IV.8.2 Methods Analyzing Competition

In the banking literature, competition is generally studied in light of the papers of Bresnahan (1982) and Lau (1982) or calculated by Panzar and Rosse's (1987) H-statistics. Moreover, there are also approaches, e.g. Lerner index, which are based on the price-cost margin and take this margin as a measure of market power. Nevertheless, not only Bresnahan's (1982) and Lau's (1982) works, but also the Panzar-Rosse H-statistics measure the competition in the entire banking system. The Lerner Index addresses this problem but requires a big set of data. Therefore the search for more flexible and easy-to-calculate methods continues. Boone (2001 and 2008) suggested an easily calculableindicator that allows for for measuring product (like the loan market) or sector specific competition measure (like commercial banks, participation and development banks). This approach, which is called the Boone indicator, is widely used in the banking sector to calculate competition in specific sectors and competition in specific product markets.

IV.8.3 Method

The Boone indicator can be interpreted as the measure of the banking sector's sensitivity to marginal cost. Basically, this indicator measures the impact of productivity on banks' profits. This expression is based on the assumption that banks with higher productivity have lower costs. Under this assumption, the profits and market shares of those banks with lower costs would be on an uptrend. The following equation has been estimated

by employing van Leuvensteijn et. al (2011)'s approach to measure the Turkish banking sector's competitive structure.

$$ln\pi_{it} = \alpha + \sum_{t=1,\dots,T} \beta_t d_t \ln MC_{it} + \sum_{t=1,\dots,T-1} \gamma_t d_t + u_{it}. \quad (1)$$

In this equation, π stands for profit, MC for the marginal cost, i for the bank, t for the period for which competition is estimated, d_t for the dummy variable indicating each period and u_{it} for the error term. In the equation, the competition indicator is measured by the banking system's sensitivity to the marginal cost in a certain t period. Therefore, $\partial\pi(.)/\partial MC(.)$ has been estimated for t each period and is equal to the competition indicator βt in the equation. Banks with low marginal cost and thus high productivity will have high profits βt and will assume a negative value. Meanwhile, competition will increase directly proportional to the incremental absolute value of the βt. In this study, the interpretations will be based on the absolute value of βt and trend of competition will be analyzed by periods.

The following equation has been estimated to analyze the impact of external funds that banks obtain on the competitive structure of the system.

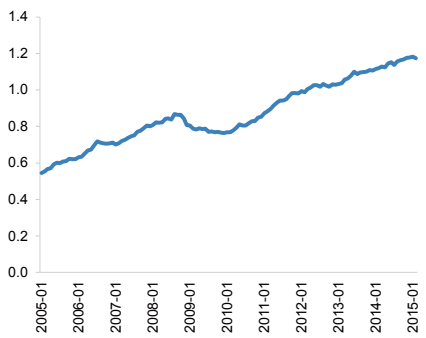
$$ln\pi_{it} = \alpha + \sum_{t=1,\dots,T} \beta_t * d_t * \ln MC_{it} + \sum_{t=1,\dots,T} \delta_t * d_t * \ln MC_{it} * EF_{it} + \sum_{t=1,\dots,T-1} \gamma_t d_t + u_{it}$$

EF_{it} indicates the external funding at time t by bank i. Thus, the competitive structure of the system is estimated as follows:

$$\frac{\partial\pi(.)}{\partial MC(.)}_{t=1,\dots,T} = \beta_t + \delta_t * \overline{EF},$$

Here, $\overline{EF}$ is the average amount of external financing in period t, and the term $\delta_t * \overline{EF}$ indicates the marginal impact of the external financing on competition. δ_t is estimated for all periods.

Chart IV.8.1
Loan/Deposit Ratio of the Banking System



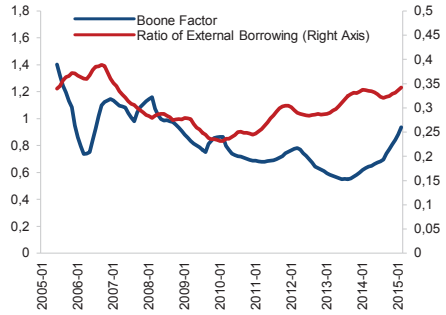
Source: CBRT

IV.8.4 Findings

The competitive structure of the Turkish banking system was estimated on a monthly basis from 2005-01 to 2015-02. The aim of our analyses was to observe the general competitive structure in the banking system and how external financing affected the level of competition. The relationship between competition and external financing in a period of increased credit volume may provide important information to policy makers (Chart IV.8.1).

The banking system's competition structure and the ratio of total external financing to total assets are shown together in Chart IV.8.2. In periods of increased external financing facilities, the funds are expected to be transferred to loans and the level of competition is expected to increase. This relationship was strong until 2008, but weakened after the 2008 crisis. According to the results of the estimations, excluding the intense competitive environment that Turkey enjoyed between 2005-2006, competition between 2006-2014 was quite stable. The competitive structure declined significantly in the post-2008 period to rebound again in time to attain the 2008-level. A similar correlation was observed for the amount of external financing of the banking system. Although this ratio was well above the 2008 level at the end of 2014, the competition indicator is below the level achieved in 2008 demonstrating that, the correlation between external financing facilities and competition has weakened recently.

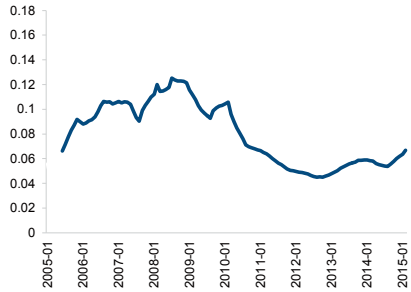
Chart IV.8.2
Boone Indicator and External Financing



Source: Author's Calculations
Note: Boone indicator and external financing are shown in six-month moving averages.

Chart IV.8.3 shows the contribution of external financing to competition. The results suggest that external financing always contribute positively to competition. The more widely the banks use external financing facilities, the more competition will increase throughout the entire sector and banks will compete in lending. Nevertheless, in the post-2008 period, this impact has decreased despite a high external financing amount. This impact has become more stable. The relationship between competition and external financing, which weakened in the post-2008 period, confirms the results presented in Chart IV.8.2. These findings can be attributed to the macroprudential measures that the CBRT introduced after the 2008 crisis towards mitigating the adverse effects of capital inflows. Recently, similar to the practices of other developing countries, the CBRT has introduced several measures to curb the volatility that capital movements may likely cause on the various segments of the markets. These measures have mitigated the transfer of these external financing facilities to loans across the entire banking sector and have thus led to a relative decline in the system's competitive structure.

Chart IV.8.3
Impact of External Borrowing on Competition



Source: Author's Calculations
Note: Impact of the Boone factor on competition is shown in six-month moving averages.

The findings of our analyses were tested with two different robustness tests. First, all banks were grouped across all periods

according to their access to external financing facilities. Each group was labelled with values 0,1,2 and 3 in which 0 indicates a bank that uses external financing facilities the least and 3 indicates the most, and then the equation below was estimated:

$$ln\pi_{it} = \alpha + \sum_{t=1,\dots,T} \beta_t * d_t * \ln MC_{it} + \sum_{t=1,\dots,T} \delta_t * d_t * \ln MC_{it} * G + \sum_{t=1,\dots,T-1} \gamma_t d_t + u_{it}. \quad (3)$$

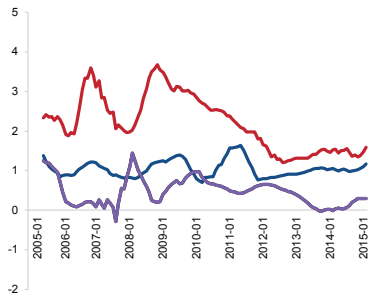
In this equation, the variable indicates the identified groups and assumes the mentioned values. Thus, the competitive structure of the system is estimated as follows;

$$\frac{\partial \pi(.)}{\partial MC(.)_{t=1,\dots,T}} = \beta_t + \delta_t * G$$

The results of the estimations confirm our earlier findings.

As a second robustness test, the cross-sections in our analysis were restricted to the groups defined in our previous robustness test and the Boone indicators were re-estimated (Chart IV.8.4). The expectation behind this grouping is that the more a bank uses external financing facilities, the more competitive the system will become. In other words, banks which use external financing facilities more intensely can offer loans with cheaper resources and can compete with other banks more intensely, while other banks which cannot use external financing facilities will fall behind the competition level in the market.

Chart IV.8.4
Boone Indicator for Groups



Source: Author's Calculations
Note: The Chart shows competition values for different groups of banks that have been grouped based on the criteria of external financing facilities. Competition values are presented in six-month moving averages method. The upper time series indicates competition of the group that enjoys the highest external financing facilities (g4). The time series in the middle belongs to the third and forth groups (g3-g4), and the lower time series belongs to the first and second groups (g1-g2).

These expectations have been proven valid by our analyses. While the competition level among banks that use external financing facilities more intensely is high, competition among banks that use external financing facilities less is lower (Chart IV.8.4). Competition in the first group that covers the banks that use external financing facilities most intensely displayed a significant rise until the end of 2008. In the years to follow, competition in this group declined gradually and showed a flat trend. The trend of competition in the first and second groups are quite similar. Obviously, lower use of external financing facilities means lower competition. In the third and fourth groups with the lowest use of external financing facilities, competition is below the average level and these banks remain

well below the average competition level of the banking system in general.

IV. 8.5 Conclusion

In this study, competition in the Turkish banking sector was estimated on a monthly basis for a period of more than ten years and the impact of external financing on competition in the banking system was analyzed. The impact of external financing system on the competition level was analyzed employing the same approach. The results of the analysis confirmed that external financing increases competition in the banking system. When banks are grouped into four according to their levels of use of external financing facilities, it is observed that banks that use the external financing facilities most intensely tend to compete with other banks more aggressively to transfer these funds into loans. Our study also showed that the upward impact of external financing on competition diminished in the post-2008 period.

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