Does a Credit Channel Exist in Turkey?

by

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Abstract

This thesis examines quarterly bank level data between the first quarter of 1998 and the third quarter of 2007 in order to show the existence of a credit channel in Turkey. Both for the full sample period (1998 -2007) and sub-sample period (2001 – 2007), my findings suggest that bank lending is more sensitive to monetary policy shocks for banks having less liquid balance sheets in Turkey. This result is more pronounced for small banks which are below the 85th percentile in the asset size distribution. These findings show that the broad credit channel is an operating part of the monetary transmission mechanism in Turkey.

Key words: Monetary Transmission Mechanism, Credit Channel, Bank Lending Channel, Liquidity, Contractionary Monetary Policy.

Özet

Uygulanan para politikalarının banka bilançolarında yarattığı değişiklikler yoluyla reel ekonomi üzerindeki etkileri birçok araştırmaya konu olmuştur. Ancak, para politikalarının banka bilançolarının aktif tarafında yarattığı değişimle mi yoksa pasif tarafında yarattığı değişimle mi reel ekonomiyi etkilediği hala belirsizliğini korumaktadır.
Bu çalışma 1998 ve 2007 üçüncü çeyrek arasındaki dönemde üç aylık banka bilançolarını kullanarak Türkiye'de aktif bir kredi kanalının var olup olmadığı araştırmaktadır. Elde edilen bulgular hem 1998-2007 arası dönemde hem de 2001 sonrasında likiditesi düşük olan bankaların borç verme kararlarının para politikası şoklarından daha çok etkilendiğini ortaya koymuştur. Bu sonuç varlık sıralamasına göre 85. yüzdelik değerin altında kalan bankalar için daha belirgindir. Tüm bu bulgular incelenen zaman diliminde Türkiye'de genel krediler kanalının (broad credit channel) parasal aktarım mekanizmasının aktif bir parçası olduğunu ortaya koymaktadır.

Anahtar Kelimeler: Parasal Aktarım Mekanizması, Kredi Kanalı, Banka Kredi Kanalı, Likidite, Sıkı Para Politikası.

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1 Introduction

The role of banks in the monetary transmission mechanism has been the focus of many studies over the last decade due to the importance of them in financial intermediation. There are two main channels that explain the monetary transmission mechanism. The first view is the money view (or the interest rate channel), which operates through the liability side of the banks' balance sheets. This is the traditional Keynesian view of the monetary transmission mechanism and it can be characterized by the simple scheme shown below where M stands for the money supply, P is the aggregate price level, i is the nominal interest rate, Y is aggregate output and I is investment (Mishkin, 2004):

Tight Monetary Policy (M↓) => (M/P) < L (i, Y) =>i↑=> I↓=>Y↓

As seen in the above scheme, when the Central Bank drains reserves from the banking system, this action results in a fall in the money stock and an increase in nominal interest rates. Consequently, economic activity slows down due to a decline in investment demand.

The recent view regarding this issue is the credit view which states that the actions of the Central Bank may also have a considerable impact on the supply of loans by banks and this in turn affects the economic activity. There are three channels of the credit view: the bank lending channel, the broad credit channel and the balance sheet channel.

Bank lending channel argues that following a monetary contraction, the decline in bank reserves lead to a decline in bank loans. What distinguishes this channel from the other two channels of the credit view is that bank lending channel does not require an initial change in interest rates to operate. In contrast, the broad credit channel and the balance sheet channel operate through deterioration in bank balance sheets following an increase in interest rates.

There are two necessary conditions for the existence of a bank lending channel. The first one requires imperfect substitutability between securities and loans as bank assets and the second one requires imperfect substitutability between non-bank sources of finance and loans as firm liabilities. Under these two conditions, when the central bank decreases reserves available to the banking system by a contractionary monetary policy, this action causes a proportional decrease in deposits (Ireland, 2005). This decline in the liability side of the banks' balance sheets should be accompanied by the same amount of decline in the asset side. To the extent in which banks cannot insulate their loans from this decline by portfolio re-arrangements, bank loans decline.

The broad credit channel does not particularly focus on bank loans. Instead, its concern is about the loan supply of all financial intermediaries after a particular monetary policy action. The crucial point for the existence of broad credit channel is imperfect capital markets. Under the Modigliani-Miller Theorem, the choice of debt-equity mix should be uninformative about its investment decisions because the cost of external and internal finance is same for a firm (Hoover, 1988). However, in imperfect capital markets external finance is more expensive than internal finance because information asymmetries between borrowers and lenders cause lenders to induce some costs in order to evaluate loan applicants and monitor the existing loan holders. Compensating lenders for these costs makes external finance more costly than internal finance which is generated within a firm by retained earnings. When a monetary contraction takes place, nominal interest rates increase as described in money view, and consequently balance sheets of firms deteriorate mainly in three ways. First, the interest payments on floating rate debt of the firm increase. Second, increase in nominal interest rates generally leads to a decline in asset prices so the value of assets owned by the firm reduces. Third, since the spending of households is generally depressed following an interest rate increase, decrease in revenues indirectly leads to a deterioration of

the firm's balance sheet. These effects result in a decline in the net worth of firms after a monetary contraction. Since net worth acts as collateral, this reduction in the net worth causes financial institutions to decrease lending. While large firms can compensate the decline in lending due to deterioration of their balance sheets by utilizing other sources of short-term credit like commercial paper market, small firms have limited access to these sources. Therefore, especially the borrowing of small firms decreases and eventually economic activity declines (Walsh, 2003).

For the balance sheet channel, banks' roles as financial intermediaries are crucial both as holders of reserve-backed deposits and as issuers of bank loans. Similar to the broad credit channel, this channel operates through a deterioration of balance sheets following a contraction. As a result, bank loans decline. For some borrowers finding an alternative source of financing other than bank loans is very difficult because of information asymmetries in financial markets. Therefore, spending of these bank-dependent borrowers decreases as a result of the decline in bank loans (Walsh, 2003). Unlike the broad credit channel, the balance sheet channel emphasizes an overall decline in loan supply rather than a decline in supply of loans for small firms only.

This thesis examines the behavior of bank lending after monetary shocks in Turkey during 1998-2007. I try to reach a conclusion about the existence of a credit channel in Turkey by investigating how the lending behavior of individual banks changes after monetary policy actions. In that respect, this thesis can be viewed as an analysis of the broad credit channel in Turkey.

2 Turkish Financial System

In channeling funds to economic units having productive investment opportunities, banking plays an important role. However, the relative importance of other financial institutions, such as insurance companies and pension funds, has started to rise in many developed countries. Even if the relative importance of other financial institutions tends to increase in Turkey as well, banks still play a dominant role in financial intermediation. Table 1 shows that the share of banks in the asset size of financial system shows a gradual decline but the banking sector still constitutes majority with its 86.2 % (as of September 2007) share within the Turkish financial sector. Also, most of the financial institutions other than banks are subsidiaries of the banks, and this situation further increases the importance of banks in financial system in Turkey.

Table 1. The Distribution of Asset Size within the Financial Sector (%)

	1997	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007**
Banks	90.3	87.5	87.4	87.3	86.4	88.0	85.8	86.3	85.6	86.0	86.2
Real Estate Investment Partnerships	2.2	2.0	2.0	1.8	1.2	0.5	0.5	0.5	0.6	0.5	0.5
Insurance Companies	2.1	2.1	2.4	2.4	2.2	2.2	2.5	2.7	3.0	3.0	3.0
Leasing Companies	N/A	2.4	1.6	1.8	2.8	1.6	1.7	1.8	1.3	1.8	1.9
Factoring Companies	0.4	1.1	1.2	1.1	1.2	0.9	1.0	1.1	1.1	1.1	1.1
Consumer Finance Companies	0.2	0.2	0.2	0.5	0.3	0.2	0.3	0.4	0.5	0.6	0.6
Securities Stock Broker	0.5	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.5	0.5	0.5
Securities Investment Funds	1.0	1.2	2.1	2.2	3.1	3.9	6.7	6.7	6.2	4.9	4.7
Pension Funds	3.3	2.8	2.6	2.5	2.4	2.3	1.1	1.1	1.2	1.5	1.5
Total	100	100	100	100	100	100	100	100	100	100	100

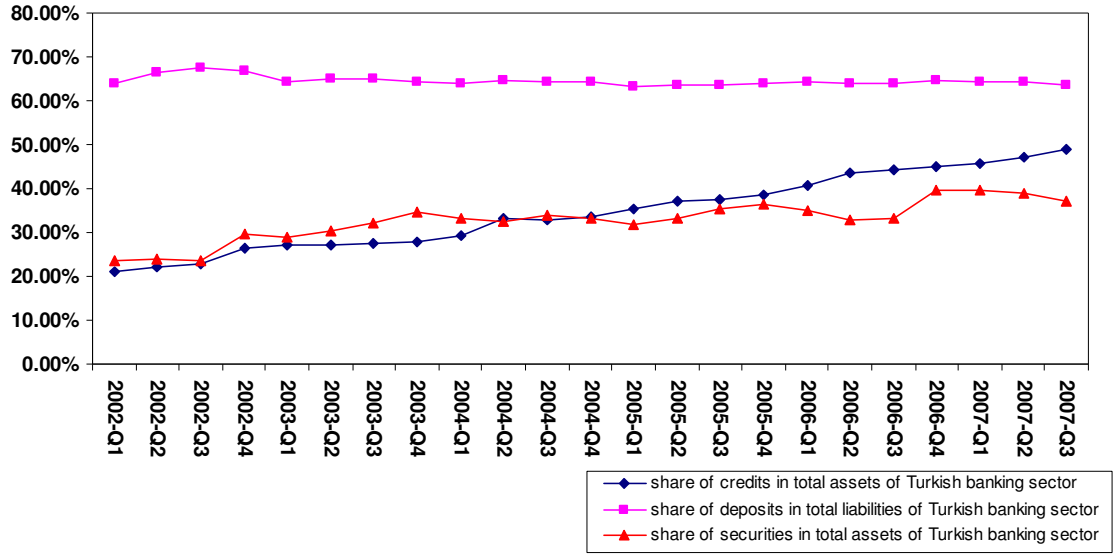
* As of September 2007
Source: Banking Regulation and Supervision Agency

2.1 Turkish Banking Sector

As of September 2007, there are 50 banks in Turkey of which there are three state banks, thirteen private banks, sixteen foreign capital commercial banks, thirteen development and investment banks, four participation banks and one Savings Deposit Insurance Fund (SDIF) bank. (Financial Markets Report, September 2007)

When the asset structure of banks is analyzed, the share of credits in total assets presents an upward trend between 2002:Q1 and 2007:Q3 as seen in Figure 1. While the banking sector credits constituted 21% of total assets in 2002:Q1, this number became 49% as of 2007:Q3. The improving economic conditions, decreasing interest rates and positively affected expectations due to successful stabilization program applied since 2001 crisis have led both spending of households and investment of firms to pick up. Furthermore, high growth rates and expansionary policies in US have led global liquidity surplus which has been mainly directed to developing countries, such as Turkey, having good investment opportunities. As a result, as of 2007:Q3 foreign direct investment (FDI) almost tripled compared to 2001, and during this period compound annual growth rate of FDI became 27%. All in all, spending and investment expenditures increased due to not only favorable economic conditions in Turkey but also global liquidity surplus well. To finance this increased spending and investment demand, the share of bank credits in total assets has presented an upward trend. The share of securities portfolio in total assets also went up during this period but at a slower rate than the share of credits does. On the liability side, the share of deposits in total liabilities stayed more or less stable around 64% in Turkish banking sector over the 2002:Q1-2007:Q3 period.

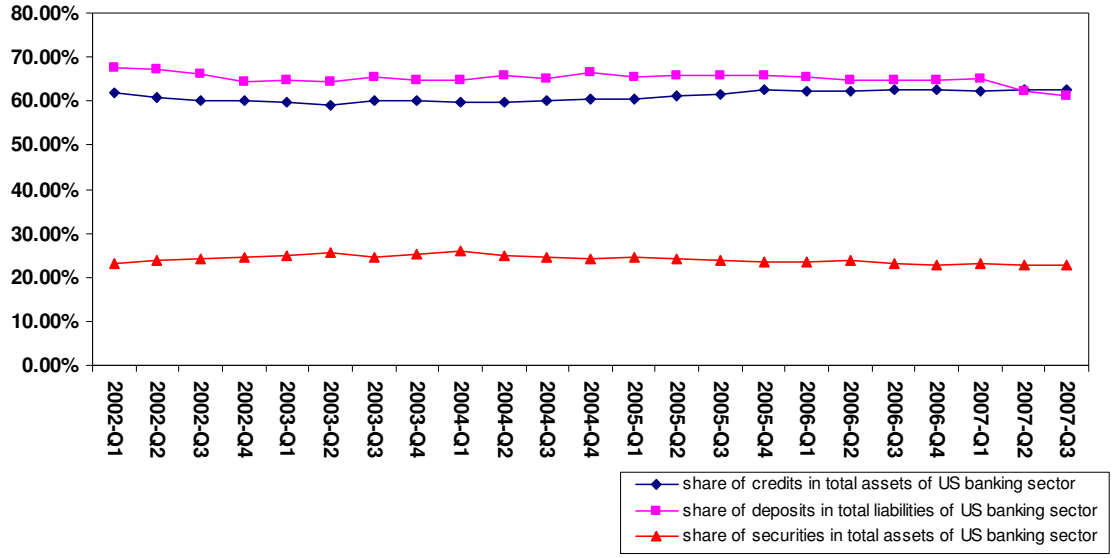
Figure 1. Asset Structure of Turkish Banking Sector



Source: The Banking Association of Turkey

When we compare these figures to the ones observed in developed countries, Figure 2 tells us that US commercial banks' share of securities portfolio in total assets was almost constant at 24 % between 2002:Q1 and 2007:Q3 (while this number was about 24% in Turkey as of 2002:Q1), and the gap between Turkey and US regarding this ratio widens as time passed (14 % gap as of 2007:Q3). The share of credits in total assets in US stayed around 61% but Turkey gets closer to US by increasing this ratio from 21% to 49% during this period. Furthermore, the share of deposits in total liabilities declined a little bit in US banking sector (from 67% to 61%) but it was very close to the one observed in Turkey over this period (approximately 63%).

Figure 2. Asset Structure of U.S. Banking Sector



Source: Federal Reserve Statistical Release, H.8, Assets and Liabilities of Commercial Banks in the United States

Table 2. Concentration Indicators in Banking Sector

	%	*2002*	*2003*	*2004*	*2005*	*2006/6*
Total Assets	***Share of first 5 banks***	58.4	60.3	59.5	63	60.3
	Share of first 10 banks	80.8	82.3	84	85	84
	HH Index*	882.9	942.1	948.9	980.5	918.4
Loans	***Share of first 5 banks***	56.3	54.7	54.1	56.3	56.7
	Share of first 10 banks	77	76.8	79	81	81.1
	HH Index	792.1	774.2	779.6	837.3	850.3
Deposits	***Share of first 5 banks***	62.2	63	64.9	66.1	65.1
	Share of first 10 banks	86.5	87.6	89.6	89.8	88.9
	HH Index	1014.1	1080.5	1157.7	1127.6	1084.3
Total Own Funds	***Share of first 5 banks***	63.1	63.5	58.1	55.8	52.7
	Share of first 10 banks	83.8	84.9	80.3	78.7	78.5
	HH Index	1003.2	1024.6	862.9	841.3	788.7
Derivative Financial Instruments	***Share of first 5 banks***	63.9	63.4	59.7	55.3	48.6
	Share of first 10 banks	81.9	81.6	79.7	79.5	77.2
	HH Index	1052	1045	881.1	802.7	697

* Herfindahl-Hirschman Index is defined as the total of squares of each bank's market share, which is stated by percentage.
Source: Banking Regulation and Supervision Agency (Latest version of this table is available as of June 2006)

Concentration of the banking sector is an important issue in analyzing the relative importance of the credit channel. Since large banks have easy access to uninsured sources of finance, bank loans are expected to be less sensitive to monetary shocks among this group. From Table 2, it is seen that the degree of concentration of the Turkish Banking Sector showed an upward trend in total assets over time but this is recently reversed.

In addition to this high concentration in the banking sector, two of the top five banks and three of the top ten banks are state banks. Existence of the state banks can decrease the relative importance of the credit channel because their primary goal is to support small entrepreneurs and agriculture instead of profit maximization. Also, their behavior in extending loans can be influenced by political factors. As a result, the amount loans extended by state banks can be less responsive to monetary shocks.

Even though these characteristics of the Turkish banking sector impede the course of credit channel, bank loans play a special role especially for small and medium size firms in Turkey due to unavailability of alternative sources of finance. The high concentration of the banking sector, the existence of state banks among large banks and the financing of small and medium size firms mainly by bank loans motivate me to search for the credit channel in Turkey among different size groups of banks separately.

3 Literature Review

Several studies have tried to identify how economy responds to monetary policy shocks and through which channels influence of monetary policy is exerted on the economy. Many of these studies show that the interest-rate channel alone is not enough to explain the economy's response to a monetary policy shock. This finding prompted the economists to search for alternative monetary transmission mechanisms like the credit channel.

Bernanke and Gertler (1995) claimed that interest rate channel should be accompanied with the balance sheet channel in the existence of imperfect capital markets because increase in interest rates following a monetary contraction has direct and indirect effects on the firms' balance sheets. Direct effect comes through increased interest payments on the floating debt of firms whereas indirect effect operates through the decline in the present value of long term assets. Hence, Bernanke and Gertler (1995) analyzed the behavior of business fix investment, spending by business on structures, equipment and software, after a monetary contraction and they found that it declines with a greater lag than other types of spending. This finding is consistent with the existence of balance sheet channel since the effect of interest rate rise on the firms' cost of borrowing through the balance sheet channel will materialize probably with a lag. They looked at the business fix investment, rather than the total investment in order to distinguish the investment in inventories which temporarily increases due to decreased spending following a contraction.

In empirical studies trying to show the existence of a credit channel, the main difficulty is to distinguish loan supply shifts from loan demand shifts at the aggregate level. To overcome this problem, Kashyap, Stein and Wilcox (hereafter KSW), (1993) created a mix variable (ratio of bank loans to commercial paper plus bank loans) and examined its movement after monetary policy shocks. According to the money view, the rise in interest rates after a contractionary monetary policy decreases investment, and this leads to a decline

in demand for not only bank loans but also non-bank sources of credit. If the money view were the only operating channel in the monetary transmission mechanism, then after a contractionary monetary policy the decline in bank loans would be driven only by the decrease in the *demand* for loans. Since the demand for non-bank sources of finance, such as commercial paper, would also decrease, the mix variable would stay the same. However, if tight monetary policy also reduces bank loan *supply* through the credit channel, some borrowers who are still searching for credit but cannot get them from banks might substitute commercial paper for bank loans. Consequently, this leads to a reduction in the mix variable. KSW showed that the mix variable shows a decline after a monetary contraction in the United States, supporting the argument that a credit channel exists in addition to the interest rate channel.

Oliner and Rudebusch (1996) questioned whether changes in the *aggregate* financing mix can be taken as an evidence for the existence of a credit channel in an economy with heterogeneous firms. They proposed that any change in the aggregate financing mix after a contractionary monetary policy shock can be due to substitution of nonbank debt for bank debt and/or shift of all types of credit from small firms to large ones. According to the broad credit channel, external finance premium caused by information asymmetries between borrowers and lenders increases following a monetary contraction especially for small firms. Therefore, broad credit channel implies that all types of credit are redirected from small firms to large ones after a tight monetary policy. Since large firms do not rely on bank debt as much as small firms do, bank loan share can decline at the aggregate level even if it small and large firms do not substitute away bank credits to commercial paper. Therefore, observed decline in the aggregate mix variable after a contractionary monetary policy does not necessarily point out for operative bank lending channel or balance sheet channel. Even in the absence of compositional shift in loan demand, decline in the aggregate mix variable formed by KSW

cannot be taken as an evidence of credit channel because assuming the bank loan supply stay same following a contraction, any shift towards commercial paper from other sources of short term financing, such as loans from insurance and finance companies, may lead to a decline in mix variable as well. Identifying the appropriate substitutes of bank debt is an important issue since decline in the aggregate mix variable of KSW may be driven by substitution of commercial paper for other forms of nonbank finance without any change in the amount bank debt in an economy. Therefore, Oliner and Rudebusch defined a new mix variable, $mix^{O\&R}$ (ratio of bank loans to commercial paper, bank loans and *other* - which stands for other forms of finance), to find empirical evidence for this view by examining the US manufacturing sector between 1974 and 1991. They found that after a monetary contraction, aggregate financing $mix^{O\&R}$ declines as KSW proposed but neither the $mix^{O\&R}$ variable of large firms nor the one of small firms change significantly. This result led them to look at the behaviors of the components of the $mix^{O\&R}$ variable, namely bank debt and total debt, separately following a monetary contraction. They observed that total debt stock increases for large firms and decreases for small ones after a monetary tightening. More importantly, between these two groups difference of total debt growth is significant. This result can be taken as an evidence for the idea that observed decline in aggregate financing $mix^{O\&R}$ after contractionary monetary policy can be due to compositional shifts in loan demand rather than the decline in loan supply. In the light of these findings, they concluded that over the period covered, the broad credit channel seems operative in US due to the significant decline in the borrowing of small firms following a monetary contraction.

The response of KSW (1996) to this alternative explanation was to observe the behavior of the aggregate mix variable among large and small firms after a monetary policy contraction without changing the definition of mix variable as Oliner and Rudebusch did. They found that tight monetary policy leads mix^{KSW} (ratio of bank loans to commercial paper

and bank loans) variable stays the same among small firms. This result is expected in the sense that the data set provided by Oliner and Rudebusch includes small firms mostly bank financed. However, after a monetary contraction mix^{KSW} variable declines among large firms as aggregate mix^{KSW} variable does. Substitution away from bank loans to commercial paper indicates that some large firms still searching for credit have to switch from bank loans to commercial paper due to decreased *loan supply* following a monetary contraction. These findings suggest that rather than disaggregating the data, redefining the mix variable led Oliner and Rudebusch to end up with different results. Then, KSW observed the behavior of "other" over the period covered by data set and they found that its behavior is so erratic. Also, running a regression in order to assess the response of "other" to monetary policy shocks gives insignificant results due to large standard errors. Even if KSW cannot provide a clear answer for the effect of "other" variable on disaggregated results of Oliner and Rudebusch, they show that by simply changing the definition of mix variable we cannot rule out the possibility of operative credit channel during the period examined. What they propose is to employ both individual bank level and firm level data for getting much more detailed information on credit channel.

Because distinguishing shifts in loan supply from shifts in loan demand is difficult by using aggregate data, micro data is used in some studies in order to explore cross-sectional implications of a broad credit channel. Kashyap and Stein (2000) examined the lending behavior at the individual bank level. Their underlying premise is that banks cannot frictionlessly switch between uninsured sources of finance and insured deposits. Therefore, after a contractionary monetary shock the decline in insured deposits cannot be compensated by a proportionate increase in uninsured sources of finance, such as CDs, and consequently banks' ability to extend credits decreases. However, the extent to which the monetary contraction is effective on the lending behavior of a bank depends on the bank characteristics.

The most important ones are the size and the liquidity of the bank. Hence, we argue that they have the broad credit channel in mind, similar to Oliner and Rudebusch (1996).

Kashyap and Stein's first hypothesis is that as the liquidity constraint on banks is intensified, these banks are expected to lend less after a monetary contraction. Mathematically, $\partial^2 L_{it} / \partial B_{it} \partial M_t < 0$ where L_{it} is a bank-level measure of lending activity, B_{it} is a measure of balance sheet strength, and M_t is a monetary policy indicator.

The second hypothesis is related to the size of a bank. Since large banks have easier access to uninsured sources of finance compared to small banks, their lending behavior is expected to be affected less from monetary shocks ($\partial^3 L_{it} / \partial B_{it} \partial M_t \partial Size_{it} > 0$).

In this thesis, I will test these two hypotheses for Turkey during the 1998 – 2007 period.

4 Methodology and Data

Following the method developed by Kashyap and Stein (2000), I estimate the quantity of $\partial^2 L_{it} / \partial B_{it} \partial M_t$ for each bank. To that end, I employ a two-step approach. The data is obtained from the Banking Association of Turkey and from the Central Bank of the Republic of Turkey. This data set contains macroeconomic variables: such as real GDP and overnight interest rate, and bank level variables: total loans for 39 quarters during 1998:Q1 through 2007:Q3.

I also consider a sub-sample estimation for the period 2001:Q1 – 2007:Q3 because before 2001, Central Bank of Turkey did not have interest rates as the operating tool. By restricting my sample to 2001 – 2007, I try to assess whether my results change or not.

In the first step, I run a regression across banks for each quarter such that log change in total loans ($\Delta \log(L_{it})$) is regressed on three[1] lags of itself and the ratio of cash and securities to total assets from the previous period (B_{it-1}):

$$(1) \quad \Delta \log(L_{it}) = \sum_{j=1}^{3} \alpha_{tj} \Delta \log(L_{it-j}) + \beta_t B_{it-1} + \varepsilon_{it}$$

The main interest in this regression is on the coefficient of $B_{it-1,}$ β_t which measures the importance of the liquidity constraints for a given bank in a particular time period. The sign of β_t coefficients are expected to be positive especially for small banks since their lending decisions should be more constrained by liquidity concerns at a given time because of their difficulty to access uninsured sources of finance.

In the second step, estimated β_ts from the first step are taken as dependent variables in a time-series regression. In fact, two methods are utilized in this step: the first one is the Ordinary Least Squares (OLS) and the second one is the Weighted Least Squares (WLS) with weights that are inversely proportional to the standard error of each estimated β_t. The aim of

[1] AIC was used in order to decide the number of lags that would be used in the specifications.

the second step regression is to detect whether monetary policy shocks affect the intensity of liquidity constraints on banks' lending. I use the overnight interest rate[2] in identifying monetary policy shocks. Two specifications of the second step regressions are employed. As right hand side variables, the first one (univariate specification) includes the contemporaneous value and three lags of the change in the monetary policy indicator M_t which is the overnight interest rate and a linear time trend to account for the factors affecting β_t such that not directly observable but highly correlated with time:

$$(2) \quad \beta_t = \eta + \sum_{j=0}^{3} \varphi_j \Delta M_{t-j} + \delta Time_t + \upsilon_t$$

Since shocks to the bank's equity capital can decrease bank lending as contractionary monetary policy would do, one should decide whether the second step regression reflects the effect of monetary policy shocks or indirect bank capital shocks on β_{it}. By adding GDP growth rate to the second step regression we can solve this problem. If the results obtained from the second step were driven by bank capital shocks, the monetary policy indicator would loose its significance and the coefficient of GDP growth would be negative. Therefore, in the second version (bivariate specification), the contemporaneous value and three lags of real GDP growth are included in addition to the right hand side variables in equation (2):

$$(3) \quad \beta_t = \eta + \sum_{j=0}^{3} \varphi_j \Delta M_{t-j} + \delta Time_t + \sum_{j=0}^{3} \gamma \Delta GDP_{t-j} + \upsilon_t$$

In both specifications of second step regressions, our concern is on the sign of the sum of the φ's. The first hypothesis, $\partial^2 L_{it} / \partial B_{it} \partial M_t < 0$, can be expressed as $\partial^2 L_{it} / \partial B_{it} \partial r_t > 0$ since a monetary contraction, or negative shocks to M_t, means positive shock to the overnight interest rate, r_t. According to the two hypotheses stated earlier, for small banks one can

[2] Both interbank interest rate between banks and interbank interest rate between banks and the Central Banks were used as an indicator of monetary shocks.

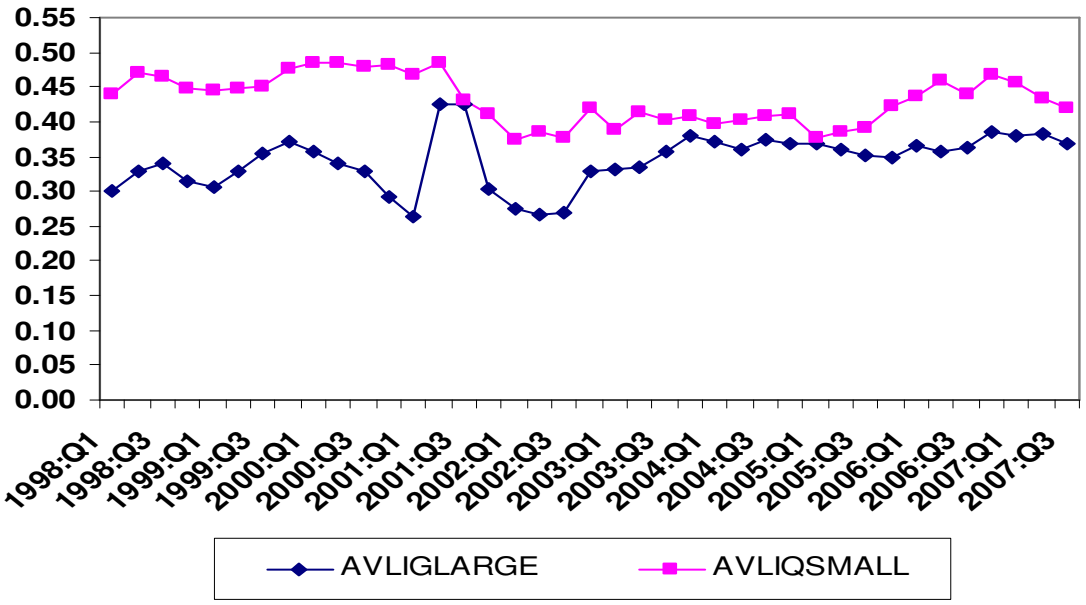
expect an increase in β_t after a monetary contraction which means a positive sign for the sum of the φ's. Since small banks do not have easy access to uninsured sources of finance, their lending decisions are affected from monetary policy shocks more as their liquidity positions decline.

Since internal liquidity position is much of a concern for small bank's lending decision in the case of a monetary policy shock, Kashyap and Stein (2000) examined small and large banks separately between 1976 and 1993 in the US. Banks having total assets above 99^{th} percentiles were taken as large banks and this two-step procedure was applied to large and small banks. For small banks, the sum of the φ's was positive and more significant compared to the large banks. Therefore, they concluded that the credit channel seemed more operative for small banks between 1976 and 1993 in the US. Following Kashyap and Stein, I use this two-step procedure for small and large banks separately to see whether a broad credit channel exists in Turkey. Among 37 banks, I take the 85^{th} percentile as a cutoff point to separate large and small banks.

5 Empirical Results

Figure 3 shows the average liquidity ratio[3] for small and large banks over the period 1998-2007 in Turkey. AVLIQLARGE stands for the average liquidity ratio for large banks and AVLIQSMALL stands for the average liquidity ratio for small banks. As seen in Figure 1, average liquidity ratio is always higher for small banks between 1998:Q1 and 2007:Q3 in Turkey. This pattern reflects the fact that liquidity is much of a concern for small banks because depletion of deposits requires small banks to cut back on the asset side of the balance sheet most of the time whereas large banks can generally compensate the decline in the liability side of the balance sheet by other sources of finance such as the credit extended by foreign banks. As 2006 Annual Report of the Banking Regulation and Supervision Agency reveals, syndicated loans extended by foreign banks have started to constitute an important source of finance for large banks especially after 2004.

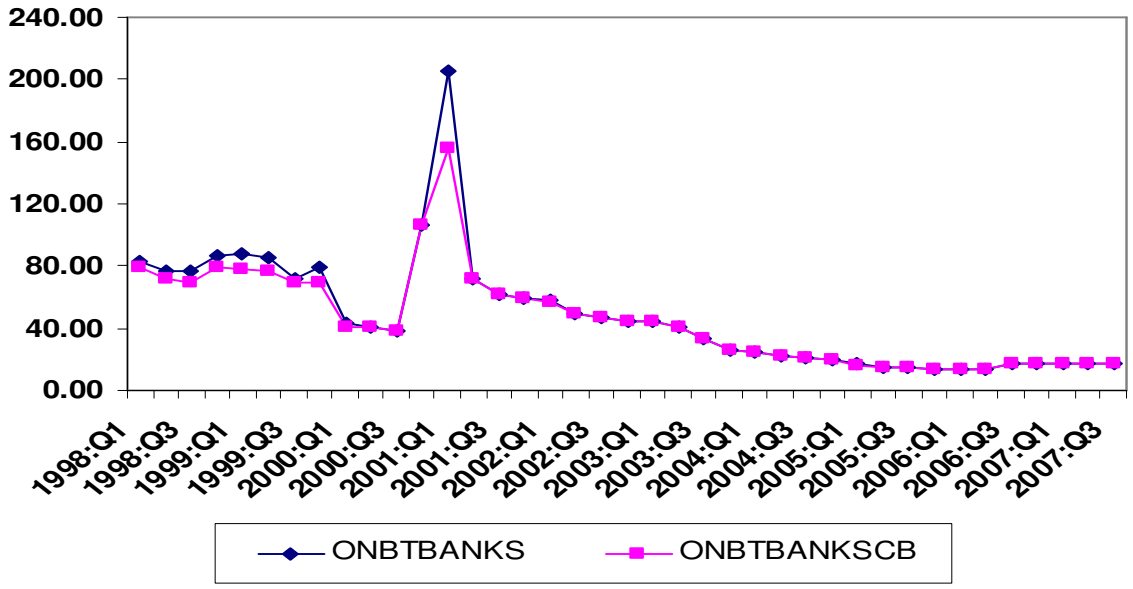
Figure 3. Average Liquidity Ratios for Small and Large Banks in Turkey (1998:Q1 & 2007:Q3)



[3]Liquidity ratio shows the ratio of cash and securities to total assets.

As a monetary policy measure the overnight interest rate is used in this analysis. In fact, there are two series for the overnight interest rate in Turkey: interbank interest rate between banks and interbank interest rate between banks and the Central Bank.

Figure 4. Overnight Interest Rates between 1998:Q1 & 2007:Q3



In Figure 4, ONBTBANKS stands for the overnight interest rate between banks and ONBTBANKSCB stands for the overnight interest rate between banks and the Central Bank. Since both series show almost an identical pattern between 1998:Q1 and 2007:Q3, only the results obtained when interbank interest rate between banks and the Central Bank is used as a monetary measure are reported.[4]

As discussed earlier, estimated β_t coefficients from the first step regressions are expected to be negative for a given bank size because among the banks in the same size class, the bank having more cash and securities, which means more liquid, can reduce their buffer-stock of cash and securities in response to a policy induced decline in reserves. Consequently, the more liquid bank has a higher chance of preventing its loan supply from decreasing after a

[4] I checked the robustness of results when the interbank interest rate between banks was used as a monetary policy measure and the results were unchanged.

monetary contraction. Therefore, the change in total amount of loans following a contraction should decrease as the liquidity of bank increases in a particular bank size. This in turn implies a negative coefficient for β_t. However, across different bank sizes, we cannot reach this conclusion. Even if the small banks' liquidity ratios are higher compared to the large banks', we cannot expect small banks to be less sensitive to monetary contraction by simply bringing down their securities portfolio rather than loan supply. Since they do not have easy access to alternative sources of finance as large banks do, they cannot decrease the liquidity ratio sharply to protect loan supply after a contraction. Therefore, I explore the behavior of estimated β_t coefficients in a particular bank size for the 2001-2007 and 1998-2007 periods separately.

As presented in Figure 5, estimated β_t coefficients for small banks are statistically significantly negative after 2001 except for 2002:Q2, 2004:Q4, 2005:Q2 and 2006:Q3 observations. For the positive estimates, only the figures we got for 2002:Q4 and 2004:Q1 are statistically significant at this level of confidence.

Figure 5. Estimated β_t Coefficients for Small Banks between 2001 & 2007

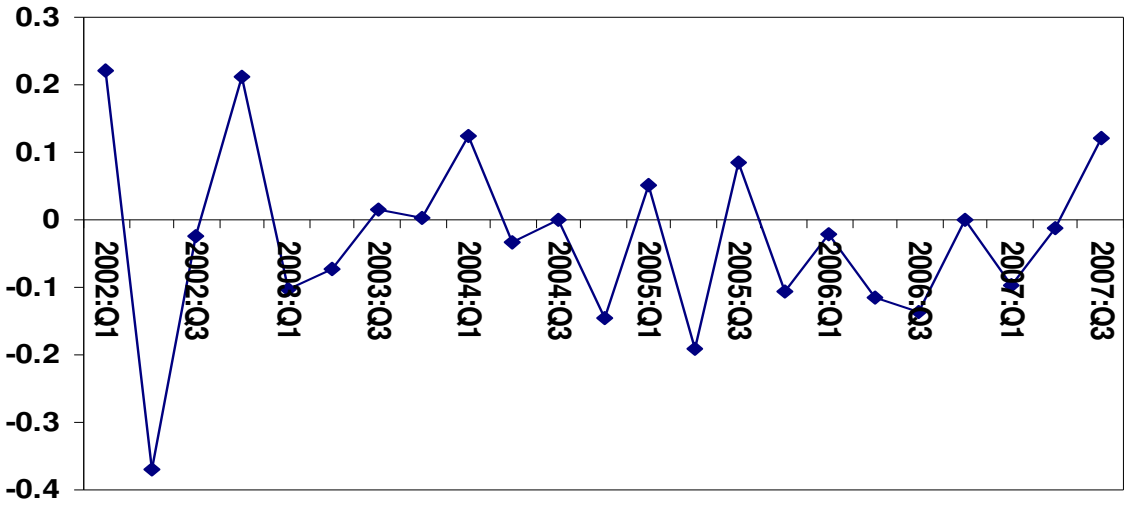
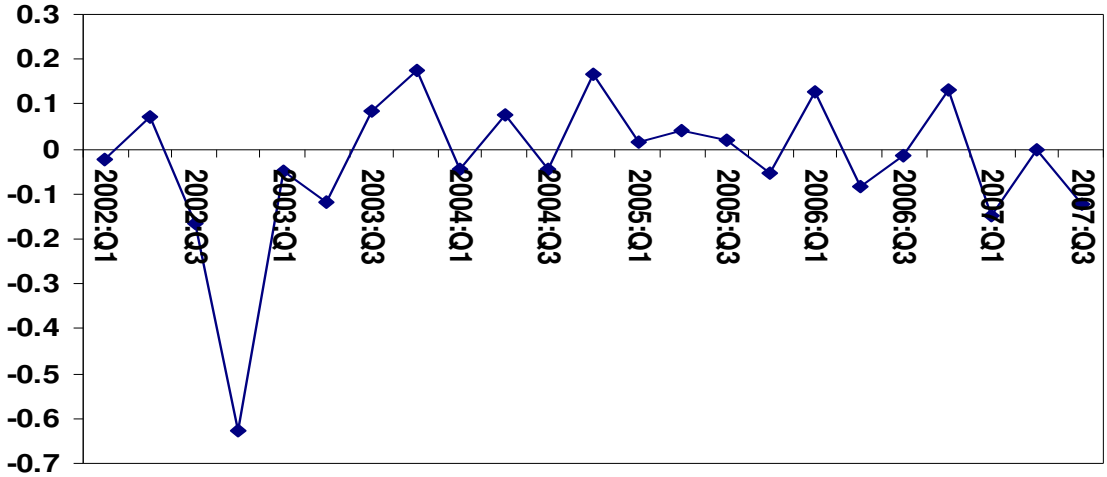


Figure 6 shows the estimated β_t coefficients for large banks between 2001 and 2007. The results seem in line with the ones observed for small banks during this period. Excluding the β_t coefficient estimates for 2004:Q4 and 2006:Q1, all positive estimates are statistically insignificant at 90% level of confidence whereas negative estimates are statistically significant except for 2002:Q3 and 2006:Q2.

Figure 6. Estimated β_t Coefficients for Large Banks between 2001 & 2007



As presented in Figure 7, first step regressions yield mostly negative β_t coefficient estimates between 1998 and 2007, and only the 2002:Q2, 2004:Q4, 2005:Q2 and 2006:Q3 estimates among these negative figures are statistically insignificant at 10% significance level. On the other hand, positive estimates are statistically insignificant except for 2001:Q4, 2002:Q4 and 2004:Q1.

Figure 7. Estimated β_t Coefficients for Small Banks between 1998 & 2007

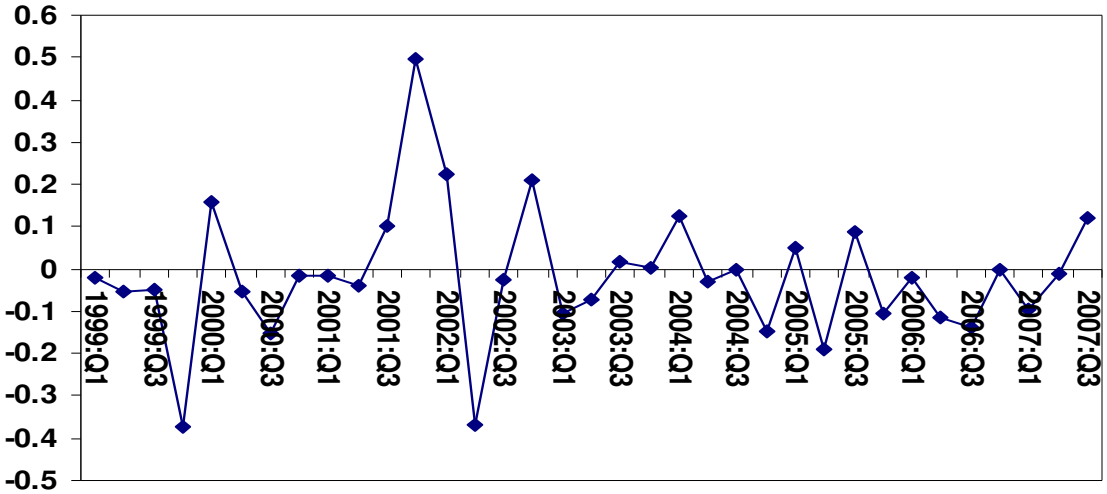
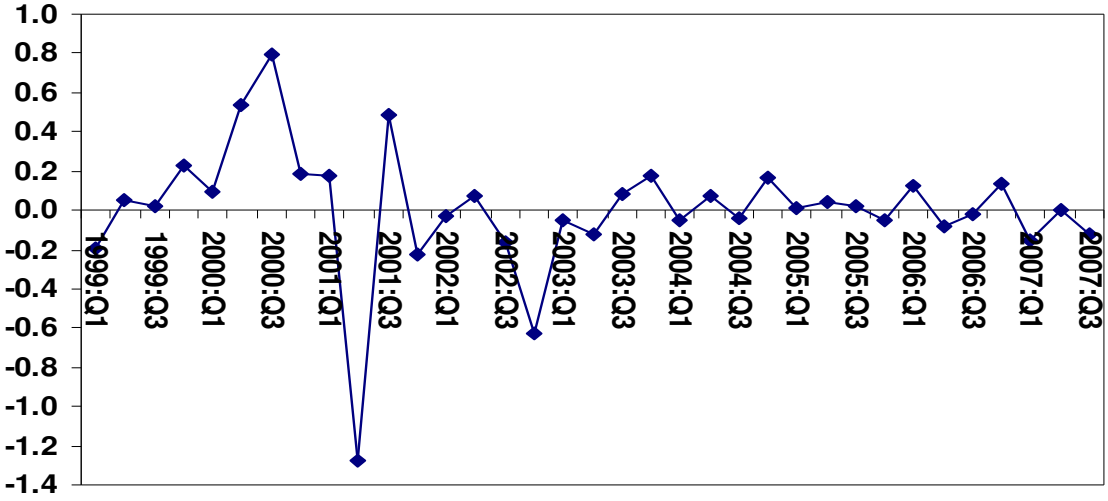


Figure 8 shows that during the 1998-2007 period, β_t coefficient estimates are mostly positive for large banks, and except for 2000:Q1, 2000:Q4, 2004:Q4 and 2006:Q1 these positive estimates are statistically significant at 10% significance level. Positive coefficient estimates mean that as the liquidity of a large bank increases, change in total amount of loans in response to a monetary contraction increases as well between 1998:Q1 and 2007:Q3. Since large banks have lower levels of liquidity ratio as seen in Figure 3, an increase in this ratio at these low levels may not have lessen the effect of monetary contraction of bank loan supply as predicted above. On the contrary, out of sixteen negative estimates we get statistically insignificant results only for 1999:Q1, 2002:Q3 and 2006:Q2.

Figure 8. Estimated β_t Coefficients for Large Banks between 1998 & 2007



5.1 Results of Second Step Regression – Full Sample

Table 3 and Table 4 show the OLS and WLS estimates of the sum of the coefficients on the interbank interest rate between banks and the central bank (i.e. sum of the φ's) under the two specifications of the model between 1998 and 2007, respectively. Assuming the operative broad credit channel, banks with less liquid balance sheets should reduce lending more after a contractionary monetary policy because these banks cannot preserve liquidity by simply bringing down their cash and securities. This effect should be more pronounced among small banks since they cannot reach uninsured sources of finance as easily as large banks do, and this prevents them from covering any decline in the amount of deposits by increasing the amount of other sources of finance. Therefore, contractionary monetary policy should intensify the effect of liquidity position on lending especially for small banks, and this indicates a positive sign for the sum of the φ's in our specification. As seen in Table 3 and Table 4, under both specifications the sign for the sum of the φ's is statistically significantly positive for small banks during the 1998-2007 period but it is statistically significantly negative for large banks for this period. These findings suggest that liquidity concerns of

small banks on their lending decisions intensify following a monetary tightening however this concern diminishes for large banks between 1998 and 2007. Sengonul and Thorbecke (2005) employed the same methodology over the period 1997-2001 in Turkey, and for small banks they found positive and significant coefficients for the sum of the φ's under both specifications. Like Sengonul and Thorbecke's findings, my results for the period 1998-2007 are in line with the theory since it states that among small banks contractionary monetary policy matters especially for less liquid banks whereas large banks' liquidity position is not expected to have an important influence on their lending decisions after monetary contraction because they have easy access to uninsured sources of finance.

Table 3. Results of Two-Step OLS Estimation Procedure: Sum of Coefficients on Monetary Policy Measure under Both Specifications between 1998 & 2007

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank		(# of observations=35)
Sum of Coefficients on overnight interest rate	Univariate Specification	Bivariate Specification
Small Banks		
Sum of coefficients	0.00559*	0.00635*
Std. errors	(3.78E-03)	(3.80E-03)
Large banks		
Sum of coefficients	-0.00724*	-0.00827*
Std. errors	(6.51E-03)	(6.68E-03)
All banks		
Sum of coefficients	0.00510*	0.00641**
Std. errors	(3.40E-03)	(3.27E-03)

*significant at 90%; ** significant at 95% level of confidence

Table 4. Results of Two-Step WLS Estimation Procedure: Sum of Coefficients on Monetary Policy Measure under Both Specifications between 1998 & 2007

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank		(# of observations=35)
Sum of Coefficients on overnight interest rate	Univariate Specification	Bivariate Specification
Small Banks		
Sum of coefficients	0.00523*	0.00668*
Std. errors	(4.35E-03)	(4.04E-03)
Large banks		
Sum of coefficients	-0.00236*	-0.00037*
Std. errors	(1.12E-02)	(1.17E-02)
All banks		
Sum of coefficients	0.00476*	0.00627**
Std. errors	(4.01E-03)	(3.60E-03)

**significant at 90%; ** significant at 95% level of confidence

Also, Table 5 and Table 6 present all the individual φ's as well as coefficient estimates for real GDP growth estimated by OLS and WLS for 1998-2007 period, respectively. Under the OLS and WLS estimation procedures, we end up with positive coefficients on real GDP growth for small banks and the sum of coefficients for φ's increases even after we control for the effects of bank capital shocks on the level of β_t. Therefore, between 1998 and 2007 we can rely on the results of univariate version of the regression. The regression results tell us that contractionary monetary policy cause small banks to cut back lending more because of the intensified liquidity concerns. This is exactly what we expect under the assumption of the existence of broad credit channel.

Table 5. Results of Two-Step OLS Estimation Procedure: Full Details (1998-2007)

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank (# of observations=35)

	Monetary Policy Indicator				**Change in GDP**			
	0	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Univariate Specification								
Small banks *(R^2= 0.3718)*								
Coefficient	.00057*	.00137*	-.00151*	.00516				
Std. errors	(.00136)	(.00163)	(.00162)	(.00136)				
Large banks *(R^2=0.5786)*								
Coefficient	.00478**	-.01534	.00461*	-.00129*				
Std. errors	(.00233)	(.00279)	(.00278)	(.00234)				
All banks *(R^2=0.3668)*								
Coefficient	.00022*	.00181*	-.00140*	.00447				
Std. errors	(.00122)	(.00146)	(.00145)	(.00122)				
Bivariate Specification								
Small banks *(R^2= 0.4614)*								
Coefficient	.00032*	.00185*	-.00104*	.00522	.00001*	2.52E-06*	.00002*	2.12E-06*
Std. errors	(.00142)	(.00189)	(.00175)	(.00155)	(.00002)	(.00002)	(.00002)	(.00002)
Large banks *(R^2=0.6161)*								
Coefficient	.00524**	-.01586	.00331*	-.00096*	-6.04E-06*	-.00002*	-. 00002*	-.00002*
Std. errors	(.00254)	(.00341)	(.00314)	(.00279)	(.00004)	(.00004)	(.00004)	(.00004)
All banks *(R^2=0.5132)*								
Coefficient	.00005*	.00258*	-.00094*	.00472	.00002*	7.73E-06*	.00002*	6.93E-06*
Std. errors	(.00123)	(.00165)	(.00152)	(.00135)	(.00002)	(.00002)	(.00002)	(.00002)

*significant at 90%; ** significant at 99%

Table 6. Results of Two-Step WLS Estimation Procedure: Full Details (1998-2007)

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank (# of observations=35)

	Monetary Policy Indicator				Change in GDP			
	0	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Univariate Specification								
Small banks *(R^2= 0.3718)*								
Coefficient	.00082*	.00062*	-.00167*	.00545***				
Std. errors	(.00113)	(.00151)	(.00171)	(.00234)				
Large banks *(R^2=0.5786)*								
Coefficient	-.00285*	-.00031*	-3.05E-05*	-.000083*				
Std. errors	(.00173)	(.00432)	(.00544)	(.00425)				
All banks *(R^2=0.3668)*								
Coefficient	.00049*	.00104*	-.00151*	.00474***				
Std. errors	(.00104)	(.00141)	(.00156)	(.00213)				
Bivariate Specification								
Small banks *(R^2= 0.4614)*								
Coefficient	.00039*	.00189*	-.00031*	.00470***	3.11E-05*	2.41E-05*	3.74E-05**	2.06E-05 *
Std. errors	(.00109)	(.00158)	(.00163)	(.00216)	(2.07E-05)	(1.84E-05)	(1.94E-05)	(1.80E-05)
Large banks *(R^2=0.6161)*								
Coefficient	-.00259*	.00142	.00194*	-.00114*	1.85E-05*	3.46E-05*	2.63E-05*	2.91E-05
Std. errors	(.00189)	(.00478)	(.00553)	(.00429)	(2.17E-05)	(2.11E-05)	(2.10E-05)	(2.08E-05)
All banks *(R^2=0.5132)*								
Coefficient	.00015*	.00232*	-.00021*	.00401***	3.32E-05**	2.41E-06*	3.86E-05***	2.10E-05*
Std. errors	(.00097)	(.00143)	(.00144)	(.00191)	(1.81E-05)	(1.62E-05)	(1.69E-05)	(1.58E-05)

*significant at 90%; ** significant at 95% level of confidence; *** significant at 99% level of confidence

5.2 Results of Second Step Regression – Sub-Sample

Table 7 and Table 8 present the OLS and WLS estimates of the sum of the φ's under the two specifications of the model after 2001, respectively. As explained in full sample analysis, operative broad credit channel requires a positive sign for the sum of the φ's in our specification. As revealed in Table 7 and Table 8, for small banks the sign for the sum of the φ's is statistically significantly positive and for large banks it is statistically significantly negative under both specifications of the model.

Our results indicate that after 2001, the liquidity concerns of small banks increases following a contractionary monetary policy shock whereas for large banks the case is exactly the opposite. The pattern observed for small banks is consistent with the underlying premise for the existence of credit channel among small banks. Also, the differential response to a monetary tightening among small and large banks is in line with what the theory predicts. However, I have no definite answer why liquidity concerns of large banks about their lending decision lessen following a monetary tightening. It should be noted that the sample period is rather small for the post-2001 sample and therefore the results may suffer from a small sample bias.

Table 7. Results of Two-Step OLS Estimation Procedure: Sum of Coefficients on Monetary Policy Measure under Both Specifications between 2001 & 2007

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank		(# of observations=23)
Sum of Coefficients on overnight interest rate	Univariate Specification	Bivariate Specification
Small Banks		
Sum of coefficients	0.00572*	0.00378*
Std. errors	(0.04287)	(0.04254)
Large banks		
Sum of coefficients	-0.00866*	-0.01403*
Std. errors	(0.05802)	(0.06705)
All banks		
Sum of coefficients	0.00541*	0.00341*
Std. errors	(0.03888)	(0.03652)

*Significant at 90% level of confidence

Table 8. Results of Two-Step WLS Estimation Procedure: Sum of Coefficients on Monetary Policy Measure under Both Specifications between 2001 & 2007

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank		(# of observations=23)
Sum of Coefficients on overnight interest rate	Univariate Specification	Bivariate Specification
Small Banks		
Sum of coefficients	0.00624*	0.00565*
Std. errors	(5.14E-02)	(5.21E-02)
Large banks		
Sum of coefficients	-0.00458*	-0.00516*
Std. errors	(3.76E-02)	(3.50E-02)
All banks		
Sum of coefficients	0.00523*	0.00465*
Std. errors	(4.59E-02)	(4.54E-02)

*Significant at 90% level of confidence

In order to assess whether the changes in the lending behavior of banks following a monetary contraction is driven by other mechanisms such as bank capital shocks or not, we perform the bivariate version of the second step regression by adding the real GDP growth to the equation. If our results regarding bank lending are not driven by a monetary policy shock, the coefficient of real GDP growth should be negative and the importance of monetary policy measure should decline. Table 9 and Table 10 present the full details of the regressions that make up Table 7 and Table 8. As Table 9 and Table 10 reveal, the coefficients on real GDP growth are significantly negative not only for large banks but also for small banks. This suggests that rising interest rates due to tight monetary action lead to a decline in economic activity, and banks experiencing huge loan losses can decrease their lending because of the reduction in bank's capital. Therefore, real GDP growth, a measure of economic activity, should affect the level of β_t negatively under this scenario, and making a judgment regarding the existence of a credit channel based on univariate specification results can be misleading. In fact, working with bivariate version to get accurate results makes sense for Turkey after 2001 because Banking Sector Restructuring and Rehabilitation Program started to be implemented on May 15, 2001 and this program intensified the capital requirements on banks due to huge loan losses experienced during 2001 banking crises. Shocks regarding bank capital caused banks to curtail lending more in order to satisfy high capital requirements. Even if we rely on the results of the bivariate specification, we find that among small banks monetary policy shocks affect more the lending behavior of those banks with the least liquid balance sheets. Therefore, our results support the existence of credit channel of monetary transmission mechanism for the post-2001 period.

Table 9. Results of Two-Step OLS Estimation Procedure: Full Details (2001-2007)

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank (# of observations=23)

	Monetary Policy Indicator				Change in GDP			
	0	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Univariate Specification								
Small banks *(R^2= 0.3718)*								
Coefficient	.00928*	-.02271*	-.01253*	.03168***				
Std. errors	(.01245)	(.01844)	(.01727)	(.01162)				
Large banks *(R^2=0.5786)*								
Coefficient	-.03299**	.03345*	-.00079*	-.00833*				
Std. errors	(.01682)	(.02491)	(.02334)	(.01571)				
All banks *(R^2=0.3668)*								
Coefficient	.00781*	-.02240*	-.00769*	.02769***				
Std. errors	(.01113)	(.01669)	(.01564)	(.01052)				
Bivariate Specification								
Small banks *(R^2= 0.4614)*								
Coefficient	-.00312*	-.00123*	-.02873*	.03686	-.00001*	-.00002*	-7.92E-06*	-.00003*
Std. errors	(.01206)	(.01894)	(.01710)	(.01076)	(.00003)	(.00003)	(.00003)	(.00003)
Large banks *(R^2=0.6161)*								
Coefficient	-.03789**	.03619*	- .01010*	- .00223*	-.00007**	-.00008*	-.00007*	-.00007*
Std. errors	(.01901)	(.02986)	(.02696)	(.01697)	(.00005)	(.00005)	(.00005)	(.00005)
All banks *(R^2=0.5132)*								
Coefficient	-.00486*	-.00027*	-.02484*	.03338	-9.98E-06*	-.00002*	-6.72E-06*	-.00003*
Std. errors	(.01036)	(.01627)	(.01469)	(.00925)	(.00003)	(.00003)	(.00003)	(.00003)

*significant at 90%, ** significant at 95%, *** significant at 99% level of confidence

Table 10. Results of Two-Step WLS Estimation Procedure: Full Details (2001-2007)

Monetary Policy Measure: Overnight interest rate between banks and the Central Bank (# of observations=23)

	Monetary Policy Indicator				Change in GDP			
	0	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Univariate Specification								
Small banks *(R^2= 0.3718)*								
Coefficient	-.00228*	-.00067*	-.02351*	.03270***				
Std. errors	(.01403)	(.02249)	(.02176)	(.01235)				
Large banks *(R^2=0.5786)*								
Coefficient	-.03036	.04167***	-.02755**	.01166*				
Std. errors	(.01046)	(.01601)	(.01566)	(.01008)				
All banks *(R^2=0.3668)*								
Coefficient	-.00197*	-.00530*	-.01395*	.02646***				
Std. errors	(.01258)	(.02008)	(.01938)	(.01100)				
Bivariate Specification								
Small banks *(R^2= 0.4614)*								
Coefficient	-.01306*	.02117*	-.04010**	.03764	-1.21E-06*	-1.43E-05*	3.11E-06*	-1.89E-05*
Std. errors	(.01358)	(.02308)	(.02222)	(.01227)	(3.53E-05)	(3.35E-05)	(3.45E-05)	(3.32E-05)
Large banks *(R^2=0.6161)*								
Coefficient	-.03029	.03369***	- .01574*	- .00717*	-5.32E-05***	-5.18E -05***	-4.72E-05***	-5.25E-05***
Std. errors	(.00953)	(.01539)	(.01454)	(.00878)	(2.45E -05)	(2.34E-05)	(2.44E-05)	(2.33E-05)
All banks *(R^2=0.5132)*								
Coefficient	-.01324*	.01804*	-.03231*	.03216***	-7.71E-07*	-1.48E-05*	2.30E-06*	-1.89E-05*
Std. errors	(.01189)	(.02021)	(.01928)	(.01069)	(3.12E-05)	(2.96E-05)	(3.05E -05)	(2.93E-05)

*significant at 90%, ** significant at 95%, *** significant at 99% level of confidence

6 Conclusion

In this thesis, I try to explore whether contractionary monetary policy shocks lead a decline in bank loan supply or not. To do this, I use the two-step approach employed by Kashyap and Stein (2000) over the 1998:Q1-2007:Q3 period. Since the Central Bank of Turkey announced overnight interest rates as a monetary policy tool after 2001, I explored post-2001 period separately. This methodology employs bank level panel data to assess the differential response of banks to a monetary tightening because if a broad credit channel is operative, loan supply of banks with lower liquidity position will be contracted more because these banks cannot maintain their existing level of lending by simply reducing their cash and securities. Furthermore, liquidity is expected to be a more important concern in lending decisions of small banks since alternative sources of finance other that deposits are very limited for them compared to large banks.

Both for the full sample and sub-sample periods, the results suggest that contractionary monetary policy shock leads a decline in supply of loans especially for small banks. However, these results do not disclaim the existence of the interest rate channel. To the contrary, these two channels operate together and the broad credit channel aggravates the impact of interest rate channel on economic activity.

However, the results for the full sample and sub-sample periods show that broad credit channel does not appear to have been an important element of monetary transmission mechanism for large banks. In contrast, these results claim that after a monetary contraction importance of liquidity on lending behavior of large banks diminishes. One reason for this behavior might be the small sample period. But if we assume that this is not a major concern, then the question arises: How do large banks find ways to reduce the importance of liquidity constraint on the lending behavior after a monetary tightening? At this point, I do not know what accounts for the unexpected behavior of large banks regarding the liquidity concerns on

their lending decisions but one explanation can be the increase in alternative sources of funding (e.g. syndicated loans extended by foreign banks) following the strong recovery of 2001 crisis (2006 Annual Report of the Banking Regulation and Supervision Agency). Since stabilization policy following 2001 crisis have been implemented successfully and macro outlook presents a promising future for Turkey, foreign acquisitions has increased considerably in Turkish banking sector. Consequently, large banks have started to access foreign funds more easily especially after 2001.

7 Data Appendix

The sample period used in this thesis covers the time period between first quarter of 1998 and the third quarter of 2007, and it includes all private and public commercial banks operating in Turkey. Up to 2007, 95 commercial banks are identified in the data, and this leads to 2185 bank-quarters of data. However, some of these banks either involve in a merger or are taken over by Savings Deposit Insurance Fund (SDIF). Because of the discontinuities in the balance sheets of these banks, they are eliminated from the data. Also, some of the investment banks have no loan portfolio in some quarters. Therefore, these investment banks are also omitted from the data. In addition, because growth rates are used in the regressions, first observations for each bank are lost. Because of these reasons, 1404 bank-quarters of observations are employed in the analysis.

Quarterly balance sheets data obtained from the Banking Association of Turkey are used to construct the liquidity ratio for each bank for each quarter. Also, the data for total loans of each bank between 1998:Q1 and 2007:Q3 come from these quarterly balance sheets. In order to construct the series for GDP growth, the data for quarterly real GDP are obtained from the Central Bank of the Republic of Turkey. Finally, the data for the overnight interest rate between banks and the overnight interest rate between banks and the Central Bank come from the Istanbul Stock Exchange.

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