Non-core Liabilities and Credit Growth

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Zubeyir KILINC, Hatice Gokce KARASOY and Eray YUCEL*

Abstract

The composition of bank liabilities has captured a lot of attention especially after the global financial crisis. It is argued that movements particularly in the non-core liabilities may reflect the stage of financial cycle. The literature claims that banks usually fund their credits with core liabilities, which grow with households’ wealth, but when there is a faster growth in credits compared to deposits, the banks resort to non-core liabilities to meet the excess demand. Despite this significant role assumed to be played by the non-core liabilities, there are not too many country-specific studies on this issue.

This study analyzes the relationship between the non-core liabilities and credits within a small open economy, namely Turkey. It investigates the relationship under alternative settings and reveals a robust relationship between credits and non-core liabilities under all frameworks. The study also verifies that elevated demand for credit may induce some increase in the non-core liabilities. Finally, the relationship is affirmed in the long-run.

*JEL Classification*: E44 - Financial Markets and the Macroeconomy; E51 - Money Supply; Credit; Money Multipliers

*Keywords*: Core Liabilities, Non-core Liabilities, Credits, Small Open Economy, VAR, VECM.

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1. Introduction

The composition of bank liabilities has captured a lot of attention especially after the 2008-global financial crisis. The literature identifies two types of liabilities: core and non-core. The core liabilities are defined as banks’ liabilities to the claimholders other than financial intermediaries, in other words, deposits. The non-core liabilities include those held by other financial intermediaries and foreign creditors. Shin and Shin (2011) along with others claim that the relative size of the non-core liabilities can increase banks’ exposures to the risks and therefore can be used as an indicator of the stage of financial cycle and the degree of vulnerability of financial institutions.

Hahm et al. (2012) point out that the core liabilities, which are the main source of funding available to the bank, grow with the size of the economy and wealth of the households. However, when credits grow faster than the core liabilities, the deposits are likely to be insufficient and banks turn to the non-core liabilities to finance this excessive credit growth. Thus, it suggests a close association between the non-core liabilities and credit growth. Based on this finding along with the others, the non-core liabilities have become a target for macro-prudential policies. Therefore, more work is required regarding the dynamics of the non-core liabilities as well as the relationship between the non-core liabilities and credit growth.

There is a growing literature that investigates the abovementioned subject. Shin and Shin (2011), for instance, examine the dynamics of the non-core liabilities for Korean banking sector and find that they are closely related to the risk-taking behaviors of the banking sector. Hahm et al. (2012), with a very extensive list of countries, show that alternative measures for the non-core liabilities have a significant predictive power on explaining currency and credit crises. Alichi et al. (2012) document that over the last decade, bank credits have moved beyond the cycle; but they also show that the non-core liabilities are the main vehicle for the expansion of bank credits.

Despite these studies, the literature still lacks of country-specific analyses. This study aims at contributing to this strand of research. In particular, it intends to enlarge the avenue of research by presenting evidence from a small open economy and shedding light on the relationship between the non-core liabilities and credit growth in Turkey. Ozen et al. (2013) investigates the behavior of non-core liabilities for Turkish economy during a financial stress abroad. It focuses on the turbulent times since during those times external financing sources is a crucial factor to maintain domestic financial stability. This study, however, tests the statement in the literature and sheds light on the particular relationship between non-core liabilities and credit growth for the Turkish economy.

Financial integration of the Turkish economy to the global markets and deepening of the credit markets have gained speed after 2000s, therefore, the analysis starts from 2001. It initially documents the basic features of the non-core liabilities of Turkey and tests the basic hypothesis presented by the recent literature whether credit growth is indeed accompanied by the non-core liabilities. Although recent literature makes it clear that the increased demand for credit may force banks to pull non-core liabilities, the analysis starts without any prior assumption. Next, it examines the relationship within a closed and a small open economy framework. Finally, it investigates the long-run relationship through a VECM analysis.

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1 Although studies for the United States and Korea show that the peaks in the non-core liabilities coincide with the crisis years and this finding is worth to test for the Turkish economy, late financial integration of the Turkish economy to the global markets and the nature of the 2008 crisis make us postpone that research to future studies.
While constructing the data set, the literature is followed and two measures for the non-core liabilities and one measure for the core liabilities are built. In a closed economy setup the basic variables are augmented with interest rate and real GDP. In an open economy framework, exchange rates and VIX are included. The details of the variables are discussed in the next section. The results are as follows. There is a robust relationship between the two under all frameworks. As is the case in the previous studies, the non-core liabilities respond to the credit growth. In other words, the credit growth in the Turkish economy pulls noncore liabilities. This relation remains valid in the long-run.

The next section introduces the data used in the analysis. Section three elaborates on empirical strategy and presents the results. The last section concludes the paper.

2. **Variables and Data**

The conceptual distinction between the core and the non-core liabilities can be made according to whether the liability is to an ultimate domestic creditor, as discussed by Shin and Shin (2011). It provides the classification in Table 1 and argues that the claims held by domestic non-financial firms are not straightforward. Therefore, the researchers use alternative measures for the non-core liabilities. Following mainly Hahm et al. (2012), we construct two measures. The first measure is the sum of the total liabilities to nonresidents and the difference between M3 and M2 aggregates of money. The second measure, on the other hand, includes only the total liabilities to nonresidents. For the core liabilities, there are alternative measures such as sum of demand, time, savings and foreign currency deposits and restricted deposits, or monetary aggregates like M1 and M2. Following the literature, in this study we only consider M1 for the core-liabilities. The last critical variable of this study, the credits, is defined as the sum of the claims to the private sector and claims to the public non-financial sector.

<table>
<thead>
<tr>
<th></th>
<th>Core Liability</th>
<th>Intermediate</th>
<th>Non-core liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly liquid</td>
<td>Cash</td>
<td>Demand deposits (non-financial corporate)</td>
<td>Repos</td>
</tr>
<tr>
<td></td>
<td>Demand deposits (households)</td>
<td></td>
<td>Call loans</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Time deposit &amp; CDs (households)</td>
<td>Time deposit &amp; CDs (non-financial corporate)</td>
<td>Time deposit &amp; CDs (banks &amp; securities firms)</td>
</tr>
<tr>
<td>Illiquid</td>
<td>Trust accounts (households)</td>
<td>Trust accounts (non-financial corporate)</td>
<td>Long-term debt securities (bank &amp; Securities firms)</td>
</tr>
<tr>
<td></td>
<td>Covered bonds (households)</td>
<td></td>
<td>ABS &amp; MBS</td>
</tr>
</tbody>
</table>


The data set covers the period of 2001Q4-2012Q1. The key variables of interest in this study, core liabilities, noncore liabilities and credits, are collected from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). We provide the summary statistics for these variables in Table 2. The other variables are collected from IFS and the Electronic Data Dissemination System of the Central Bank of the Republic of Turkey except the interest rate (OECD Turkey overnight money rate) and VIX, which are taken from Bloomberg, see the Appendix for details.

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2 The funds that commercial banks generate from the Central Bank via repo transactions were ignored while calculating the non-core liabilities for the sake of consistency and comparability with the literature.
Figure 1 presents the core and the non-core liabilities across time along with the nominal GDP and Figure 2 lays out the evolution of the liabilities and credits as a ratio to GDP over time. The figures suggest that, especially after the 2008 global financial crisis, the non-core liabilities in Turkish economy has significantly increased. The figures roughly suggest that the non-core liabilities are more cyclical than the core liabilities whereas the cyclicity in credits is very low.\(^3\)

### Table 2. Summary Statistics for Key Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Core1</th>
<th>Core2</th>
<th>Non-core1</th>
<th>Non-core2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (Turkish lira)</td>
<td>35.20</td>
<td>243.30</td>
<td>87.60</td>
<td>69.10</td>
</tr>
<tr>
<td>Median</td>
<td>36.50</td>
<td>202.00</td>
<td>87.20</td>
<td>65.30</td>
</tr>
<tr>
<td>Range</td>
<td>2.89-161.00</td>
<td>33.50-670.00</td>
<td>18.80-226.00</td>
<td>15.60-188.00</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>48.10</td>
<td>185.00</td>
<td>58.70</td>
<td>49.10</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.63</td>
<td>0.81</td>
<td>0.80</td>
<td>1.03</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>2.21</td>
<td>2.70</td>
<td>3.00</td>
<td>3.38</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>4.93</td>
<td>4.78</td>
<td>4.49</td>
<td>7.63</td>
</tr>
<tr>
<td>p-value</td>
<td>0.09</td>
<td>0.09</td>
<td>0.11</td>
<td>0.02</td>
</tr>
<tr>
<td>Sample size</td>
<td>53</td>
<td>42</td>
<td>42</td>
<td>42</td>
</tr>
</tbody>
</table>

3\(^3\) As suggested by the referee, excess volatility of non-core liabilities is an interesting point; however, it is beyond the scope of this study and is left to future research.

### 3. Model Estimates and Implications

During the analysis we have initially considered the growth rates of variables as well as the changes in their ratios to GDP. As the main findings stay intact for both we report only the results for the ratio definition and do not report for the growth rates to save space.\(^4\) Before investigating the relationship between the non-core liabilities and credits, we have applied standard unit root tests to our variables (not reported). Wherever applicable the series have been seasonally adjusted. Since our sample period includes the 2008 crisis, we include three dummy variables. First one captures all rehabilitating period after 2008, and the other two capture the first and second quantitative easing (QE) decisions of the Federal Reserve Bank of the US.\(^5\)

We start the analysis with a two-by-two VAR to set the ground. For the lag length, we choose one lag after checking for alternative information criteria.\(^6\) Although the literature suggests that the credits are more exogenous than the non-core liabilities, we check for the alternative ordering as well. In both orderings the relationship between the non-core liabilities and credits is well established. The literature suggests that the financial sector will rely more on the non-core liabilities in the case that the core liabilities are not sufficient to fund the demand for credit. However, since 2010, there has been a surge of capital flows from advanced economies to the emerging market economies. Meanwhile, some of the countries, such as Turkey, have dealt with excessive growth in

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\(^3\) As suggested by the referee, excess volatility of non-core liabilities is an interesting point; however, it is beyond the scope of this study and is left to future research.

\(^4\) Another reason behind this choice is the recent emphasis of the CBRT on the growth rate of the credit-to-GDP ratio.

\(^5\) For the first [second] QE, the dummy variable is 1 for the period of 2008Q3-2010Q1 [2010Q3-2011Q2] and 0 for the rest of the sample.

\(^6\) Throughout the paper we use this lag specification controlling the optimality at each time.
credits. Therefore, the reverse ordering may also provide a plausible story.\(^7\) Despite this rationale, we follow the literature and report the results for only the ordering suggested by the literature. Figure 3 shows the impulse responses of the two variables to each other for 90 and 95 percent confidence intervals. We perform the same analysis for both of the measures of the non-core liabilities; however, for the rest of the paper we do not report the results for the second measure as it does not alter the results. The impulse response functions reveal that when there is an increase in the demand for credit, financial institutions search for non-core liabilities. Moreover, the dummy variables that we have created to capture the 2008 crisis do not alter the results.

Figure 3. Impulse Response Functions

(ORDERING: DCRED1R DNCL1R)

![Impulse Response Functions](image)

The inner (brown) and outer (red) envelopes are the 90 and 95 percent confidence intervals, respectively.

After establishing a significant relationship between the non-core liabilities and credits in the simplest framework, we embed these in a closed economy framework. We include the first difference of the interest rate and real GDP growth rate and maintained the ordering of \([\text{interest rate, GDP, credits, non-core liabilities}]\). The impulse response functions (Figure 4) verify the finding that the growth in credits pulls non-core liabilities. Quite interestingly, the non-core liabilities seem to be unresponsive to the rest of the variables other than the credits. An unintuitive result is the negative response, although insignificant for most of the periods, of the credit to the GDP. Other findings are as follows: The interest rates respond to the credits positively. Although it is insignificant, the interest rates respond to the GDP positively, which is appropriate for an inflation-targeting economy. GDP responds to the interest rates and non-core liabilities negatively.

Under alternative Cholesky orderings the results may differ, though not in a very significant way. If, for instance, the non-core liabilities are more exogenous than the credits, the responses of both variables to each other become positive and statistically significant.\(^8\)

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\(^7\) We also look at the generalized responses and detect a bi-directional response.

\(^8\) We consider orderings that seem to be suitable for a closed economy set-up and check for the results where credits and non-core liabilities alternate. The interpretation remains the same. Some of orderings that we consider are (1) grgdp, dcred1r, di, dncl1r, (2) grgdp, di, dncl1r, dcred1r, (3) dncl1r, di, grgdp, dcred1r, (4) dcred1r, dncl1r, di, grgdp. For generalized responses, both of the variables respond to each other, which are significant at 95 percent confidence interval.
The results indicate that the relationship is maintained in a closed economy framework and next we test whether the relationship is still valid within a small open economy framework. To do that, we add real exchange rate and VIX to the closed economy framework incorporating VIX as an exogenous variable to the system. For the initial ordering, we assume that: [interest rates, exchange rate, GDP, credits, non-core liabilities].

The impulse responses presented in Figure 5 justify our storyline. The response of the non-core liabilities to the credits is significantly positive. Another finding under this specification is significantly positive response of the interest rate to the credits. Finally, and interestingly, an increase in the non-core liabilities causes depreciation in the exchange rate. This can be interpreted by the change in the risk perceptions in the international financial markets. If there is an increase in the foreign liabilities...
of the economy, the repayment concerns arise causing the Turkish lira to depreciate. If we alternate the non-core liabilities and credits, both of the variables respond to each other significantly as is the case under previous specifications.\footnote{Estimating the VAR with different orderings does not result in a significant difference. Particularly, we take into account the following orderings and for each we also alternate the non-core liabilities and credits: (1) di, deptry, grgdp, dcred1r, dnc1r, (2) grgdp, deptry, dcred1, di, dnc1r, (3) deptry, grgdp, di, dnc1r, dcred1r, (4) dnc1, deptry, di, grgdp, dcred1r, (5) di, dcred1r, deptry, dnc1r, grgdp.}{\footnote{Note that, we did not include control variables, like current account balance, fiscal stance or overall debt of the economy, which might also impact the ability of the banking sector to attract more non-core liabilities. However, this exercise is left to a further research.}

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**Figure 5. Impulse Response Functions**

*ORDERING: DI, DEPTRY, GRGDP, DCRE1R, DNC1R*

The inner (brown) and outer (red) envelopes are the 90 and 95 percent confidence intervals, respectively.

Up to this point, we mainly focused on the argument that the credit pulls non-core liabilities. However, it might be an interesting exercise to detect the dynamics of credits, core liabilities and non-core liabilities. To do that, we initially assume that the credits are the most exogenous variable and the credit growth is initially financed by core liabilities. We use core1 measure as the proxy for the core liabilities. Figure 6 shows the impulse responses for the ordering of \[dcred1r, dnc1r, dcore1r\]. The response of the non-core liabilities to the credit growth is significantly positive verifying the results found above. Meanwhile, the core liabilities respond to both credits and the non-core liabilities positively. These findings may indicate an intuitive diversification story such that the core...
liabilities may alter the flow of non-core liabilities, which may strengthen the response of the non-core liabilities to the credits.

**Figure 6. Impulse Response Functions**

*ORDERING: DCRED1R DNCL1R DCORE1R*

![Impulse Response Functions Diagram](image)

The inner (brown) and outer (red) envelopes are the 90 and 95 percent confidence intervals, respectively.

As an alternative ordering we use \([dcred1r, dcore1r, dncl1r]\). Under this specification, as shown in Figure 7, the non-core liabilities respond positively to both core liabilities and credits and the core liabilities respond positively to the credits. A positive response of core to non-core liabilities can be observed with 90 percent confidence.
The final ordering we consider is \([dcore1r, dcred1r, dncl1r]\) the impulse response functions for which are presented in Figure 8. Under this ordering, different than the previous two specifications, credits respond to the core liabilities positively. The non-core liabilities positively respond to the core liabilities and credits.

To sum up the above analysis delivers the following result. Under all specifications, credits respond to the non-core liabilities, whereas in all, the non-core liabilities respond credits and core liabilities positively and significantly. This can be interpreted as the non-core liabilities do not push the credit growth in the Turkish economy, which is in line with the literature.
As a final exercise we search for a long run relationship between the core liabilities, the noncore liabilities, credits and GDP.\textsuperscript{11} All variables are deflated using the GDP deflator and seasonally adjusted whenever applicable.

We order the variables as follows: credits, core liabilities, non-core liabilities and GDP. We have chosen this ordering since as the literature claims, following an increase in credits (mostly arising from demand side) banks will first try to finance this credit demand with core liabilities, if they are not enough, banks will increase their credit supply with noncore liabilities. As a result of these interactions in financing sector, aggregate demand will decide total real GDP. The estimates are as below where boldfaced figures are significant at 10% level.\textsuperscript{12}

\textsuperscript{11} The VECM for these four variables embeds the VECM which is constructed with three variables; noncore liabilities, credits and GDP.

\textsuperscript{12} The lag order of 2 is based on economic intuition.
The cointegrating vector states that the hypothesis is valid in the long run. The credits move in the same direction with both core and noncore liabilities, however, it moves in the opposite direction of GDP. This result can be interpreted as, long run estimates favor the financial crisis literature that emphasize the property of credit growth as a leading indicator of downturns mainly caused from financial markets. Importantly, the non-core liabilities move in the opposite direction of the core liabilities, supporting the bank behavior discussed above.

The impulse responses are provided in Figure 9. Though some of the responses seem not to be stabilizing over 8 quarters, they do for longer horizons. The responses of the core liabilities, the non-core liabilities and GDP to credits are statistically significant. The responses of the non-core liabilities to the core liabilities and GDP to core liabilities are near-significant. The most important finding is that the response of the non-core liabilities to the credits is positive and statistically significant, where the response of the credits to the non-core liabilities is positive but statistically insignificant. Therefore, we can conclude that the relationship between the credits and the non-core liabilities are confirmed in the long-run.

4. Concluding Remarks

There are two types of bank liabilities; core and non-core. The recent global financial crisis has attracted a lot of attention on especially the second type of liabilities since the relative size of these liabilities can increase banks’ exposures to risks and therefore be used as an indicator of the stage of the financial cycle of the economy. The main findings in the literature suggest that the core liabilities grow with the economy and in the cases of fast credit growth, the banks turn to the non-core liabilities to finance the credit demand. However, it is claimed that there is a close relationship between the credits and the non-core liabilities; the literature still lacks country-specific analyses investigating this relationship. This study aims at providing evidence from a small open economy, namely Turkey, and enlarging the avenue of research on this issue.

The financial integration of the Turkish economy to the global markets has picked up after 2000s therefore our analysis spans the period from 2001 to 2012. This paper basically tests the hypothesis of the credit growth is accompanied by an increase in the non-core liabilities under alternative frameworks in an eloquent manner.

We start with a two-by-two VAR and then examine the relationship within a closed and a small open economy framework. The most important finding of this exercise is that the relationship stays intact under all specifications. Next, we include both the core and the non-core liabilities in the same framework. Even though the impulse responses differ according to the ordering of the variables, one pattern stays robust for all specifications: non-core liabilities respond significantly and positively to both credits and core liabilities. Finally, we verify the relationship in the long-run within a VECM framework. To sum up, we interpret all these results as a verification of strong association between the credits to the non-core liabilities.

\[
\begin{bmatrix}
\Delta \ln cred_t \\
\Delta \ln core_t \\
\Delta \ln ncore_t \\
\Delta \ln gdp_t \\
\end{bmatrix} = \begin{bmatrix}
0.063 & 1.000 & \ln \text{cred}_{t-1} & \ln \text{core}_{t-1} \\
-0.071 & -0.478 & \ln \text{ncore}_{t-1} & \ln \text{gdp}_{t-1} \\
0.091 & -1.190 & 79.044 & 1 \\
-0.001 & -237.569 & -0.001 & 0.001 \\
\end{bmatrix} + \begin{bmatrix}
0.225 & -0.089 & -0.117 & 15.593 \\
-0.424 & -0.158 & 0.181 & 11.527 \\
0.693 & 0.169 & -0.260 & -2.845 \\
-0.001 & 0.001 & -0.002 & 0.382 \\
\end{bmatrix} \begin{bmatrix}
\Delta \ln cred_{t-1} \\
\Delta \ln core_{t-1} \\
\Delta \ln ncore_{t-1} \\
\Delta \ln gdp_{t-1} \\
\end{bmatrix}
\]

This study can be extended towards a few directions. One direction might be a search for an asymmetric relation between non-core liabilities and credits during expansionary and contractionary periods. This search might also be enlarged to examine the roles of macro-prudential policies that are designed to be countercyclical. Another direction might be to build a structural model and exactly identify the role of non-core liabilities within a small open economy.

**Figure 9. Impulse Response Functions Vector Error Correction Model**

The envelopes show the 90 percent confidence intervals.
References


Appendix

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symbol</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-core Liabilities: total liabilities to nonresidents+M3-M2</td>
<td>NCL1</td>
<td>IFS</td>
</tr>
<tr>
<td>Non-core Liabilities as a ratio to seasonally adjusted GDP</td>
<td>NCL1R</td>
<td></td>
</tr>
<tr>
<td>First difference of NCL1R</td>
<td>DNCL1R</td>
<td></td>
</tr>
<tr>
<td>Non-core Liabilities: total liabilities to nonresidents</td>
<td>NCL2</td>
<td>IFS</td>
</tr>
<tr>
<td>Non-core Liabilities as a ratio to seasonally adjusted GDP</td>
<td>NCL2R</td>
<td></td>
</tr>
<tr>
<td>First difference of NCL2R</td>
<td>DNCL2R</td>
<td></td>
</tr>
<tr>
<td>Measure of Credits: sum of claims to private sector and claims to public non-financial sector</td>
<td>CRED1</td>
<td>IFS</td>
</tr>
<tr>
<td>Credits as a ratio to seasonally adjusted GDP</td>
<td>CRED1R</td>
<td></td>
</tr>
<tr>
<td>First difference of CRED1R</td>
<td>DCRED1R</td>
<td></td>
</tr>
<tr>
<td>Core Liabilities: M1</td>
<td>CORE1</td>
<td>IFS</td>
</tr>
<tr>
<td>Core Liabilities as a ratio to seasonally adjusted GDP</td>
<td>CORE1R</td>
<td></td>
</tr>
<tr>
<td>First difference of CORE1R</td>
<td>DCORE1R</td>
<td></td>
</tr>
<tr>
<td>First difference of interest rates</td>
<td>DI</td>
<td>CBRT</td>
</tr>
<tr>
<td>Growth rate of GDP: Growth of (seasonally adjusted) real GDP of Turkey</td>
<td>GRGDP</td>
<td>CBRT</td>
</tr>
<tr>
<td>Depreciation of exchange rate: Depreciation rate of TL across USD</td>
<td>DEPTRY</td>
<td>CBRT</td>
</tr>
<tr>
<td>VIX</td>
<td>VIX</td>
<td>Bloomberg</td>
</tr>
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</table>

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