

# Liquidity Management of Non-Financial Firms: Cash Holdings and Lines of Credit Evidence from Turkey

February 2016

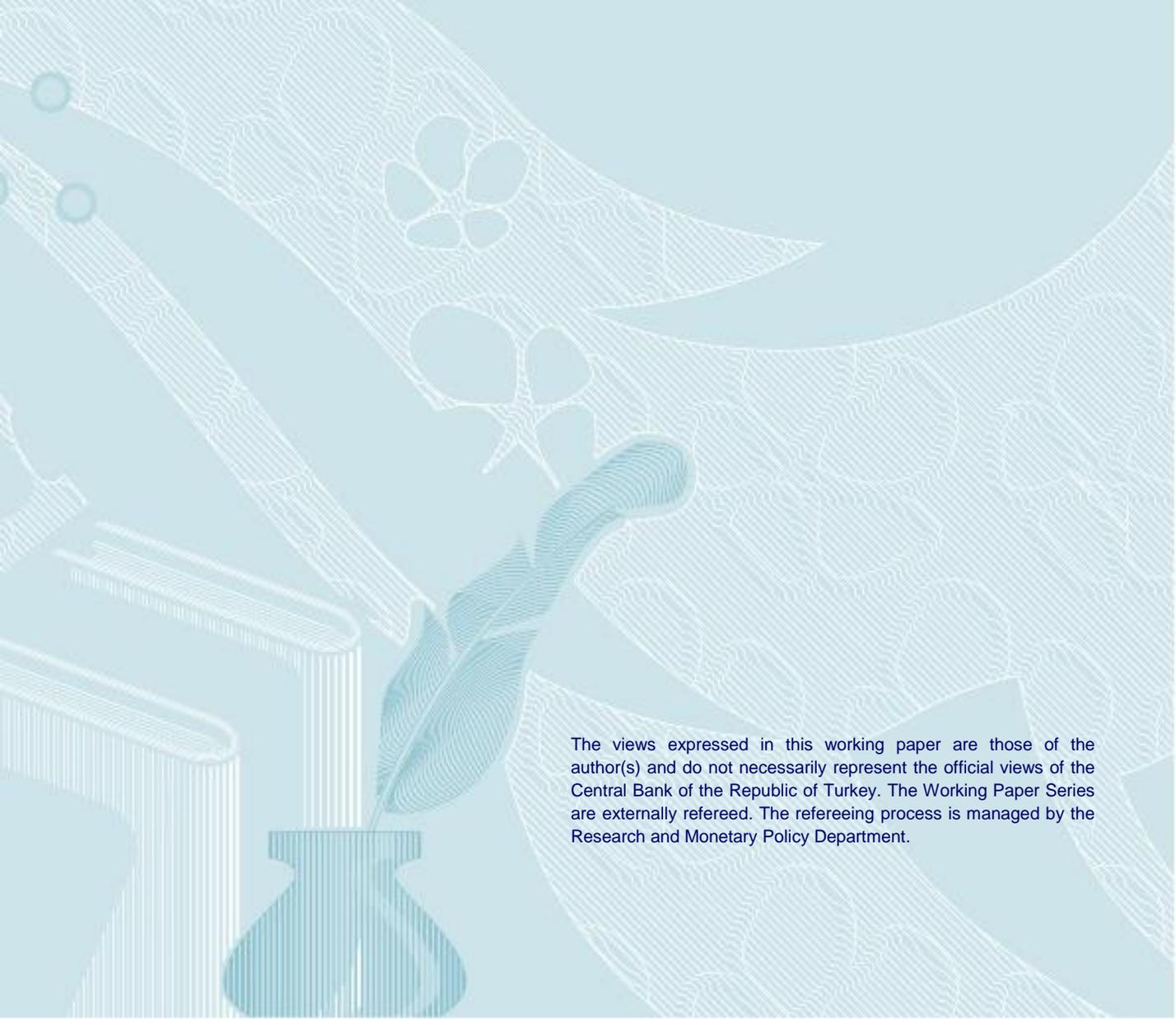
Yavuz ARSLAN  
Yunus Emrah BULUT  
Tayyar BÜYÜKBAŞARAN  
Gazi KABAŞ

© Central Bank of the Republic of Turkey 2016

Address:  
Central Bank of the Republic of Turkey  
Head Office  
Research and Monetary Policy Department  
İstiklal Caddesi No: 10  
Ulus, 06100 Ankara, Turkey

Phone:  
+90 312 507 54 02

Facsimile:  
+90 312 507 57 33



The views expressed in this working paper are those of the author(s) and do not necessarily represent the official views of the Central Bank of the Republic of Turkey. The Working Paper Series are externally refereed. The refereeing process is managed by the Research and Monetary Policy Department.

# Liquidity Management of Non-Financial Firms: Cash Holdings and Lines of Credit

## Evidence From Turkey<sup>±</sup>

Yavuz Arslan<sup>±</sup>, Yunus Emrah Bulut<sup>\*‡</sup>, Tayyar Büyükbaşaran<sup>\*</sup>, Gazi Kabaş<sup>\*</sup>

### Abstract

With a novel dataset of over two thousand firms covering 2006-2012 period, this study examines liquidity management of non-financial firms in Turkey. We find the following results: First, cash holdings and lines of credits are complementary if the profits are low or cash holdings are small, while they become substitutes if profits are high or cash holdings are large. Second, firms with more available funds (cash plus unused credit lines) invest more than the others; moreover, given the same amount of available funds, those firms which hold more cash make more investment. Third, firms with small cash holdings prefer unused credit lines to cash when they get more profitable; whereas firms with large cash holdings prefer cash to unused credit lines when they get more profitable. Fourth, we find evidence of nonlinearities regarding the determinants of cash holdings and credit limits. Finally, our analysis also includes the effects of aggregate financial uncertainty on liquidity management, and it discriminates between holdings of local currency denominated and foreign currency denominated credit limits. Our study is the first one to examine liquidity management of firms in an emerging economy, and bears some critical differences with the findings of earlier studies.

**JEL classifications:** G31, G32

**Keywords:** Credit Lines, Cash holdings, Liquidity Management.

---

± All views expressed in this paper are those of the authors and do not necessarily reflect the views of the BIS or the CBRT. We thank editor Süleyman Tolga Tiryaki and an anonymous referee for their valuable suggestions.

<sup>±</sup> Bank for International Settlements, email: yavuz.arslan@bis.org.

<sup>‡\*</sup> Corresponding author. Central Bank of Republic of Turkey, email: emrah.bulut@tcmb.gov.tr.

<sup>\*</sup> Central Bank of Republic of Turkey, email: tayyar.buyukbasaran@tcmb.gov.tr.

<sup>\*</sup> Central Bank of Republic of Turkey, email: gazi.kabas@tcmb.gov.tr.

## 1. Introduction

In a frictionless Modigliani-Miller type world, firms can easily obtain external funds to finance their profitable projects. However, financial frictions, which might be caused by sources like information problems and transaction costs, can hinder some firms from accessing external liquidity and consequently hinder undertaking valuable projects when sources of internal liquidity are scarce. When financial frictions are present, firms begin to substitute internal finance for external finance since in rainy days accessing internal funds is easier.

Corporate finance literature emphasizes the role of cash holdings in the liquidity management of non-financial firms. The uncertainty regarding the future liquidity needs make firms accumulate cash in order to undertake profitable projects if the need for liquidity is realized.<sup>1</sup> Similar arguments are put forward by the theoretical literature on lines of credit. Lines of credit can also be used against future liquidity shocks to enable firms to undertake profitable projects.<sup>2</sup> Since cash and credit lines may serve the same purpose theoretically, the substitution between cash and credit lines get some attention in the literature recently. Sufi (2009) empirically investigates the choice between cash and lines of credits for the first time and finds that firms that are more profitable use more credit lines relative to cash in their liquidity management. This finding implies that cash and credit lines are imperfect substitutes. Moreover, if one takes profit as an indicator of liquidity need, the finding of Sufi (2009) implies that when firms need liquidity most, they rely more on cash than lines of credit. Campello et al. (2009) and some other studies in the literature also confirm these findings by using different databases of firms and some survey results. Thus, the roles of cash holdings and lines of credit in the liquidity management of non-financial firms may differ in some respects.

In this paper, we investigate the liquidity management of non-financial firms in Turkey. We use a novel dataset of over two thousand firms in our analysis. Our dataset includes balance sheet information of non-financial firms and credit usage and lines of credit information of these firms from 2006 to 2012. We first investigate the determinants of cash holdings and unused lines of credit of the firms separately and then investigate the choice between cash and unused lines of credit a la Sufi (2009). Our findings partly in line with those of Sufi (2009) and Campello et al. (2009). However, our findings differ from those of Sufi (2009) and Campello et al. (2009) in some critical aspects when we add new dimensions to the analysis which do not exist in these papers. Our main findings can be summarized as follows:

First, regarding substitution between cash and credit limits, we find that cash and lines of credits are complementary instruments if the cash generating capacity of the firms are low (profits are low) or cash holdings are small. When profits are high or cash holdings are large, cash and credit lines are substitutes. This finding is more nuanced than the finding by Campello et al. (2009) who emphasize the substitutability between cash holdings and credit lines regardless of the level of profit or cash holdings.

Second, we find that, in their liquidity management, *firms with small cash holdings prefer unused credit lines* to cash when they get more profitable; whereas *firms with large cash holdings prefer cash* to unused credit lines when they get more profitable. Since small profit levels may not enable firms

---

<sup>1</sup> See Almeida et al. (2004).

<sup>2</sup> See Holmström and Tirole (1998).

to accumulate enough cash, firms have to rely on unused credit lines granted by banks in order to hedge themselves to the future liquidity shocks. Overall, our results do not fully comply with Sufi (2009) and some others<sup>3</sup> in their findings of positive relation between profitability and the relative use of credit lines to cash for US firms. We find that, in Turkey, for the firms in the bottom 30<sup>th</sup> percentile of cash holdings the relation between profit and relative use of credit lines to cash is positive while at the top 30<sup>th</sup> percentile it is negative.

Third, to investigate these findings further, we study the relation of ex-post investments of firms with the available funds (unused limits + cash). We find that firms with more available funds invest more. Moreover, given the same amount of available funds, those firms which hold more cash do even more investment.<sup>4</sup> This result is robust to different estimation techniques and valid even if we take out firm fixed effects. These findings may help to explain the substitution between cash and credit lines. It may be the case that, firms with low cash holdings complement their liquidity with credit lines whereas firms with high cash holdings substitute cash holdings for credit limits, because cash is more valuable in the sense that it enables exploiting investment opportunities better than credit limits. Hence the firms that have high cash holdings or high cash generating capacity prefer cash to unused credit lines.

Fourth, our findings emphasize nonlinearities in the liquidity management of firms. We find evidence of nonlinearity regarding the determinants of cash and credit limits. For example, unused credit limits increase as tangible asset increases for small size firms and unused credit limits decrease as tangible asset increases for large size firms.

Fifth, regarding the effects of aggregate financial variables, our findings suggest that unused credit lines are more sensitive to financial variables than cash. Firms hold unused limits when uncertainty in international markets are high (VIX), however firms hold less unused limits when uncertainty in Turkey is high (VIX for Turkey) which is consistent with Acharya et al. (2009)'s argument that higher aggregate uncertainty make banks to tighten their supply of credit limits.

Finally, unlike the extant literature, our dataset enables us to discriminate between Turkish Lira (henceforth TL) and foreign currency (henceforth FX) denominated credit lines. Hence we repeat our analysis for TL and FX denominated credit lines separately. Our findings indicate that profit affects TL and FX unused credit limits differently. Moreover, cash holdings has more effect on TL unused credit lines. We find that firms that have higher amount of foreign sales to foreign credits hold more FX unused limits than TL unused limits and they hold more unused limits than cash.

The findings outlined above indicate some potential differences in the practice of liquidity management of firms in emerging countries and developed ones, and/or publicly traded firms and privately owned ones. On the one hand, the relatively weak enforcement of contracts in emerging countries and insufficient legal codes regarding the usage of lines of credit have the potential to differentiate the role of credit lines in the liquidity management of firms in emerging countries compared to firms in developed countries. On the other hand, privately owned firms and publicly traded ones may behave (or be treated by the financial sector) differently. Since our data set includes

---

<sup>3</sup> See, for example, Acharya et al. (2014) and Campello et al. (2011).

<sup>4</sup> These findings are robust to endogeneity concerns as we use instrumental variables and GMM methods to contain endogeneity.

mostly privately owned firms<sup>5</sup>, our results may differ from previous studies which include only publicly traded firms. In this sense, more research on emerging countries discriminating privately owned firm data would shed light on these differences.

This paper contributes to the corporate liquidity management literature of non-financial firms in multiple ways. First, so far, the extant literature on the choice between cash and credit lines mainly focuses on US firms, while we conduct our analysis for Turkish firms. Second, the datasets that are used in this literature almost always cover publicly traded firms, whereas our dataset mostly comprises of privately owned firms. Third, our basic results differ from the results of the extant literature. Last, to the best of our knowledge, our paper is the first study that investigate credit limits and the choice between cash and credit limits of firms in an emerging country setting.

The paper proceeds as follows: Section 2 discusses some related literature, although without the intention of being comprehensive. Section 3 presents the data and the methodologies we use in our analysis. Section 4 discusses institutional settings of credit line contracts in Turkey and presents some univariate results. Section 5 provides the results of multivariate analysis and discusses their implications. Section 6 concludes. Some additional tables and figures are given in Appendix 1 and Appendix 2.

## **2. Related Literature**

Literature on corporate liquidity policy primarily deals with cash holdings. Both theoretical and empirical studies investigate the determinants of cash holdings and the precautionary usage of cash holdings for future liquidity shocks. On the other hand, empirical and theoretical literature on lines of credits gains prevalence only recently. Specifically, empirical literature on lines of credits gains momentum especially in the second half of the 2000s. In this section, we briefly present some relevant studies that are of interest to our paper without any intention of being comprehensive.

Regarding the cash holdings of firms, Almeida, Campello and Weisbach (2004) model the demand for liquidity of firms where financially constrained firms systematically save cash out of their cash flows while unconstrained firms do not. They test their model's predictions and find a positive correlation between cash flows and the change in cash holdings in financially constrained firms while the coefficient for unconstrained firms is insignificant statistically. In this regard, cash holdings emerge as a precautionary saving instrument and financially constrained firms tend to accumulate cash out of their cash flows for future liquidity needs. Similarly Acharya, Almeida and Campello (2007) stress the hedging role of cash holdings in corporate liquidity management. This vein of literature emphasizes the role of cash holdings as being driven by a precautionary motive regarding future uncertainty in the liquidity needs of firms.

From the perspective of the banking literature, Kashyap, Rajan and Stein (2002) proposes a theory of why taking deposit and lending take place in the same firm (bank). They suggest that banks are liquidity providers for firms via lines of credits and providing liquidity is less costly if banks are deposit takers. Since both deposit withdrawals and lines of credits withdrawals may left banks illiquid, banks hold a proportion of their assets in liquid forms as to insulate themselves from these withdrawals. Kashyap, Rajan and Stein (2002) suggests that these liquid reserves cost less if banks

---

<sup>5</sup> Unfortunately, we could not discriminate publicly traded firms from privately owned ones in our analysis, since the titles of the firms are undisclosed in the dataset for privacy purposes.

provide both deposit taking and lending services, hence there is economies of scope in these activities. This perspective may explain the widespread availability of lines of credits, especially in countries like Turkey where the financial systems are dominated by commercial banks (so called bank based financial intermediation countries).

Regarding lines of credits, Holmström and Tirole (1998) present a model that incorporates two-tier information asymmetry in which there is moral hazard problem between depositors and financial intermediaries as well as between financial intermediaries and firms. In their model, firms face uncertain idiosyncratic liquidity shocks when valuable projects are in progress and to cope with the liquidity needs, firms reserve some cash from previous period or sign lines of credit agreements with financial intermediaries. In equilibrium reserving cash is costlier than signing lines of credit agreements<sup>6</sup>, so that firms prefer to obtain lines of credit where available. Hence, financial intermediaries can insure firms for future liquidity shocks by mean of lines of credits. In this model, cash holdings and lines of credit both emerge as precautionary saving instruments to cushion future liquidity shocks.

Since both cash and lines of credit serve the same purpose of precautionary saving as the model of Holmström and Tirole (1998) suggests, it is natural to ask under which situations firms prefer cash to lines of credit and vice versa. Sufi (2009) is the first attempt to empirically investigate the choice between cash holdings and lines of credits. As both cash and lines of credit are treated in the literature as hedging instruments against future liquidity shocks, Sufi (2009) tries to identify the determinants of the choice between cash and lines of credits in corporate liquidity management and finds that firms prefer to use cash more heavily when they need liquidity most. Specifically, Sufi (2009) finds a positive correlation between lagged profit and the ratio of lines of credit to the sum of lines of credit and cash which suggests that firms that need liquidity most (low profit states of the world) use cash more heavily than lines of credit. Sufi (2009) further investigates as to why firms rely cash more in low profit states of the world and argues that financial covenants in lines of credit agreements prevents firms to use lines of credit in bad states of the world because violating financial covenants hamper future availability of credit lines.

There are also studies that try to identify the conditions that may result in different usages of cash and credit lines. As such, Acharya, Almeida and Campello (2013) develop a model in which banks provide liquidity insurance for firms as lines of credits by pooling firms' idiosyncratic liquidity shocks. Firms that are more likely to be affected by aggregate liquidity shocks are more likely to hold cash since lines of credit for those firms are more costly. They find that in times of high aggregate volatility, banks are more reluctant to initiate new credit lines and firms are more likely to increase their cash holdings. Hence, this study suggests that aggregate financial conditions may have some effects on the liquidity policies of non-financial firms.

In another paper, Acharya, Almeida, Ippolito and Perez (2014) propose a theory suggesting credit lines are instruments of monitored liquidity insurance where monitoring of banks and possible revocations of lines give firms incentive to avoid illiquidity transformations. The costs of credit lines for high liquidity risk firms are higher and those firms are more likely to hold cash relative to lines of

---

<sup>6</sup> This is because of the fact that the opportunity cost of saved cash is the forgone cash flows of investment of that size.

credits. They empirically test their arguments and find that firms which experience an increase in liquidity risk substitute cash for lines of credits.

Apart from the studies that rely on balance sheet data, there are some other studies that use surveys to inquire the liquidity policies of non-financial firms. In this vein, Lins, Servaes and Tufano (2010) survey CFOs from 29 different countries to explore the choice between cash holdings and lines of credits in corporate liquidity management. They find that lines of credits are the main source of liquidity in firms around the world which correspond to about 15% of the assets while non-operational cash holdings correspond to about 2% of the assets. They also stress that lines of credit usages are heavier in countries where external credit markets are less developed. An interesting finding they state is that lines of credits are used as sunny day liquidity sources while cash holdings are used as rainy day liquidity sources. In another study, Campello, Giambona, Graham and Harvey (2011) provide another survey analysis consists of responses of 800 CFOs from North America, Europe and Asia. They find that cash holdings and lines of credits are imperfect substitutes. They also find that the relations between cash and credit lines are non-linear in the sense that as the cash holding grows, the negative relation between cash holdings and credit lines becomes more negative. Their results also comply with those of Sufi (2009) in the sense that the relation between credit lines and profits are negative.

As a study that reviews the extant literature on cash holdings and lines of credits, Demiroglu and James (2011) point out that financial covenants, material adverse change clauses, borrowing base, performance pricing, bank financial conditions and rollover risks are among the main factors affecting the firms' decisions of using credit lines. In another paper, Demiroglu and James (2012) show that bank lending conditions are more important for private firms than for public firms in accessing lines of credits.

Our study mostly resembles Sufi (2009) and Campello et al. (2011). We investigate the determinants of cash holdings and lines of credits as in Campello et al. (2011) and we investigate the choice between cash holdings and lines of credits as in Sufi (2009). To the best of our knowledge, there is no study thus far that investigates the choice between cash and lines of credits for the firms in an emerging country and specifically in Turkey.

### **3. Data and Methodology**

#### **3.1. Data**

In our analysis, we use a novel dataset comprised of firm balance sheets and lines of credit data from the Central Bank of the Republic of Turkey (CBRT). Our dataset spans years from 2006 to 2012; hence, our time period is seven years. Our dataset is a balanced panel comprises of 2342 firms and 16394 firm year observations. Lines of credit data includes the total credit limits and total credit usages of firms. Both credit limits and credit usages are available for two types of credits according to their denomination currency. First one is for credits and credit limits denominated in Turkish Lira (TL) and second one is for credits and credit limits denominated in foreign exchange (FX).<sup>7</sup> In calculating lines of credits; in addition to commercial loans, leasing credits are also included. Moreover, TL loans indexed to foreign currencies are counted as FX loans.

---

<sup>7</sup> Exact currency in which FX loans are actually made is not available. They are aggregated in US dollar and converted to TL from the end of year spot nominal exchange rate.

The definitions of variables used in our analysis are as follows: We define *size* as log of total assets, *net worth* as total assets minus external liabilities divided by total assets - equivalent to one minus *leverage*, *tangible assets* as durable assets divided by total assets, *profitability* as net profit divided by total assets, *FX net position* as the ratio of foreign sales minus FX credits to total assets, *coverage* as the ratio of net profit to financial expenses, *borrowing base* as the sum of stocks and receivables divided by total assets, *cash holdings* as the sum of cash and financial holdings divided by total assets and *unused limits* as total limits minus total credits divided by total assets. In analysis of the choices between cash and lines of credit and between TL and FX denominated lines of credit, we use two additional variables which are *unused limits divided by unused limits plus cash* and *unused FX limits divided by unused FX limits plus unused TL limits*. When we analyze the choice between lines of credit and cash and ex-post investment and available funds relation, we divide balance sheet variables by total assets minus cash as in Sufi (2009). On the other hand, in the analysis of the determinants of cash and lines of credit usage we divide balance sheet variables by total assets.

We also use macroeconomic variables in our analysis. These data includes basket exchange rate which is the average of US Dollar/TL and Euro/TL exchange rates weighted equally, standard deviation of the basket exchange rate, credit spreads for TL loans and for FX loans, standard deviations of both credit spreads, VIX, country CDS for Turkey, GDP growth, interest rate of benchmark one year treasury bond and implied exchange rate volatility for the next year. We also estimate a GARCH(1,1) model for the volatility of returns in BIST to get a VIX like volatility index for Turkey. *In all regression analysis, we winsorize variables at both %99 and %1 levels in order to prevent the outliers to affect our results.*

**Table 1: Descriptive Statistics of Balance Sheet Variables**

Variable	Obs	Min	p25	Mean	Median	p75	Max	Std. Dev.
unused limits	16394	0.00	0.16	0.62	0.40	0.75	107	1.68
unused TL limits	16394	0.00	0.10	0.43	0.25	0.50	107	1.60
unused FX limits	16394	0.00	0.00	0.20	0.07	0.26	17.47	0.42
cash	16394	0.00	0.01	0.11	0.05	0.15	0.96	0.13
unused limits/unused limits+cash	16391	0.00	0.67	0.77	0.87	0.96	1.00	0.27
unused FX limits/unused FX limits+unused TL limits	15900	0.00	0.00	0.29	0.26	0.50	1.00	0.28
financial holdings	16391	0.00	0.00	0.01	0.00	0.00	1.00	0.06
profitability	16394	-12	0.00	0.03	0.03	0.07	12	0.19
net worth	16394	-16	0.26	0.44	0.42	0.63	1.00	0.33
tangible assets	16394	0.00	0.10	0.27	0.23	0.39	0.99	0.20
size	16394	10	16	17	17	18	24	2
FX net position	16394	-2.40	0.00	0.27	0.02	0.29	37.36	0.78
coverage	14890	-2060227	-6	-394	-1	0	523031	21941
borrowing base	16394	0.00	0.32	0.51	0.53	0.71	1.00	0.26

Table 1 gives the descriptive statistics of the variables used in our analysis.<sup>8</sup> Average cash/assets ratio is 0.11 and the median is 0.05 which suggests that firms hold low levels of cash holdings on

<sup>8</sup> The statistics are derived for the variables without winsorization, however in regression analysis we use winsorized data.

average. The corresponding average for unused limits is 0.62 and the median is 0.40. Moreover, the cash holdings' distribution is skewed to the left as the 25<sup>th</sup> percentile value is 0.01 and 75<sup>th</sup> percentile value is 0.15. The average value of unused limits/unused limits + cash variable<sup>9</sup> is 0.77 and the median is 0.87 suggesting that unused limits constitutes the overwhelming portion of available funds for the firms. Moreover, the distribution of this variable is skewed to the right as the 25<sup>th</sup> percentile value is 0.67 and 75<sup>th</sup> percentile value is 0.96. One of the salient features in Table 1 is that there seems to be a kind of “pecking order” of liquidity management in non-financial firms. Mean profitability is 0.03, mean cash holding is 0.11 and mean unused lines of credit is 0.62, as Campello et. al. (2011) observe the same order in their survey in so far as unused lines of credit in our sample is larger than their survey sample, cash holdings is roughly the same and profitability is smaller.<sup>10</sup>

**Table 2: Cash, Unused Limits and the Choice Between Them with Respect to Sectors**

SECTORS	unused limits	unused limits	cash	cash	unused limits/unused limits+cash	unused limits/unused limits+cash	unused limits/total limits	unused limits/total limits
	mean	median	mean	median	mean	median	mean	median
AGRICULTURE, FORESTRY AND FISHING	0.40	0.33	0.09	0.03	0.78	0.92	0.56	0.55
MINING AND QUARRYING	0.36	0.21	0.10	0.03	0.62	0.78	0.75	0.86
MANUFACTURING	0.60	0.45	0.10	0.06	0.79	0.88	0.70	0.73
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	0.29	0.15	0.07	0.03	0.65	0.81	0.65	0.74
WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	0.31	0.20	0.05	0.04	0.62	0.85	0.76	0.76
CONSTRUCTION	0.46	0.23	0.08	0.03	0.75	0.88	0.76	0.85
WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	0.63	0.45	0.13	0.07	0.75	0.86	0.71	0.74
TRANSPORTATION AND STORAGE	0.60	0.34	0.12	0.06	0.72	0.83	0.73	0.82
ACCOMMODATION AND FOOD SERVICE ACTIVITIES	0.35	0.21	0.07	0.03	0.74	0.88	0.64	0.69
INFORMATION AND COMMUNICATION	0.51	0.21	0.10	0.05	0.71	0.83	0.80	0.90
REAL ESTATE ACTIVITIES	0.41	0.36	0.03	0.01	0.87	0.98	0.72	0.73
PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	0.27	0.21	0.11	0.04	0.68	0.85	0.80	0.88
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	0.35	0.24	0.14	0.08	0.69	0.76	0.62	0.59
EDUCATION	0.35	0.15	0.12	0.08	0.55	0.67	0.69	0.74
HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	0.31	0.19	0.06	0.02	0.82	0.89	0.56	0.59
OTHER SERVICE ACTIVITIES	0.08	0.02	0.17	0.09	0.34	0.44	1.00	1.00

Table 2 gives the mean and the median values of unused limits, cash, unused limits to total of unused limits and cash and unused limits to total limits ratios for different sectors<sup>11</sup> in our sample. Regarding unused limits, the highest mean and median values are in the wholesale and the retail sector which is followed by manufacturing sector as the corresponding values for these two sectors are very close to each other: Average unused limits is about %60 and the median is about %45. The mean value for transportation and storage sector is also very close to these two sectors, although not the median value. After these three sectors, the information and communication (ICT) sector is the one that holds the largest unused limits than the other remaining sectors. Regarding the reliance of

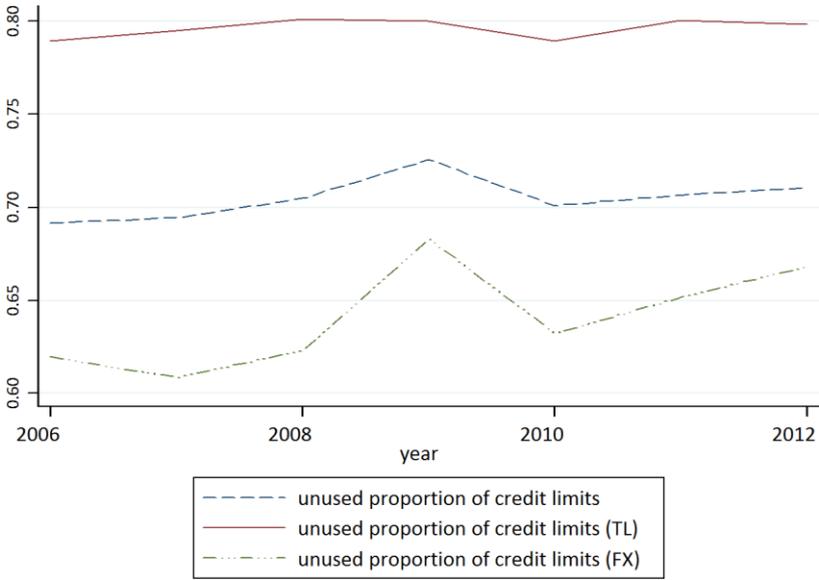
<sup>9</sup> Sufi (2009) reports that unused limits represent half of the available funds (unused limits+cash) in his sample. It is higher in our sample.

<sup>10</sup> They report that mean cash holding in their sample is 0.12, mean credit limit is 0.24 and mean profitability is 0.09.

<sup>11</sup> Sectors are classified according to Nace Rev.2.

unused credit lines with respect to the cash holdings, average values of unused limits/unused limits+cash ratio are 0.79, 0.75, 0.75 and 0.71 for manufacturing, construction, wholesale and retail and ICT sectors respectively.

Regarding the time evolution of average unused portions of the credit limits, Figure 1 below depicts the series for total, TL and FX unused limits. As can be seen, firms hold more unused TL portions than the FX ones. The average unused credit limits ratio is around %80 for TL, whereas it is around %65 for FX. Furthermore, the time variation in FX unused portions are higher than that of the TL portions. In addition, the sample average of the FX unused limits to the total unused limits is 0.29 as it is given in the Table 1.



**Figure 1: Average Unused Portions of Credit Limits**

**3.2. Methodology**

In determining the methods of regressions, we follow the literature and choose to conduct our analysis with the Pooled OLS method as in Sufi (2009) and Campello et al. (2011). Although, we choose Pooled OLS to be consistent with Sufi (2009) and Campello et al. (2011), we also check our results with different techniques as well. Our results generally remain valid for regressions estimated with between effects model.<sup>12</sup> In all regressions, errors are clustered at industry level as in Sufi (2009). In the last part of our analysis, we inquire the investment and the available funds nexus of firms with different techniques such as two-stage LS and GMM in order to contain possible endogeneities.

In regressions by which we investigate the determinants of cash and lines of credits separately, the explanatory variables are contemporaneous as in Campello et al. (2011). This may induce possible endogeneity concerns. To this end, we repeat the same analysis with one period lagged

<sup>12</sup> Between effects estimation is similar of an OLS regression where averages of the variables in the time dimension are taken, and the regression runs on these averages.

explanatory variables. The results are qualitatively the same. For the sake of comparability with Campello et al. (2001), we prefer to keep the contemporaneous regressions in our paper.

#### **4. Institutional Setting and Univariate Analysis**

In this section, we first provide a brief discussion of the institutional setting in Turkey regarding the use of line of credits. After that, we discuss some findings in a univariate setting to motivate the multivariate analysis. Last, we point out two empirical aspects that we observe in our dataset regarding the nonlinearity of the credit limits and cash holdings with respect to firm characteristics. This would justify the empirical specifications in our multivariate regression analysis.

##### **4.1. Institutional Setting**

We are not aware of any study that explains the credit line agreement practices between firms and banks in Turkey. Hence, to be able to understand the institutional settings regarding the credit lines in Turkey, we provide some evidences that are gathered from credit line contracts which are available over the Internet. Moreover, this subsection also includes authors' insights based on some anecdotal evidences that are obtained through conversations with several loan officers of banks and some financial managers of firms who are responsible for credit line contracts.

The lines of credit agreements between banks and firms are established via credit line contracts. Therefore, stating the features of credit line contracts would be beneficial to understand results that are presented later. First of all, a typical bank does explicitly state that the contract does not obligate itself to satisfy all of firm's credit demands. In a typical credit line contract, credit limits are determined according to general economic environment, bank's credit allocation policy, usage of credit, firm's financial condition, term of credit, type and quality of collaterals, etc. It is stated that if one or many of the mentioned circumstances alter, bank has the right to cancel all or some parts of the credit line contract. Moreover, if firm's financial condition or values of collaterals decreases, if firm is unable to provide more or new collateral when demanded or if there exists unfavorable market information, then bank has right to cancel all or some parts of the credit line without noticing the firm. These properties of the contracts in Turkish credit market look similar to the financial covenants that are common in the US credit market (See Demiroglu and James, 2012).

Typical credit line contract intensively emphasizes the collaterals and collateral-related issues. If the value of the collaterals deteriorates, then the bank has right to demand additional collaterals. In addition to collaterals, bank carefully examines the relationship between the firm and other banks. If the firm defaults on its debts with other financial institutions, bank could exercise its rights related to default terms. Moreover, the bank closely monitors the financial statements of the firm and generally demands a predetermined total income/total assets or a similar acid ratio on the credit line contract. If the bank decides that this ratio is not sufficient for the firm to honor its debt, the bank has the right to announce (technical) default of the firm.

These features of credit line contracts in Turkey have some similarities with the contracts in the US. However, we think that the contracts are not as binding for the banks as they are in the US. As a result, lines of credit practices in Turkey have some resemblances with the practice in US as well as some differences. Therefore, our empirical analysis in this paper would help to identify the similarities and differences between the Turkish and the US case.

## 4.2. Univariate Analysis

Before turning to the multivariate setting, it may be helpful to analyze the liquidity management of non-financial firms in a univariate setting. For this purpose, Table 3 reports the mean and the median values of cash/total assets, unused limits/total assets and unused limits/unused limits+cash ratios for the quartiles of some selected variables. For their relevance to the main discussion of the paper, we emphasize the variables profit and the cash holdings.

**Table 3: Cash, Unused Limits and the Choice Between Them with Respect to Quartiles of Selected Variables**

Panel A: Mean												
	cash/total assets				unused limits/total assets				unused limits/unused limits+cash			
	0-25	25-50	50-75	75-100	0-25	25-50	50-75	75-100	0-25	25-50	50-75	75-100
total assets	0.11	0.11	0.10	0.11	0.69	0.62	0.62	0.57	0.73	0.77	0.80	0.77
tangible assets	0.14	0.12	0.10	0.07	0.72	0.65	0.61	0.52	0.72	0.77	0.79	0.79
profit	0.08	0.09	0.11	0.15	0.59	0.62	0.63	0.65	0.78	0.80	0.78	0.71
net worth	0.08	0.10	0.11	0.14	0.58	0.60	0.66	0.66	0.79	0.81	0.79	0.68
FX net positions	0.10	0.12	0.11	0.10	0.58	0.58	0.65	0.72	0.73	0.78	0.79	0.80
cash holdings					0.10	0.10	0.11	0.12	0.22	0.14	0.06	0.01

Panel B: Median												
	cash/total assets				unused limits/total assets				unused limits/unused limits+cash			
	0-25	25-50	50-75	75-100	0-25	25-50	50-75	75-100	0-25	25-50	50-75	75-100
total assets	0.05	0.05	0.05	0.06	0.32	0.40	0.44	0.42	0.86	0.87	0.89	0.87
tangible assets	0.07	0.07	0.06	0.03	0.36	0.45	0.44	0.34	0.83	0.87	0.88	0.90
profit	0.03	0.04	0.06	0.10	0.34	0.37	0.45	0.43	0.90	0.89	0.88	0.81
net worth	0.04	0.05	0.06	0.09	0.36	0.45	0.46	0.31	0.90	0.90	0.88	0.79
FX net positions	0.04	0.06	0.06	0.06	0.29	0.42	0.47	0.52	0.86	0.86	0.88	0.90
cash holdings					0.04	0.05	0.06	0.07	0.18	0.12	0.04	0.01

Panel A reports the mean values of cash/total assets, unused limits/total assets and unused limits/unused limits+cash for the quartiles of the explanatory variables, while Panel B reports the corresponding median values.

In Panel A of the table, mean values of the ratio corresponding to columns are given with respect to different quartiles of the variables in the rows. In Panel B same applies for the median values. First thing to notice from Panel A and Panel B is nonlinearity and skewness of these ratios with respect to the balance sheet variables. For example, as profit increases average cash holdings of the firms increase. This is also the case for the unused limits. However, for the lowest quartile of the profit the average unused limits/unused limits+cash ratio is 0.78 while it is 0.80, 0.78 and 0.71 for the second, third and the highest quartiles respectively. Hence, we observe an increase between the first and the second quartiles. On the other hand, the median values suggest a decrease between the first and the second quartiles as given in the Panel B of the table. Furthermore, both for the average and the median values, the drops between the third and the highest quartiles are quite salient. Same is true for net worth as well. Moreover, the median is consistently below the mean for every quartile and every variable which indicates the distributions of these ratios are skewed. Therefore univariate analysis suggest that multivariate empirical analysis has to take nonlinearity into account.

We see that increases in the unused limits/total assets ratio are quite low for the different quartiles of the cash holdings both for the mean and the median values. For example, the average unused limits ratio is 0.10, 0.10, 0.11 and 0.12 from the first quartile of cash holdings to the last

quartile. The median values increase by 0.01 for an increase in quartile which is also low. Interestingly, both the average and the median values of unused limits/unused limits+cash ratio decrease as the quartiles of cash holdings increase. For example, average ratios are 0.22, 0.14, 0.06 and 0.01 for the first, second, third and the last quartiles of the cash holdings respectively. This implies that the more cash firms have, the more they rely on cash in their liquidity managements.

#### 4.2.1. Negative and Positive Profits

To motivate the specifications that we use in the multivariate regressions, Figure 2 draws the unused limits/unused limits+cash ratio for the whole sample, low and high cash flow firms and large and small firms.<sup>13 14</sup> As can be seen from the figure, when *the size of the firms* is taken into account, there is not much of a difference between large and small firms regarding the choice between unused limits and cash. However, when *the amount of cash flow* is taken into account, for low cash flow firms the bulk of the observations is concentrated at the top right side of the scatter plot while for high cash flow firms observations are concentrated at the top left side of the respective graph. Graph for the whole sample suggests that zero profit level is an important benchmark point. In order to identify this more clearly, Figure 3 draws the same graph for negative and positive profit levels separately. For negative profit region, the relation between lagged profits and unused limits/unused limits + cash ratio appears to be positive, whereas for positive profit region, it appears to be negative. To capture this observation in our regression analysis, we define a dummy variable (henceforth *profitability dummy*) that takes the value 1 if profit is positive and value 0 if profit is zero or negative. Then we interact this dummy variable with the profit, in order to capture the different relation between profit and cash, unused limits and unused limits/unused limits + cash ratio.

---

<sup>13</sup> Low (high) cash flow firms are determined this way: if a firm's profit is below (above) median for all years we label this firm as low (high) cash flow firm. Small and large firms are determined similarly.

<sup>14</sup> The direct cut of the points in the graphs are due to the fact that we winsorize the variables shown in the graph at 5 percent at both ends to mitigate the outliers affect the scale of the x axis in the graphs.

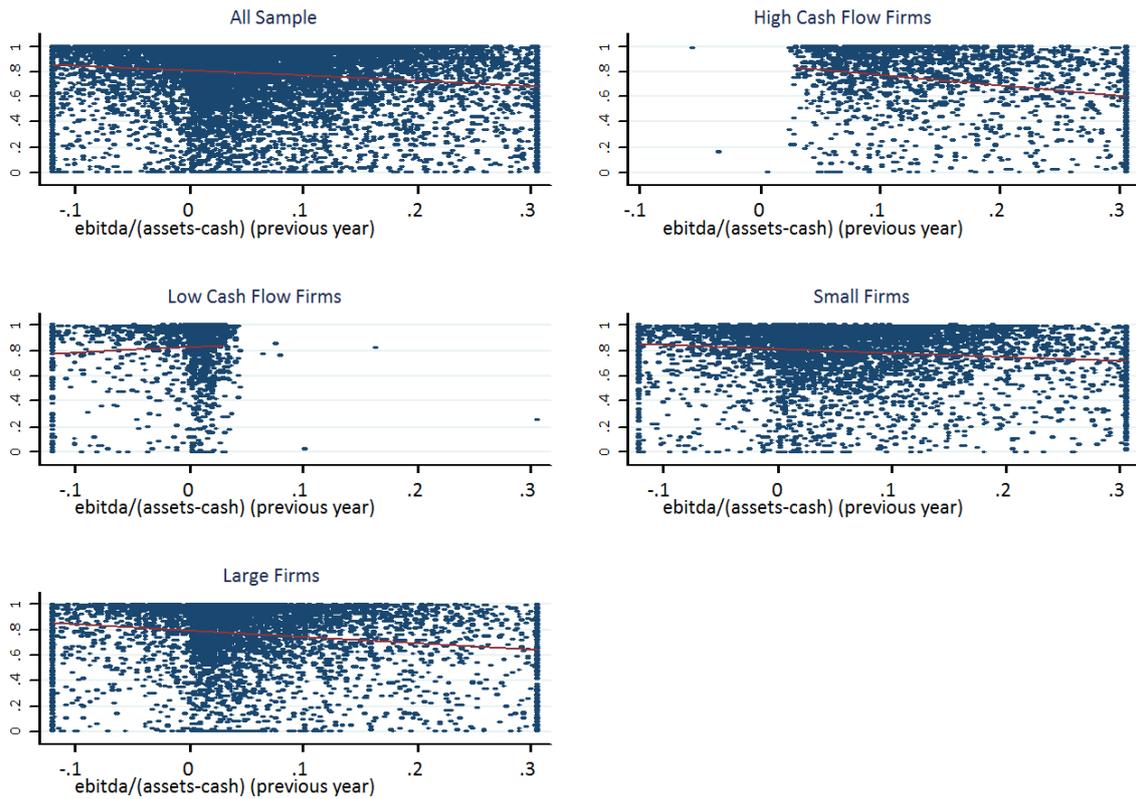


Figure 2: Scatter diagram of the choice between unused limits and cash for different firm types

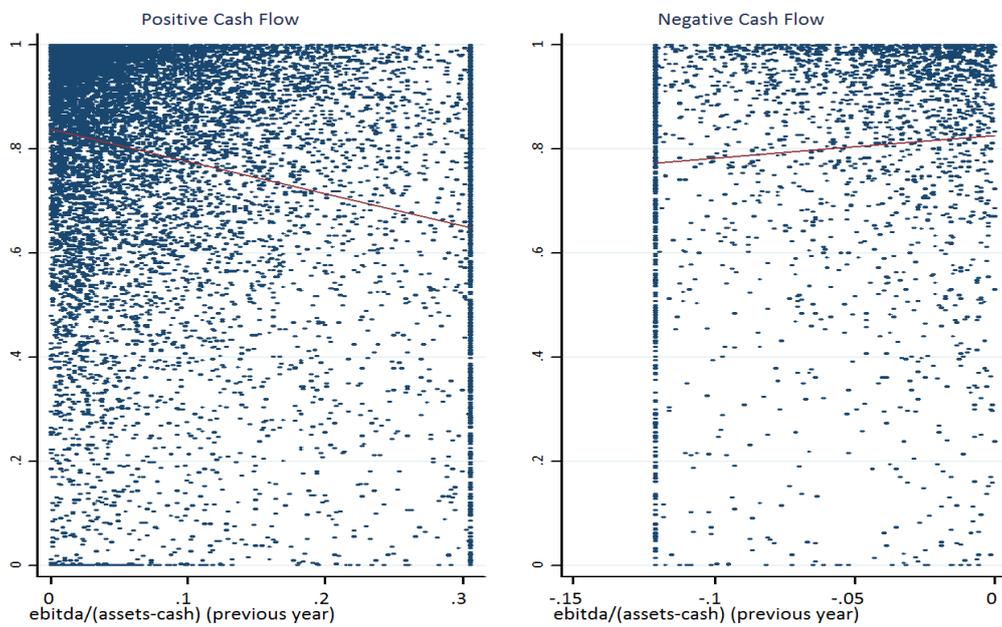
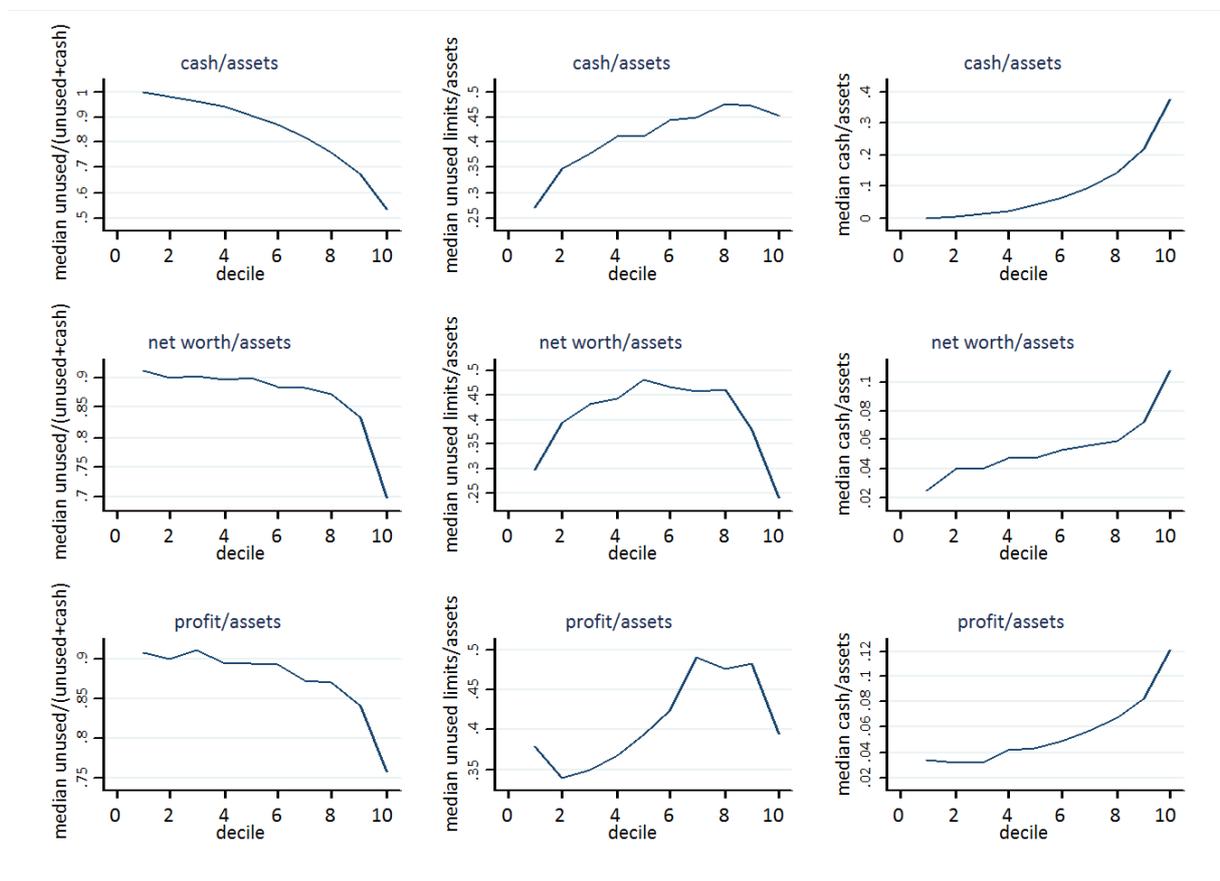


Figure 3: Scatter diagram of the choice between unused limits and cash for positive and negative profits

#### 4.2.2. Nonlinearity

One of the salient features of the cash holdings and unused credit limits in our sample is the nonlinearity of their relation with different characteristics of the firms. To be able to visualize this point more rigorously, Figure 4 depicts median unused limits/unused limits+cash ratio, median unused limits/assets ratio and median cash/assets ratio for the different deciles of cash/assets, net worth/assets and profit/assets, while Figure A1 in Appendix 2 depicts the same ratios for tangible assets/assets, size and foreign sales/total sales.<sup>15</sup>

As can be seen, the shape of the unused limits/assets is an inverted U for net worth, profit, tangible assets, size and foreign sales. On the other hand, the cash/assets seems increasing in net worth and profit, the shape of it is an inverted U for tangible assets and foreign sales while the shape reveals no clear pattern for size. Regarding unused limits/unused limits + cash ratio, it seems increasing in tangible assets while it seems decreasing nonlinearly for cash, net worth and profit. The relation is inverted U shaped for size and U shaped for foreign sales.



**Figure 4: Nonlinearity of the relation between unused credit limits and firm characteristics**

Similar nonlinearities can be found for different firm characteristics. However, it is not clear which variable or variables derive the nonlinearity in these relations. To deal with the nonlinearity,

<sup>15</sup> These figures remain similar if percentiles of one period lagged firm characteristics are used instead of contemporaneous ones.

we include the squared<sup>16</sup> values of firm characteristics to the regressions. Because nonlinearity is observable in many variables, we add squared values of each variable one by one in our analysis and choose the one in which the R-squared of the regression is the highest. By this way, we select a benchmark regression to test the effects of the financial variables on the liquidity management of the firms.

## 5. Multivariate Results

In this section<sup>17</sup>, we first investigate the determinants of cash holdings and lines of credits separately. After that, we investigate the choice between cash holdings and lines of credits as in Sufi (2009). However, our analysis differs from Sufi (2009) in the way that we also consider different currency denominations of the lines of credits, the effects of financial variables and the nonlinearities in the liquidity management practices of firms. Last, we show in an ex-post analysis that cash holdings are more valuable than credit lines in the sense that for a given level of available funds (unused credit limits plus cash), firms that hold more cash (higher cash/available funds ratio) have higher investment than firms that hold less cash.

### 5.1. Cash and Unused Lines of Credit

As emphasized in the literature review section, cash literature mainly treats cash holdings in the context of precautionary savings motive. Similarly, literature on lines of credit also emphasizes the same role of credit lines. Sufi (2009), in his analysis of choice between cash and lines of credit, investigates the determinants of credit lines relative to cash holdings in a Pooled OLS regression where the dependent variable is the ratio of credit lines to the sum of credit lines and cash. However, a change in this ratio may reflect two different movements: movements in cash holdings or movements in credit lines. Hence, in this section we focus on cash holdings and lines of credit separately to investigate the response of these variables to firm characteristics and financial variables as in Campello et al. (2011).

Table 4 presents the results of regressions where dependent variable is cash holdings<sup>18</sup> and explanatory variables are various firm characteristics. Since in theory cash holdings and lines of credit serve the same purpose of insurance against future liquidity shocks, it can be expected that they are substitutes to each other. To investigate this point we also include unused lines of credit as an explanatory variable in the regressions. Different from literature, in these regressions we also control for whether a firm makes profit or loss has an effect on firm's cash management as discussed before. Moreover, in regressions we allow for nonlinearities in the control variables.

---

<sup>16</sup> It appears from Figure 3 that second order polynomial is a good approximation to deal with these nonlinearities.

<sup>17</sup> Before presenting the results, it should be noted that since our analysis in this paper did not attempt to separate credit supply conditions from the credit demand conditions, all the results should be interpreted as correlations without putting too much weight on causality. Nevertheless, we also provide possible explanation(s) from which those correlations might stem.

<sup>18</sup> Our specifications here regarding the determinants of cash holdings are not fully in compliance with the literature on the determinants of the cash holdings. However, these regressions show the effects of those variables on the cash holdings that are also used in the regressions of determinants of unused credit lines and the choice between cash and unused credit lines. These results would help to understand the choice regressions by providing the effects of explanatory variables on the cash holdings and unused credit limits separately. Regarding the determinants of cash holdings, reader may refer to Opler, Pinkowitz, Stulz, and Williamson (1999) and Bates, Kahle, and Stulz (2009).

In all regressions, the coefficients of unused limits are positive which imply a complementarity between cash holdings and credit lines in contrast with the findings of Campello et al. (2011). The coefficients are statistically significant in 1% level, although the magnitudes are small. In regression 1, we do not allow for any nonlinearities in any variable. In this case, net profit has a positive and significant coefficient telling that firms that have higher net profit levels have more cash assets. In regression 2, we test whether having positive or negative profit has an effect on cash holdings. To do so, we include a positive profit dummy (profitability dummy) and an interaction of this dummy with profit level. With this new specification, the sign of the coefficient of profit turns into negative with 1 percent significance level. Coefficient of the interaction between these two variables is positive and larger than coefficient of net profit. This result implies that firms with negative profit hold less cash assets than firms with positive profits. Contributing to literature, this unexplored result tells that firms drain their cash when they make negative profits and save cash when they make positive profits. When interaction terms between unused credit lines and net profit included to the specifications, the coefficients of the interaction terms have negative however insignificant values which are larger than the coefficients of unused limits in absolute value. This result implies nonlinear relationship between cash holdings and net profits where we also see this nonlinearity in the determinants of unused credit lines.

**Table 4: Determinants of Cash Holdings**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
unused limits	0.011*** (0.003)	0.009*** (0.003)	0.010*** (0.003)	0.019*** (0.006)	0.021*** (0.006)	0.031*** (0.006)	0.010*** (0.003)
net profit	0.181*** (0.023)	-0.093*** (0.025)	-0.071** (0.028)	-0.072** (0.028)	-0.085*** (0.027)	-0.069** (0.028)	-0.095*** (0.025)
profitability dummy		0.000 (0.003)	0.000 (0.003)	-0.000 (0.003)	0.001 (0.003)	0.003 (0.003)	0.000 (0.003)
net profit*dummy		0.486*** (0.039)	0.481*** (0.039)	0.481*** (0.040)	0.452*** (0.038)	0.389*** (0.039)	0.485*** (0.039)
net profit*unused limits			-0.027 (0.023)	-0.028 (0.023)	-0.029 (0.023)	-0.027 (0.024)	
unused limits*unused limits				-0.003 (0.002)	-0.004* (0.002)	-0.006*** (0.002)	
size (assets)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.013 (0.018)	-0.018 (0.019)	-0.000 (0.001)
size*size					0.000 (0.001)	0.000 (0.001)	
net worth	0.055*** (0.015)	0.051*** (0.013)	0.051*** (0.013)	0.051*** (0.013)	0.073*** (0.008)	0.057*** (0.008)	0.051*** (0.013)
net worth*net worth					0.005*** (0.001)	0.004*** (0.001)	
tangible assets	-0.140*** (0.010)	-0.141*** (0.010)	-0.140*** (0.010)	-0.141*** (0.010)	-0.158*** (0.029)	-0.186*** (0.031)	-0.142*** (0.010)
tangible assets*tangible assets					0.016 (0.034)	0.023 (0.034)	
FX Net Position	-0.008** (0.004)	-0.010*** (0.004)	-0.011*** (0.004)	-0.011*** (0.004)	-0.010** (0.004)	-0.010** (0.004)	-0.011*** (0.004)
coverage						-0.000*** (0.000)	
borrowing base						-0.052*** (0.012)	
vix							0.025** (0.010)
Constant	0.129*** (0.026)	0.108*** (0.026)	0.108*** (0.026)	0.108*** (0.026)	0.202 (0.158)	0.287* (0.166)	0.099*** (0.025)
Observations	16,394	16,394	16,394	16,394	16,394	14,890	16,394
R-squared	0.108	0.129	0.129	0.130	0.137	0.137	0.128
Industry Dummy	Yes						
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	No
Adj. R-squared	0.11	0.13	0.13	0.13	0.13	0.14	0.13

Dependent variables in all regressions are Cash/Total Assets. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

In all regressions, net worth has positive and tangible assets has negative signs. However, size does not significantly affect cash holdings. These findings imply that, firms with high level of tangible assets use less cash in their cash management policy. Yet, firms that have high net worth use more cash. Moreover, in all regressions the coefficient of FX net position is negative. This finding is intuitive since as proxy for FX net position increases, firms have natural hedge position for negative currency shocks. This is a positive signal for banks because negative currency shocks are not rare in emerging market countries. Therefore, firms hold less cash assets as their FX net position increases. In the sixth regression we allow for nonlinearities in firm characteristics. Moreover, we include both borrowing base and coverage which negatively affects cash holdings. Since both tangible assets and borrowing base are indicators of a firm's relatively liquid assets, these results are expected as firms with high tangible assets and borrowing base make them feel more comfortable for future liquidity shocks as they may easily liquidate their assets.

Regression 7 is presented in Table 2 for the purpose of being a benchmark model for the regressions that include aggregate financial variables. Except from VIX index, all explanatory variables are kept in the regressions given in Table 6 with financial variables enter the regressions one by one like VIX in regression 7 of Table 2. The coefficient of VIX is statistically significant and positive which implies that aggregate uncertainty make firms to hold more cash as Acharya et al. (2009) suggest. As can be seen, the coefficient of VIX for Turkey is statistically insignificant. The insignificance of VIX for Turkey might be explained by the fact that our sample consists mostly firms that are not publicly listed in BIST and are relatively insensitive to the developments in the stock exchange in their cash policies. Moreover, level of exchange rate has a significant positive coefficient which implies that depreciation in Turkish Lira makes firms hold more cash.<sup>19</sup>

**Table 5: Cash Holdings and Financial Environment**

	vix (Turkey)	cds	gdp growth	TL credit spread	TL credit spread (std. dev.)	basket credit spread	basket credit spread (std. dev.)	exchange rate	exchange rate (std dev.)	implied exchange rate volatility
	-0.026 (0.028)	0.000 (0.000)	0.031*** (0.012)	-0.000 (0.001)	-0.049 (0.051)	-0.199* (0.112)	0.298 (0.208)	0.008* (0.005)	-0.018 (0.014)	-0.000 (0.000)
Observations	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394
R-squared	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.128	0.128
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No	No	No	No	No

Coefficients are taken from regression 7 in Table 4 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

We conduct same analysis for unused credit lines. As presented in Table 4 and 5, the results are similar. Parallel to previous results, in all regressions, the coefficients of cash assets are positive which solidifies the complementarity between cash assets and unused credit lines. In regression 1, without any nonlinearity, coefficient of net profit is positive. Again, this suggests that firms with high profit have more unused credit lines. Considering net profit affects positively cash holdings, it seems that profit increases both cash holdings and unused credit lines. However, driving force of these two relations might be different. Firstly, level of cash holding is determined solely by firm. Yet, usage of

<sup>19</sup> Firms may try to exploit profit opportunities when domestic currency depreciates by hoarding FX denominated cash.

credit line depends on both banks' and firms' decisions. The positive relationship between profit and unused credit lines might stem from several sources. For instance; on one hand; as firm obtains more cash flow, i.e. it makes more profit; bank might increase the level of credit line due to the fact that with higher profits, firm turns into a more desirable customer for bank. On the other hand; firm may decide to use cash flow for its spending instead of using credits. Therefore, unused credit line increases. Comparing the results in the cash holding case in which the firm is the sole decision maker, the effect of net profit on credit line usage requires different interpretation.

**Table 6: Determinants of Unused Lines of Credit**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cash holdings	0.267*** (0.076)	0.237*** (0.075)	0.353*** (0.082)	0.695*** (0.167)	0.653*** (0.168)	0.697*** (0.171)	0.686*** (0.167)
net profit	0.043 (0.088)	-0.505*** (0.160)	-0.282* (0.167)	-0.305* (0.167)	-0.357** (0.167)	-0.533*** (0.167)	-0.349** (0.166)
profitability dummy		0.061*** (0.020)	0.052** (0.020)	0.051** (0.020)	0.051** (0.020)	0.049** (0.020)	0.049** (0.020)
net profit*dummy		0.717*** (0.214)	0.850*** (0.216)	0.837*** (0.216)	0.833*** (0.215)	1.120*** (0.224)	0.850*** (0.214)
net profit*cash holdings			-2.064*** (0.534)	-1.867*** (0.528)	-1.828*** (0.530)	-1.791*** (0.587)	-1.868*** (0.527)
cash holdings*cash holdings				-0.807** (0.358)	-0.736** (0.359)	-0.555 (0.369)	-0.771** (0.358)
size (assets)	-0.004 (0.006)	-0.003 (0.006)	-0.003 (0.006)	-0.004 (0.006)	0.140 (0.091)	0.097 (0.087)	-0.000 (0.006)
size*size					-0.004 (0.003)	-0.003 (0.002)	
net worth	-0.013 (0.036)	-0.017 (0.036)	-0.021 (0.035)	-0.023 (0.036)	0.011 (0.040)	0.099** (0.039)	-0.021 (0.036)
net worth*net worth					0.008* (0.004)	0.021*** (0.003)	
tangible assets	-0.111** (0.051)	-0.111** (0.051)	-0.107** (0.051)	-0.109** (0.051)	0.100 (0.143)	0.305** (0.147)	-0.120** (0.051)
tangible assets*tangible assets					-0.312* (0.174)	-0.302* (0.174)	
FX Net Position	0.111*** (0.025)	0.108*** (0.025)	0.106*** (0.025)	0.106*** (0.025)	0.108*** (0.025)	0.099*** (0.024)	0.103*** (0.025)
coverage						0.000*** (0.000)	
borrowing base						0.340*** (0.050)	
vix							0.599*** (0.052)
Constant	0.456*** (0.128)	0.378*** (0.129)	0.369*** (0.129)	0.367*** (0.129)	-0.905 (0.805)	-0.880 (0.771)	0.228* (0.128)
Observations	16,394	16,394	16,394	16,394	16,394	14,890	16,394
R-squared	0.045	0.047	0.050	0.050	0.052	0.069	0.043
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	No
Adj. R-squared	0.04	0.05	0.05	0.05	0.05	0.07	0.04

Coefficients are taken from regression 4 in Table 4 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

When the interaction of cash holdings and profit is included to the specifications, the coefficients of the interaction terms turn out to be negative and statistically significant in all specifications. This finding suggests nonlinearity between cash holdings, unused limits and profits. It indicates that for sufficiently negative profit, firms increase unused limits as their cash holdings get larger, however if firms have positive profit levels; the relation reverses such that firms increase their cash holdings as they reduce their unused lines of credits. Similarly, for sufficiently small level of cash holdings, if firms have negative profit, there is a positive relationship between profit and unused limits. This relation solidifies as firms have more cash holdings. If firms have positive profit, the effect of level of cash holdings alters. For sufficiently small level of cash holdings, net profit and unused lines are positively correlated; yet, as level of cash holding increases the correlation becomes

negative. This result implies that if firms hold small cash reserves, they tend to accumulate unused limits as they become more profitable. However if firms hold sufficiently large cash reserves, they substitute cash for unused limits as they become more and more profitable. In this sense, our findings do not coincide with the findings of Campello et al. (2011)'s since they find a negative relation between cash holdings and credit lines and this substitution gets stronger as profits become larger.

Different than cash holdings, results indicate that, excluding tangible assets, firm characteristics do not affect firms' unused credit line decision. However, letting nonlinearity in these variables changes the findings. With nonlinearity, as expected, net worth affects positively unused credit line in an increasing manner. Tangible assets and unused lines are negatively correlated if nonlinearity is not taken into account. After controlling for nonlinearity, firms increase their unused limits as they have more tangible assets in a decreasing manner. *Another interesting result is about the effect of FX net position on unused credit lines. In the analysis of cash holdings, we find that as firms' FX net positions increase they hold less cash. However, as the regressions in Table 6 reveal, as firms' FX net positions increase they hold more unused credit limits on their off-balance sheets.*

**Table 7: Unused Lines of Credit and Financial Environment**

	vix (Turkey)	cds	gdp growth	TL credit spread	TL credit spread (std. dev.)	basket credit spread	basket credit spread (std. dev.)	exchange rate	exchange rate (std. dev.)	implied exchange rate volatility
	-1.053*** (0.131)	0.001*** (0.000)	-0.040 (0.057)	2.708*** (0.231)	7.554*** (0.595)	4.167*** (0.724)	9.900*** (1.084)	0.289*** (0.024)	-0.548*** (0.067)	0.001 (0.001)
Observations	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394
R-squared	0.041	0.041	0.039	0.042	0.042	0.040	0.041	0.046	0.040	0.039
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No	No	No	No	No

Coefficients are taken from regression 7 in Table 6 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

Table 7 summarizes the effects of financial and macroeconomic conditions on credit line usage. *In times of high international uncertainty (high VIX), firms hold more unused limits, however the coefficient of VIX for Turkey is negative implying that high uncertainty in Turkey makes firms to hold less unused limits which is consistent with the arguments of Acharya et al. (2009) who state that in an increasing aggregate uncertainty environment banks are reluctant to increase their offer of credit limits.* Moreover, GDP growth negatively affects unused limits where CDS for Turkey positively affects it. Comparison of Table 7 with Table 5 suggests that, unused lines of credits are more sensitive to the financial environment than cash holdings. The variables related with credit spreads and exchange rates<sup>20</sup> are all statistically significant for unused credit lines, whereas they are mostly insignificant for cash holdings. Moreover, GDP growth negatively affects unused limits and positively affects cash holdings, which suggests that in times of high growth firms accumulate cash and prefer cash holdings to unused credit lines.

In many emerging market economies, debt dollarization is an important phenomenon.<sup>21</sup> Our dataset allows us to investigate credit lines in different denominations i.e. TL or FX. We apply the

<sup>20</sup> The sensitivity does not solely come from FX unused limits. TL unused limits are also sensitive to the exchange rate related variables as can be seen in Table A5 in Appendix 1.

<sup>21</sup> Dalgic, Kabas and Luo (2016) use same dataset and analyze this issue.

previous regressions on both TL and FX denominated credit lines separately. Table A4 in Appendix 1 presents the results of the regressions whose the dependent variable is TL unused lines of credit. Table A5 presents the effects of financial environment. The coefficients of cash holdings are significantly positive. The coefficients of net profit is negative and its interaction with profitability dummy is positive. This finding indicates that the nonlinearity between net profit and unused credit line exists also in TL denominated credit lines. Interaction term between cash holdings and net profit is significantly negative. Size affects TL denominated unused credit lines negatively and net FX position does not have statistically significant effect on unused TL credit lines. VIX for Turkey's coefficient is significantly negative and indicators related with banks' credit supply standards are significantly positive. Standard deviation of exchange rate negatively affects unused TL credit lines.

The results of the regressions where dependent variable is unused FX credit limits are given in Table A6 and the corresponding results for financial variables are given in Table A7. The coefficients of cash holdings are positive and significant however the magnitudes of the coefficients are smaller than the ones in TL regressions. Moreover, coefficients of net profit are insignificant except for one specification and the interactions of profit with profitability dummy are also insignificant except for two specifications. Interaction terms between cash holdings and net profit are significantly negative, however smaller in magnitudes than the ones in TL cases. *One of the main differences between TL and FX denominated credit lines is related with the net FX position. Net FX position has insignificant effect on TL credit limits whereas it has positive and statistically significant effect on FX credit limits.* Regarding the effects of financial variables on FX unused lines of credit, the coefficients of VIX, CDS, TL credit spread, standard deviation of TL credit spread, basket credit spread, standard deviation of basket credit spread, exchange rate and implied exchange rate volatility are all positive and significant statistically. The coefficient of GDP growth is negative and statistically significant and the coefficient of VIX for Turkey is negative but insignificant. Exchange rate and the implied exchange rate volatility have different effects on TL and FX denominated credit lines. *Taken together, our findings suggest that uncertainties in the exchange rate market and credit markets are associated with firms holding more unused lines of credits in their off-balance sheets in which by this way they hedge against the risks in these markets. The positive and significant coefficient of implied exchange rate volatility implies that firms use unused FX credit lines against future uncertainty in the exchange rate market.*

So far, we are concentrated on the determinants of cash holdings and credit lines separately. In the following, we examine the choice between cash and lines of credit by the mean of a single variable: unused limits/unused limits + cash. In the subsequent analysis of the choice, the explanatory variables are one year lagged values of the respective variables as in Sufi (2009). As the discussion so far reveals, some variables affect cash and unused credit limits in the same way. To discriminate the relative movements of these variables, the following discussion might be helpful.

## **5.2. Choice between Cash and Lines of Credit**

The choice between cash and lines of credit is first investigated in Sufi (2009). Main finding of that paper is that firms use less credit limits relative to cash when they need funding most. In another words, positive relation is found between lagged profit and relative use of credit lines to cash. Sufi (2009) proposes a reason explaining the behavior stating that financial covenants make

firms avoid extending their credit limits as violating a covenant may make those firms deprived of possible future funding from banks.

We investigate the choice between cash and lines of credit following Sufi (2009). Our previous treatment of cash and unused credit lines which identifies the determinants of each of them clarifies individual movements of these variables in response to different firm characteristics and financial environment. As discussed previously, both cash and unused credit limits respond to financial variables in a precautionary manner. To be able to discriminate the relative movements of these variables to each other, we construct the variable unused lines of credit /unused lines of credit + cash and use it as dependent variable in regressions. Besides, to eliminate the possible endogeneity problems, all explanatory variables are one year lagged values of those variables as in Sufi (2009).

**Table 8: Choice between Unused Lines of Credit and Cash**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
lagged net profit	-0.252*** (0.023)	-0.186*** (0.046)	-0.480*** (0.048)	-0.195*** (0.043)	-0.190*** (0.044)	-0.206*** (0.044)
lagged profitability dummy		0.050*** (0.007)	0.045*** (0.007)	0.039*** (0.007)	0.043*** (0.007)	0.046*** (0.007)
lagged net profit*dummy		-0.354*** (0.071)	-0.372*** (0.093)	-0.143** (0.068)	-0.302*** (0.070)	-0.319*** (0.069)
lagged size (assets)	0.015*** (0.001)	0.016*** (0.001)	0.226*** (0.022)	0.014*** (0.001)	0.259*** (0.021)	0.244*** (0.021)
lagged size* lagged size			-0.006*** (0.001)		-0.007*** (0.001)	-0.007*** (0.001)
lagged net worth	-0.002 (0.006)	-0.002 (0.007)	-0.008 (0.009)	0.013 (0.015)	0.005 (0.009)	-0.005 (0.006)
lagged net worth*lagged net worth			0.000 (0.000)		0.000** (0.000)	
lagged tangible assets	-0.030** (0.013)	-0.022* (0.013)	0.295*** (0.038)	0.036** (0.016)	0.302*** (0.038)	0.299*** (0.038)
lagged tangible assets*lagged tangible assets			-0.415*** (0.049)		-0.424*** (0.049)	-0.425*** (0.050)
lagged FX net position	0.000 (0.004)	0.002 (0.004)	0.029*** (0.008)	0.004 (0.004)	0.031*** (0.008)	0.035*** (0.008)
lagged FX net position*lagged FX net position			-0.009*** (0.003)		-0.009*** (0.003)	-0.012*** (0.003)
exchange rate					0.085*** (0.020)	
(lagged unused limits (fx)/unused limits(fx)+cash)* difference (exchange rate)					12.705*** (3.948)	
interest rate (1 year)					0.003*** (0.001)	
lagged financial assets*interest rate (1 year)					-0.066*** (0.004)	
lagged net profit*lagged net profit			-0.697*** (0.071)			
coverage				0.000*** (0.000)		
borrowing base				0.076*** (0.014)		
vix						-0.001 (0.037)
Constant	0.465*** (0.044)	0.438*** (0.045)	-1.365*** (0.190)	0.445*** (0.049)	-1.819*** (0.193)	-1.531*** (0.189)
Observations	14,050	14,050	14,050	12,810	13,917	14,050
R-squared	0.050	0.058	0.088	0.062	0.102	0.075
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	No	No
Adj. R-squared	0.05	0.06	0.09	0.06	0.10	0.07

Dependent variables in all regressions are Unused Lines of Credit/Unused Lines of Credit + Cash. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

Table 8 presents the results where the dependent variable is unused lines of credit/unused lines of credit + cash. Regression 1 in Table 8 replicates the corresponding regression in Sufi (2009) for

Turkey in which Sufi (2009) finds a positive coefficient of lagged net profit in the US data; whereas we find a negative one in our data. Hence, our findings contradict with the findings of Sufi (2009)'s for the case of Turkey. *Our results imply that as firms earn more profit, they prefer cash to credit limits.* The coefficients of other variables are consistent with the Sufi (2009)'s findings; i.e. the coefficient for size is positive, the coefficient for net worth is negative and the coefficient for tangible assets is positive if we introduce nonlinearity for tangible assets.

**Table 9: Choice between Unused Lines of Credit and Cash (By Cash Holdings)**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
lagged net profit	0.233*** (0.085)	-0.071 (0.050)	-0.305*** (0.046)	0.013 (0.076)	-0.005 (0.064)	-0.008 (0.042)
lagged profitability dummy	0.043*** (0.011)	0.019** (0.009)	0.040*** (0.008)	-0.019 (0.013)	0.002 (0.010)	-0.007 (0.008)
lagged net profit*dummy	-0.396*** (0.126)	0.096 (0.084)	0.009 (0.076)	0.024 (0.117)	-0.091 (0.092)	-0.089 (0.068)
lagged size (assets)	0.093*** (0.036)	0.213*** (0.029)	0.303*** (0.023)	0.229*** (0.034)	0.187*** (0.029)	0.221*** (0.020)
lagged size*lagged size	-0.003** (0.001)	-0.006*** (0.001)	-0.008*** (0.001)	-0.005*** (0.001)	-0.004*** (0.001)	-0.005*** (0.001)
lagged net worth	-0.007 (0.016)	-0.002 (0.025)	-0.019** (0.009)	-0.004 (0.003)	-0.034** (0.014)	-0.010 (0.008)
lagged net worth*lagged net worth	-0.000 (0.000)	-0.107*** (0.029)	-0.020 (0.013)			
lagged tangible assets	0.370*** (0.059)	0.318*** (0.049)	0.307*** (0.044)	0.059*** (0.022)	0.045** (0.018)	0.045*** (0.013)
lagged tangible assets*lagged tangible assets	-0.548*** (0.078)	-0.323*** (0.063)	-0.375*** (0.057)			
lagged FX net position	0.037*** (0.012)	0.008 (0.011)	0.044*** (0.009)	0.230*** (0.018)	0.166*** (0.014)	0.155*** (0.010)
lagged FX net position*lagged FX net position	-0.006 (0.005)	0.001 (0.004)	-0.013*** (0.004)	-0.045*** (0.006)	-0.024*** (0.005)	-0.023*** (0.004)
exchange rate	0.041* (0.025)	0.067*** (0.021)	0.034* (0.017)	-0.026 (0.019)	-0.059*** (0.016)	-0.038*** (0.012)
(lagged unused limits (fx)/unused limits(fx)+cash)*difference (exchange rate)	0.000 (0.000)	0.000 (0.000)	0.001** (0.000)	0.000 (0.000)	0.001* (0.000)	0.001*** (0.000)
interest rate (1 year)	-0.002* (0.001)	0.001 (0.001)	0.001 (0.001)			
lagged financial assets*interest rate (1 year)	-0.056*** (0.012)	-0.067*** (0.008)	-0.062*** (0.004)			
Constant	-0.035 (0.318)	-1.263*** (0.260)	-2.182*** (0.210)	-2.019*** (0.296)	-1.681*** (0.252)	-1.969*** (0.181)
Observations	4,084	5,622	9,839	3,895	5,519	9,640
R-squared	0.119	0.117	0.130	0.257	0.273	0.258
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No
Adj. R-squared	0.11	0.11	0.13	0.25	0.27	0.26

Dependent variables in regressions 1, 2 and 3 are Unused Lines of Credit/Unused Lines of Credit + Cash, while dependent variables in regressions 4, 5 and 6 are Unused FX Lines of Credit/Unused FX Lines of Credit + Unused TL Lines of Credit. In regressions 1 and 4, sample is restricted to less than and equal to the 30<sup>th</sup> percentile with respect to the lagged cash holdings, while in regressions 2 and 5 sample is restricted to between 30<sup>th</sup> and 70<sup>th</sup> percentile and in regressions 3 and 6 sample is restricted to the greater than and equal to the 70<sup>th</sup> percentile. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

To show the implications of different cash holding levels, we present the results of regressions in Table 9 where we divide our sample according to the percentiles of the cash holdings of the firms. Regression 1 is for the sample where cash holding is less than and equal to the lowest 30<sup>th</sup> percentile

where regression 3 is for the highest 30<sup>th</sup> percentile and regression 2 is for the sample in between. As can be seen, the coefficient of the profit for the bottom percentile is positive and significant, the coefficient for the highest percentile is negative and significant and the coefficient for the middle percentile is negative but insignificant. This result suggests that firms in the bottom percentile of cash holdings prefer credit limits more as they get more profitable and the firms in the top percentile of cash holdings prefer cash as they get more profitable. This implies that after firms are able to accumulate sufficient cash, they rely on cash more in their liquidity management as their profitability increases, whereas if the firms cannot accumulate sufficiently large cash they rely more on credit limits in their liquidity managements as their profitability increases. Hence, this result highlights that firms' decisions on their liquidity management depend crucially on the cash holding levels they have. For the firms in the bottom percentile, the insight of Sufi (2009) may be relevant for Turkey, however for the top percentile our findings show the opposite relation between profits and the relative use of credit lines with respect to cash.

The results of the previous section emphasize that for small holdings of cash, firms complement their cash holdings with unused credit lines and for high holdings of cash, firms substitute cash for unused credit lines as they get more profitable. The previous finding of this section comply with those of the previous section and suggests further that small cash holding firms increase their unused credit limits more than cash holdings and high cash holding firms increase their cash holdings more than unused limits as they get more profitable. Hence, the importance of credit lines for small cash holding firms are more pronounced than high cash holding firms. On the other hand, the regressions 4 through 6 in Table 9 replicate the same regressions for the choice between TL and FX credit lines. We find no difference among different percentiles in the choice between lines of credit for different currency denominations.

Regarding the impact of financial variables on the choice between credit lines and cash, Table 10 presents the estimation results for the coefficients of different financial variables. The VIX for Turkey's coefficient is negative and statistically significant implying that in the times of high domestic uncertainty firms prefer cash more. The coefficients for TL credit spread and standard deviation of TL credit spread are positive and significant where basket credit spread's coefficient is negative and significant. Hence in times of high spread in TL credits and uncertainty regarding the spread firms hold more cash relative to low spread and tranquil times. Oppositely, in the times of high credit spread for foreign currency loans, firms hold more cash. The coefficient of exchange rate is positive and significant. However, the coefficient of exchange rate volatility is insignificant.

**Table 10: Effects of Financial Environment on the Choice between Unused Lines of Credit and Cash**

	vix (Turkey)	cds	gdp growth	TL credit spread	TL credit spread (std. dev.)	basket credit spread	basket credit spread (std. dev.)	exchange rate (std. dev.)	implied exchange rate volatility
	-0.298*** (0.075)	0.000* (0.000)	-0.045* (0.026)	0.659*** (0.113)	1.138*** (0.225)	-0.288 (0.249)	0.518 (0.436)	0.065** (0.029)	-0.001 (0.001)
Observations	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394
R-squared	0.076	0.075	0.075	0.076	0.076	0.075	0.075	0.075	0.075
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No	No	No	No

Coefficients are taken from regression 6 in Table 8 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

To analyze the choice between TL and FX credit lines, we estimate a list of regressions whose results are given in Table A8 and Table A9. Coefficient of profit is significantly negative implying that as profit level increases firms prefer less unused FX credit lines comparing with TL credit lines. Intuitively, FX credit is more risky since it bears the currency risk. Controlling for FX net position, a negative sign of profit suggests that although banks might increase both TL and FX line of credits of firms, firms utilize more of their FX line of credits. In addition, the coefficient of FX net position is positive and highly statistically significant which suggests that the more the firms export comparing FX loans the more unused FX credit lines than unused TL credit lines they hold. However the coefficient of squared FX net position is negative and significant which implies that the relation reverses as the net position gets larger. Moreover there is also nonlinearity in the effect of size. The coefficient of size is positive while the coefficient of squared size is negative.

The effects of financial variables on the choice between FX and TL credit lines reveal that firms prefer more FX unused limits when implied exchange rate volatility is high implying a hedging motive. Moreover when spreads and their volatility are high for FX loans, firms prefer more FX credit lines suggesting relative attractiveness of lines of credits with respect to spot loans. In times of high uncertainty in Turkey (VIX for Turkey), firms hold more FX limits. When GDP growth is high, firms hold more TL lines and the TL credit spread has a negative and significant coefficient which suggests that firms prefer FX credit lines when spreads for TL loans are high.

### **5.3. Ex-Post Investment and Available Funds**

In this section, we investigate whether firms that hold more available funds (unused credit limits plus cash) invest more than firms that hold less available funds. Theory suggests that both cash and unused limits help firms to exploit investment opportunities when liquidity needs arise. Hence, one would expect that firms that have higher levels of available funds achieve higher levels of investment than the firms that have lower levels of available funds. To this end, we conduct regression analysis below whose dependent variables are ex-post investment performances of the firms. To see the relationship between ex-post investment and available funds, we use available funds as explanatory variable in the regressions. However, as we show in the previous sections, cash and unused lines become substitutes when firms have high profits or high levels of cash holdings. This implies that the usability and effectiveness of cash and unused credit lines may not be exactly same. To differentiate between cash and unused credit limits, we add interaction term of available funds and the cash divided by available funds ratio to the regressions. We interpret that the coefficient of this term reflects the differentiated role of cash holdings with respect to unused credit limits in the ex-post investment performances of the firms.

Since we have no data regarding the market value of firms, we have no q-statistics for the firms. As a result, we employ an ex-post approach inquiring the growth performance in ex-post investment rather than inquiring the exploitation of investment opportunities. We define four different ex-post investment indicators: one period growth in tangible assets, two period average of one period growths in tangible assets, one period growth in total assets minus cash and two period average of one period growths in total assets minus cash. The results for the one period growth in tangible assets and total assets minus cash are given in Table 11 where the results for the two period averages are given in Table 12.

**Table 11: Available Funds and Ex-Post Investment**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
available funds	0.016*** (0.006)	0.033*** (0.003)	0.019** (0.009)	0.087*** (0.007)	0.034*** (0.013)	0.035** (0.016)	0.041** (0.019)	0.159*** (0.010)	0.168*** (0.042)	0.154 (0.162)
available funds*cash ratio	0.005 (0.019)	0.084*** (0.014)	0.094*** (0.029)	0.215*** (0.023)	0.084** (0.037)	0.170*** (0.042)	0.168*** (0.043)	0.251*** (0.036)	0.316*** (0.070)	0.296 (0.205)
lagged growth						0.107 (0.162)	0.231 (0.256)		0.035 (0.221)	-0.042 (0.883)
Observations	14,049	14,049	14,049	14,049	11,705	9,365	9,365	11,705	9,365	9,365
R-squared	0.008	0.054	0.010	0.115						
Industry Dummy	Yes	Yes								
Year Dummy	Yes	Yes								
Firm Fixed Effects			Yes	Yes						
Hansen J						0.59	0.55		0.64	0.16
Sargan						0.39	0.33		0.41	0.05

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels. Dependent variables in regressions 1, 3, 5, 6 and 7 are growth in tangible assets, where dependent variables in regressions 2, 4, 8, 9 and 10 are growth in total assets-cash holdings. Regressions 1 and 2 are estimated with Pooled OLS, regressions 3 and 4 are estimated with fixed effects model, regressions 5 and 8 are estimated with two stage instrumental variables approach, regressions 6 and 9 are estimated with GMM approach where the dependent variable is instrumented with its own lags while regressions 7 and 10 are estimated with GMM approach where the dependent variable is instrumented with the lags of the other growth variable.

**Table 12: Available Funds and Two Period Average Ex-Post Investment**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
available funds	0.021*** (0.006)	0.031*** (0.003)	0.023*** (0.008)	0.071*** (0.005)	0.023*** (0.007)	0.025*** (0.007)	0.027*** (0.008)	0.072*** (0.006)	0.073*** (0.006)	0.073*** (0.007)
available funds*cash ratio	0.001 (0.017)	0.055*** (0.010)	0.085*** (0.023)	0.130*** (0.016)	0.040** (0.019)	0.057** (0.026)	0.053** (0.027)	0.092*** (0.017)	0.124*** (0.019)	0.123*** (0.020)
lagged growth						0.029 (0.032)	0.155* (0.079)		-0.023 (0.034)	0.047 (0.088)
Observations	11,707	11,707	11,707	11,707	9,364	7,024	7,024	9,364	7,024	7,024
R-squared	0.011	0.066	0.014	0.142						
Industry Dummy	Yes	Yes								
Year Dummy	Yes									
Firm Fixed Effects			Yes	Yes						
Hansen J						0.02	0.89		0.27	0.59
Sargan						0.00	0.83		0.06	0.47

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels. Dependent variables in regressions 1, 3, 5, 6 and 7 are two period average growth in tangible assets, where dependent variables in regressions 2, 4, 8, 9 and 10 are two period average growth in total assets-cash holdings. Regressions 1 and 2 are estimated with Pooled OLS, regressions 3 and 4 are estimated with fixed effects model, regressions 5 and 8 are estimated with two stage instrumental variables approach, regressions 6 and 9 are estimated with GMM approach where the dependent variable is instrumented with its own lags while regressions 7 and 10 are estimated with GMM approach where the dependent variable is instrumented with the lags of the other growth variable.

To check for robustness, we employ different estimation techniques. In both tables, regressions 1 and 2 are estimated with Pooled OLS, regressions 3 and 4 are estimated with fixed effects model, regressions 5 and 8 are estimated with two stage instrumental variables approach, regressions 6 and 9 are estimated with GMM approach where the dependent variable is instrumented with its own lags while regressions 7 and 10 are estimated with GMM approach where the dependent variable is instrumented with the lags of the other growth variable. Since it may be argued that firms that have

better investment opportunities might accumulate more available funds and cash, hence there may be reverse causality; we use instrumental variables and GMM methods to deal with this problem.

*The results in both tables suggest that firms that have more available funds invest more as the coefficients of available funds are positive and significant in all regressions. Moreover, the coefficient of interaction between available funds and cash ratio (cash divided by available funds) is also positive and significant in most regressions which suggests that firms that hold more cash for a given level of available funds invest more. This result suggests that both unused lines of credits and cash holdings are valuable in the sense that they enable firms to invest; however the results also suggest that cash is more valuable in this sense. This finding may explain the nonlinearity between cash holdings and unused credit limits. In the previous sections, we emphasize that the relation between cash and unused limits is non-linear. For sufficiently low amount of profits, unused limits and cash holdings are complements because both are useful to exploit future growth opportunities. However, for sufficiently high profits, firms substitute cash for unused credit limits because cash is more valuable to be used in future growth opportunities and firms that are able to accumulate sufficient cash prefer cash to unused credit limits.*

## **6. Conclusion**

The role of cash holdings are relatively well investigated in the empirical literature of corporate liquidity management, however the role of credit lines gains importance recently. Both theoretical and empirical literatures on cash holdings emphasize the precautionary role of cash for future liquidity shocks. The same argument is also put forward by the theoretical literature on lines of credit (Holmström and Tirole, 1998) and empirical literature supports the insights of this theoretical literature. Since both cash and lines of credit can be used for the same purpose, the choice between them is also investigated empirically (Sufi, 2009). Growing literature continues to propose different usages and implications of lines of credit (Acharya et al., 2009; Acharya et al., 2014). We contribute to this literature by investigating the determinants of cash holdings and lines of credit and the choice between them for non-financial firms in Turkey.

Our findings suggest that cash and lines of credits are complementary instruments in liquidity management of firms if the cash generating capacity of the firms are low (profits are low) or cash holdings are small. If firms accumulate large cash reserves or if firms are profitable enough to be able to accumulate cash, they substitute cash for credit lines. Moreover, if firms have small cash holdings they prefer unused credit limits more to the cash as they get more profitable, while if firms have large cash holdings they prefer cash to unused limits as they get more profitable. This finding differs from the arguments of Sufi (2009), Campello et al. (2011) and Acharya et al. (2009). They find for US firms that cash and unused lines of credit are substitute for each other and firms that are more profitable prefer credit limits more to cash. The different results may be sourced by different factors: The studies that are mentioned largely use publicly traded firms in US while our study use both publicly traded and privately owned firms in Turkey, hence the results might differ because of the different attitudes of firms in developed countries and developing countries or because of the different attitudes of private and public firms. The results may just merely reflect the different practice of credit lines of firms peculiar to Turkey. To say more about this, the extant literature unfortunately lacks the relevant and comparable studies for developing countries.

Moreover, our findings indicate that nonlinearities prevail in the liquidity management of Turkish non-financial firms. The relation between unused credit limits and some firm characteristics exhibit clear nonlinearity. For example, increase of the size for relatively small sizes increases unused credit limits, while increases in the high level sizes decreases unused credit limits.

We also investigate the choice between FX credit limits and TL credit limits. Our findings suggest that firms that have higher FX net position to total sales ratio hold more FX unused credit lines relative to TL unused credit lines. We also find significant effects of aggregate financial variables on unused credit lines and cash holdings. In general, our findings indicate that credit limits are more sensitive to financial environment than cash holdings. Besides, we find that uncertainty in the exchange rate market make firms hold more unused credit limits on their off balance sheets compared to cash holdings and more FX unused credit limits compared to TL unused credit limits. This finding supports the argument that firms use credit lines as a hedging instrument.

Our study contributes to the corporate liquidity management literature in multiple ways: This study is the first one that investigates the Turkish case. This study is also, to our knowledge, the first one on emerging country firms. Moreover, our base finding differs from the common findings of the extant literature which are mainly on publicly traded US firms. For future study, we think that investigating the possible differences of corporate liquidity management in developing and developed countries may shed light on the different practices of liquidity management in these countries especially for credit lines. We also want to emphasize that high credit expansions may have important implications for the usage practices of credit lines especially in developing countries. Moreover, using a suitable methodology to identify credit supply conditions and credit demand conditions separately may be helpful to investigate further the liquidity management of the firms.

## References

- Acharya, V., Almeida, H., Campello, M., 2007. A Hedging Perspective on Corporate Financial Policies. *Journal of Financial Intermediation* 16, 515–554.
- Acharya, V., Almeida, H., Campello, M., 2009. Aggregate Risk and the Choice between Cash and Lines of Credit. *Journal of Finance*, VOL. LXVIII, NO. 5, 2059-2116.
- Acharya, V., Almeida, H., Ippolito, F., Perez, A., 2014. Credit Lines as Monitored Liquidity Insurance: Theory and Evidence. *Journal of Financial Economics* 112, 287-319.
- Almeida, H., Campello, M., Weisbach, M., 2004. The Cash Flow Sensitivity of Cash. *Journal of Finance* 59, 1777–1804.
- Bates, T.W., Kahle, K.M. and Stulz, R.M., 2009. Why do US firms hold so much more cash than they used to?. *The Journal of Finance*, 64(5), pp.1985-2021.
- Campello, M., Graham, J., Giambona, E., Harvey, C., 2011. Liquidity Management and Corporate Investment during a Financial Crisis. *The Review of Financial Studies* v 24 n 6,1944-1979.
- Dalgic, H. C., Kabas, G., Luo, V. X., 2016. Emerging Market Dollar Debt and Macro-prudential Policy Response. Unpublished Manuscript.
- Demiroglu, C., James, C., 2011. The Use of Bank Lines of Credit in Corporate Liquidity Management: A Review of Empirical Evidence. *Journal of Banking & Finance* 35, 775-782.

Demiroglu, C., James, C. and Kizilaslan, A., 2012. Bank lending standards and access to lines of credit. *Journal of Money, Credit and Banking*, 44(6), pp.1063-1089.

Holmström, B., Tirole, J., 1998. Private and Public Supply of Liquidity. *Journal of Political Economy* 106, 1–40.

Kashyap, A. K., Rajan, R., Stein, J.C., 2002. Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking. *The Journal of Finance*, vol. LVII, no. 1.

Lins, K., Servaes, H., Tufano, P., 2010. What Drives Corporate Liquidity? An International Survey of Cash Holdings and Lines of Credit. *Journal of Financial Economics*, 98, 160-176.

Opler, T., Pinkowitz, L., Stulz, R. and Williamson, R., 1999. The determinants and implications of corporate cash holdings. *Journal of financial economics*, 52(1), pp.3-46.

Sufi, A., 2009. Bank Lines of Credit in Corporate Finance: An Empirical Analysis. *Review of Financial Studies* 22, 1057–1088.

## Appendix 1

Table A1 in Appendix 1 provides the simple correlations of balance sheet variables with each other. Unused limits has a positive correlation between profitability whereas unused limits / unused limits + cash has a negative correlation. The correlation between cash and profitability is positive, between cash and unused limits is positive and between cash and unused limits / unused limits + cash is negative. The correlations between size, net worth and tangible assets are positive whereas the correlation between profit and size is positive while between profit and tangible assets and between profit and net worth is negative.

Table A2 and Table A3 in Appendix 1 give the descriptive statistics and simple correlations respectively for aggregate financial variables used in the analysis. The correlation between VIX and VIX for Turkey is negative. Implied exchange rate's correlations between standard deviations of both credit spreads are positive and it is 0.80 for standard deviation of basket credit spread and 0.53 for TL credit spread.

**Table A1: Simple Correlations of Balance Sheet Variables**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
profitability (1)	1												
tangible assets (2)	-0.0305	1											
size (3)	0.061	0.0365	1										
net worth (4)	-0.0259	0.1619	0.0323	1									
cash (5)	0.0877	-0.204	-0.011	0.1596	1								
coverage (6)	-0.0333	-0.0028	-0.0222	-0.0289	-0.0315	1							
borrowing base (7)	0.0169	-0.5937	-0.2097	-0.1319	0.0844	0.0112	1						
foreign sales (8)	0.0085	0.0041	0.0953	-0.006	-0.0499	0.0064	-0.0038	1					
unused limits (9)	0.0015	-0.052	-0.0365	0.0157	0.0597	0.005	0.041	0.0001	1				
unused TL limits (10)	0.0027	-0.05	-0.0684	0.005	0.0518	0.0041	0.0363	-0.043	0.9702	1			
unused FX limits (11)	-0.0043	-0.0173	0.1188	0.0453	0.042	0.0047	0.0263	0.1697	0.3029	0.0632	1		
unused limits/unused limits+cash (12)	-0.0549	0.1021	0.0239	-0.1344	-0.5852	0.0312	0.0498	0.0451	0.1579	0.1087	0.223	1	
unused FX limits/unused FX limits+unused TL limits (13)	0.0203	0.0951	0.3558	0.0175	-0.0404	0.0046	-0.0757	0.3904	0.0331	-0.0804	0.4528	0.1661	1

**Table A2: Descriptive Statistics of Aggregate Financial Variables**

Variable	Obs	Mean	Std. Dev.	Min	Max
TL credit spread	7	2.266184	1.478315	0.7241509	4.8925
basket credit spread	7	2.660709	0.6022821	2.106792	3.837212
Std Dev. TL credit spread	7	1.067373	0.514331	0.3306662	1.910867
Std Dev. basket credit spread	7	0.6187279	0.3121881	0.3189127	1.209988
VIX	7	22.68493	7.380971	12.78038	32.58267
VIX for Turkey	7	48.96738	3.31573	44.76002	54.36686
CDS	7	219.8742	58.02142	166.5025	317.5303
GDP growth	7	3.537441	5.205762	-6.973418	9.339109
implied exchange rate volatility	7	13.73169	3.182509	9.215833	18.8438
1 year interest rate	7	12.68595	4.865486	7.744088	18.5637

**Table A3: Simple Correlations of Aggregate Financial Variables**

	TL credit spread	basket credit spread	Std Dev. TL credit spread	Std Dev. basket credit spread	VIX	VIX for Turkey	CDS	GDP growth	implied exchange rate volatility	1 year interest rate
TL credit spread	1									
basket credit spread	0.1168	1								
Std Dev. TL credit spread	0.5013	0.6865	1							
Std Dev. basket credit spread	0.0073	0.5941	0.4925	1						
VIX	-0.1085	0.648	0.5031	0.8847	1					
VIX for Turkey	-0.2593	0.4199	0.2641	0.0713	-0.0431	1				
CDS	0.1556	0.7352	0.6528	0.966	0.8351	0.1709	1			
GDP growth	-0.0527	-0.2607	-0.1582	-0.7339	-0.4191	0.1054	-0.7178	1		
implied Exchange rate volatility	-0.3512	0.6896	0.5276	0.8029	0.7585	0.4872	0.8116	-0.5141	1	
1 year interest rate	-0.4471	0.2549	-0.0517	0.1963	-0.0585	0.5639	0.2468	-0.5268	0.5288	1

**Table A4: Determinants of Unused TL Lines of Credit**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cash holdings	0.203*** (0.051)	0.182*** (0.051)	0.263*** (0.056)	0.569*** (0.116)	0.543*** (0.116)	0.554*** (0.119)	0.561*** (0.116)
net profit	0.036 (0.062)	-0.322*** (0.106)	-0.167 (0.109)	-0.187* (0.109)	-0.204* (0.107)	-0.290*** (0.103)	-0.220** (0.108)
profitability dummy		0.037*** (0.013)	0.030** (0.013)	0.029** (0.013)	0.028** (0.013)	0.026** (0.012)	0.028** (0.013)
net profit*dummy		0.483*** (0.140)	0.575*** (0.142)	0.564*** (0.142)	0.569*** (0.142)	0.736*** (0.145)	0.575*** (0.140)
net profit*cash holdings			-1.438*** (0.367)	-1.263*** (0.360)	-1.236*** (0.362)	-1.321*** (0.388)	-1.267*** (0.358)
cash holdings*cash holdings				-0.721*** (0.257)	-0.668*** (0.258)	-0.517** (0.263)	-0.693*** (0.257)
size (assets)	-0.029*** (0.004)	-0.029*** (0.004)	-0.029*** (0.004)	-0.029*** (0.004)	-0.014 (0.067)	-0.064 (0.063)	-0.026*** (0.004)
size*size					-0.000 (0.002)	0.001 (0.002)	
net worth	-0.011 (0.026)	-0.014 (0.026)	-0.017 (0.026)	-0.018 (0.026)	-0.016 (0.027)	0.040 (0.025)	-0.017 (0.026)
net worth*net worth					0.001 (0.004)	0.012*** (0.002)	
tangible assets	-0.089*** (0.034)	-0.090*** (0.034)	-0.087** (0.034)	-0.089*** (0.034)	0.125 (0.099)	0.291*** (0.099)	-0.097*** (0.034)
tangible assets*tangible assets					-0.307*** (0.118)	-0.305*** (0.115)	
FX Net Position	-0.009 (0.014)	-0.012 (0.014)	-0.013 (0.014)	-0.013 (0.014)	-0.012 (0.014)	-0.017 (0.014)	-0.015 (0.014)
coverage						0.000** (0.000)	
borrowing base						0.257*** (0.034)	
vix							0.366*** (0.036)
Constant	0.777*** (0.085)	0.728*** (0.086)	0.722*** (0.086)	0.720*** (0.086)	0.570 (0.600)	0.749 (0.562)	0.635*** (0.085)
Observations	16,394	16,394	16,394	16,394	16,394	14,890	16,394
R-squared	0.054	0.056	0.059	0.060	0.061	0.084	0.052
Industry Dummy	Yes						
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	No
Adj. R-squared	0.05	0.05	0.06	0.06	0.06	0.08	0.05

Coefficients are taken from regression 4 in Table 4 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

**Table A5: Unused TL Lines of Credit and Financial Environment**

	vix (Turkey)	cds	gdp growth	TL credit spread	TL credit spread (std. dev.)	basket credit spread	basket credit spread (std. dev.)	exchange rate	exchange rate (std. dev.)	implied exchange rate volatility
	-0.920*** (0.094)	0.000*** (0.000)	-0.036 (0.037)	1.869*** (0.168)	4.174*** (0.398)	2.119*** (0.475)	5.654*** (0.398)	-0.205*** (0.017)	-0.433*** (0.047)	-0.001 (0.001)
Observations	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394
R-squared	0.053	0.050	0.048	0.052	0.050	0.049	0.050	0.057	0.050	0.048
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No	No	No	No	No

Coefficients are taken from regression 7 in Table A4 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

**Table A6: Determinants of Unused FX Lines of Credit**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cash holdings	0.066* (0.034)	0.062* (0.034)	0.094*** (0.036)	0.163** (0.075)	0.146* (0.075)	0.175** (0.080)	0.160** (0.075)
net profit	0.033 (0.036)	-0.076 (0.064)	-0.015 (0.065)	-0.020 (0.065)	-0.051 (0.064)	-0.136* (0.075)	-0.026 (0.064)
profitability dummy		0.018** (0.009)	0.015* (0.009)	0.015* (0.009)	0.016* (0.009)	0.014 (0.010)	0.015 (0.009)
net profit*dummy		0.116 (0.094)	0.153 (0.097)	0.150 (0.097)	0.160* (0.097)	0.273** (0.109)	0.151 (0.097)
net profit*cash holdings			-0.568** (0.239)	-0.529** (0.242)	-0.525** (0.240)	-0.329 (0.291)	-0.525** (0.242)
cash holdings*cash holdings				-0.161 (0.161)	-0.134 (0.161)	-0.118 (0.179)	-0.153 (0.161)
size (assets)	0.028*** (0.002)	0.029*** (0.002)	0.029*** (0.002)	0.028*** (0.002)	0.195*** (0.031)	0.191*** (0.036)	0.029*** (0.002)
size*size					-0.005*** (0.001)	-0.005*** (0.001)	
net worth	-0.007 (0.017)	-0.008 (0.017)	-0.009 (0.017)	-0.009 (0.017)	0.011 (0.016)	0.042** (0.018)	-0.009 (0.017)
net worth*net worth					0.004** (0.002)	0.004*** (0.002)	
tangible assets	-0.006 (0.021)	-0.005 (0.021)	-0.004 (0.021)	-0.004 (0.021)	0.005 (0.059)	0.044 (0.066)	-0.006 (0.021)
tangible assets*tangible assets					-0.020 (0.074)	-0.021 (0.080)	
FX Net Position	0.121*** (0.013)	0.121*** (0.014)	0.120*** (0.014)	0.120*** (0.014)	0.121*** (0.013)	0.118*** (0.013)	0.120*** (0.014)
coverage						0.000*** (0.000)	
borrowing base						0.079*** (0.023)	
vix							0.229*** (0.024)
Constant	-0.382*** (0.056)	-0.401*** (0.056)	-0.404*** (0.056)	-0.404*** (0.056)	-1.848*** (0.269)	-1.893*** (0.310)	-0.453*** (0.056)
Observations	16,394	16,394	16,394	16,394	16,394	14,890	16,394
R-squared	0.119	0.120	0.121	0.121	0.126	0.123	0.118
Industry Dummy	Yes						
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	No
Adj. R-squared	0.12	0.12	0.12	0.12	0.12	0.12	0.12

Dependent variables in all regressions are Unused FX Lines of Credit/Total Assets. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

**Table A7: Unused FX Lines of Credit and Financial Environment**

	vix (Turkey)	cds	gdp growth	TL credit spread	TL credit spread (std. dev.)	basket credit spread	basket credit spread (std. dev.)	exchange rate	exchange rate (std. dev.)	implied exchange rate volatility
	-0.082 (0.059)	0.000*** (0.000)	-0.065** (0.026)	0.766*** (0.098)	3.286*** (0.272)	2.180*** (0.325)	4.674*** (0.513)	0.068*** (0.010)	-0.073*** (0.027)	0.003*** (0.001)
Observations	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394
R-squared	0.116	0.118	0.116	0.117	0.257	0.117	0.118	0.117	0.116	0.116
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No	No	No	No	No

Coefficients are taken from regression 7 in Table A6 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

**Table A8: Choice between Unused TL Lines of Credit and Unused FX Lines of Credit**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
lagged net profit	-0.056***	-0.010	-0.010	0.002	-0.008	-0.005
	(0.018)	(0.036)	(0.036)	(0.039)	(0.036)	(0.036)
lagged profitability dummy		-0.010	-0.012*	-0.011	-0.010	-0.009
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
lagged net profit*dummy		-0.063	-0.055	-0.038	-0.067	-0.067
		(0.058)	(0.058)	(0.061)	(0.059)	(0.057)
lagged size (assets)	0.056***	0.056***	0.226***	0.055***	0.225***	0.226***
	(0.001)	(0.001)	(0.017)	(0.001)	(0.017)	(0.017)
lagged size*lagged size			-0.005***		-0.005***	-0.005***
			(0.001)		(0.001)	(0.001)
lagged net worth	-0.004	-0.003	-0.012*	0.000	-0.012*	-0.007*
	(0.003)	(0.003)	(0.007)	(0.003)	(0.007)	(0.004)
lagged net worth*lagged net worth			-0.000		-0.000	
			(0.000)		(0.000)	
lagged tangible assets	0.050***	0.049***	0.031	0.037**	0.033	0.053***
	(0.011)	(0.011)	(0.035)	(0.015)	(0.035)	(0.011)
lagged tangible assets*lagged tangible assets			0.029		0.027	
			(0.045)		(0.046)	
lagged FX net position	0.101***	0.101***	0.176***	0.105***	0.175***	0.176***
	(0.004)	(0.004)	(0.009)	(0.004)	(0.009)	(0.009)
lagged FX net position*lagged FX net position			-0.029***		-0.029***	-0.029***
			(0.003)		(0.003)	(0.003)
coverage				0.000***		
				(0.000)		
borrowing base				-0.021		
				(0.014)		
exchange rate					-0.045***	
					(0.011)	
(lagged unused limits (fx)/unused limits(fx)+cash)*difference (exchange rate)					9.272*	
					(4.764)	
vix						0.078**
						(0.035)
Constant	-0.636***	-0.625***	-2.057***	-0.578***	-1.977***	-2.069***
	(0.048)	(0.048)	(0.152)	(0.053)	(0.154)	(0.152)
Observations	13,659	13,659	13,659	12,573	13,529	13,659
R-squared	0.248	0.248	0.259	0.245	0.255	0.258
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes	No	No
Adj. R-squared	0.25	0.25	0.26	0.24	0.25	0.26

Dependent variables in all regressions are Unused FX Lines of Credit/Unused FX Lines of Credit + Unused TL Lines of Credit. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

**Table A9: Effects of Financial Environment on the Choice between TL and FX Unused Lines of Credit**

	vix (Turkey)	cds	gdp growth	TL credit spread	TL credit spread (std. dev.)	basket credit spread	basket credit spread (std. dev.)	exchange rate	exchange rate (std. dev.)	implied exchange rate volatility
	0.208***	0.000***	-0.111***	-0.472***	0.065	0.474*	1.676***	-0.042***	-0.177***	0.002***
	(0.073)	(0.000)	(0.025)	(0.099)	(0.211)	(0.255)	(0.432)	(0.010)	(0.026)	(0.000)
Observations	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394	16,394
R-squared	0.258	0.257	0.258	0.258	0.257	0.257	0.258	0.258	0.258	0.258
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	No	No	No	No	No	No	No	No	No	No

Coefficients are taken from regression 6 in Table A8 where each variable enter one by one. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. Variables are normalized with total assets and winsorized at both %1 and %99 levels.

Appendix 2

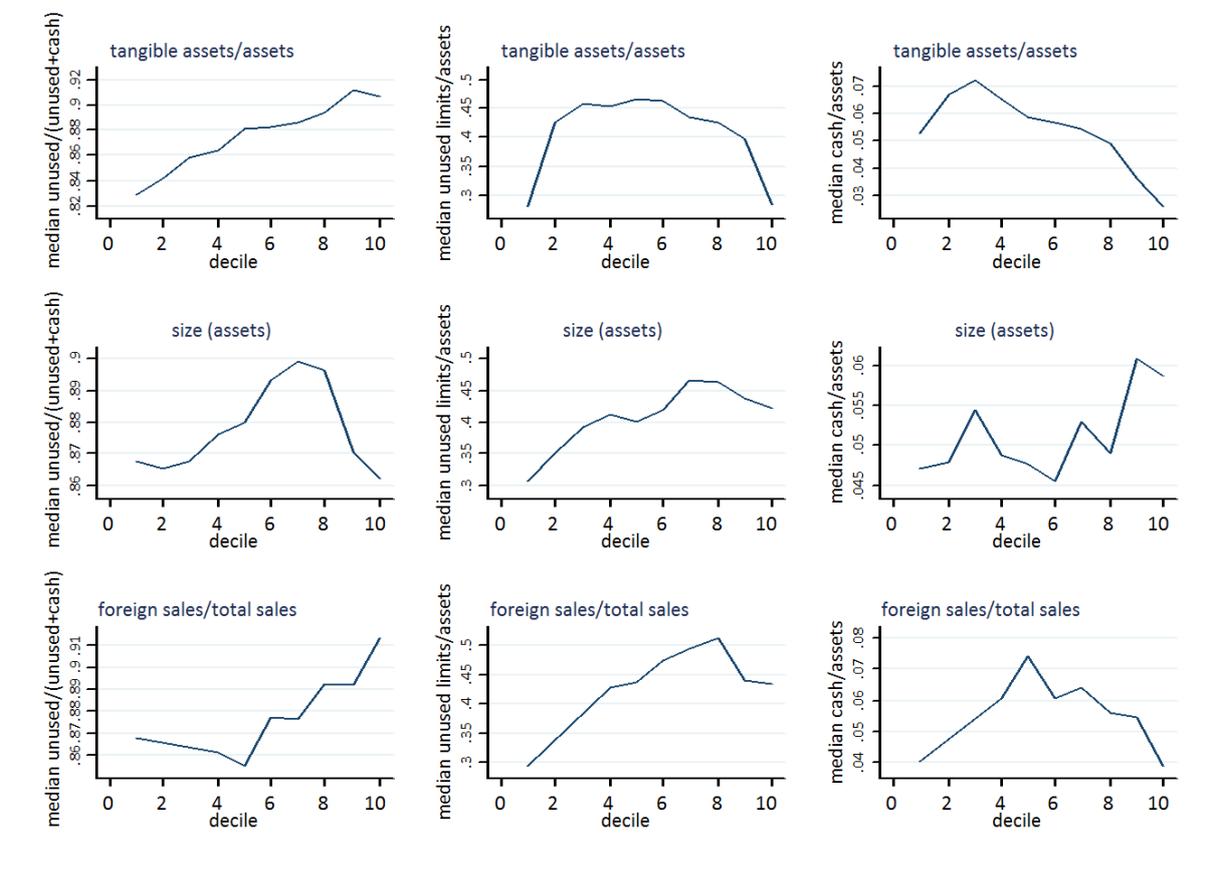


Figure A1: Nonlinearity of the relation between unused credit limits, cash holdings and firm characteristics

## Central Bank of the Republic of Turkey

### Recent Working Papers

The complete list of Working Paper series can be found at Bank's website

(<http://www.tcmb.gov.tr>).

#### A Hedonic House Price Index for Turkey

(Timur Hülagü, Erdi Kızılkaya, Ali Gencay Özbekler, Pınar Tunar Working Paper No. 16/03 February 2016)

#### In Pursuit of Understanding Markups in Restaurant Services Prices

(Mustafa Utku Özmen Working Paper No. 16/02 January 2016)

#### Immigration and Prices: Quasi-Experimental Evidence from Syrian Refugees in Turkey

(Binnur Balkan Konuk, Semih Tümen Working Paper No. 16/01 January 2016)

#### Tüketici Güvenini Belirleyen Unsurlar Üzerine Ampirik Bir Çalışma: Türkiye Örneği

(Tuğrul Gürür , Zübeyir Kılınc Working Paper No. 15/38 December 2015)

#### Imported Intermediate Goods and Product Innovation: Evidence from India

(Murat Şeker, Daniel Rodriguez-Delgado, Mehmet Fatih Ulu Working Paper No. 15/37 December 2015)

#### Liquidity Crises, Liquidity Lines and Sovereign Risk

(Yasin Kürşat Önder Working Paper No. 15/36 December 2015)

#### Quantifying the Effects of Loan-to-Value Restrictions: Evidence from Turkey

(Yavuz Arslan, Gazi Kabaş, Ahmet Ali Taşkın Working Paper No. 15/35 December 2015)

#### Compulsory Schooling and Early Labor Market Outcomes in a Middle-Income Country

(Huzeyfe Torun Working Paper No. 15/34 November 2015)

#### "I Just Ran four Million Regressions" for Backcasting Turkish GDP Growth

(Mahmut Günay Working Paper No. 15/33 November 2015)

#### Has the Forecasting Performance of the Federal Reserve's Greenbooks Changed over Time?

(Ozan Ekşi ,Cüneyt Orman, Bedri Kamil Onur Taş Working Paper No. 15/32 November 2015)

#### Importance of Foreign Ownership and Staggered Adjustment of Capital Outflows

(Özgür Özel ,M. Utku Özmen,Erdal Yılmaz Working Paper No. 15/31 November 2015)

#### Sources of Asymmetry and Non-linearity in Pass-Through of Exchange Rate and Import Price to Consumer Price Inflation for the Turkish Economy during Inflation Targeting Regime

(Süleyman Hilmi Kal, Ferhat Arslaner, Nuran Arslaner Working Paper No. 15/30 November 2015)

#### Selective Immigration Policy and Its Impacts on Natives: A General Equilibrium Analysis

(Şerife Genç İleri Working Paper No. 15/29 November 2015)

#### How Does a Shorter Supply Chain Affect Pricing of Fresh Food? Evidence from a Natural Experiment

(Cevriye Aysoy, Duygu Halim Kırılı, Semih Tümen Working Paper No. 15/28 October 2015)

#### Decomposition of Labor Productivity Growth: Middle Income Trap and Graduated Countries

(Gökhan Yılmaz Working Paper No. 15/27 October 2015)

#### Estimating Income and Price Elasticity of Turkish Exports with Heterogeneous Panel Time-Series Methods

(İhsan Bozok, Bahar Şen Doğan, Çağlar Yüncüler Working Paper No. 15/26 October 2015)

#### External Shocks, Banks and Monetary Policy in an Open Economy: Loss Function Approach

(Yasin Mimir, Enes Sunel Working Paper No. 15/25 September 2015)

#### Tüm Yeni Açılan Krediler Eşit Mi? Türkiye'de Konut Kredisi ve Konut Kredisi Dışı Borç ile Özel Kesim Tasarruf Oranı

(Cengiz Tunç, Abdullah Yavaş Working Paper No. 15/24 September 2015)