

## CROSS-SECTIONAL FACTS ON BANK BALANCE SHEETS OVER THE BUSINESS CYCLE

Osman Furkan Abbasoğlu, Şerife Genç, and Yasin Mimir\*

**ABSTRACT** We investigate the cyclical behavior of commercial banks' balance sheet variables for different size groups using bank-level Turkish data. We first rank banks based on the size of their assets, and then systematically document business cycle facts of various balance sheet items and profitability measures of different bank groups. We find that the cyclical behavior of these variables is quite heterogeneous at the cross-sectional level: (i) Bottom 25 percent banks finance 30 percent of their assets with equity while for larger banks this ratio is around 12 percent, implying that debt financing is more prevalent for larger banks, (ii) bank assets and credits are highly procyclical and the level of procyclicality is lower for larger banks, (iii) security holdings of small banks are countercyclical whereas those of large banks are procyclical, (iv) total deposits are procyclical except for top 25 percent and equity issuance is acyclical to countercyclical at best, (v) loan spread is strongly countercyclical except for small banks while return on assets and equity are acyclical, and (vi) switching between debt and equity financing is more pronounced for the top 25 percent banks. The rich set of cross-sectional empirical facts about the cyclical behavior of bank balance sheets presented in this paper should be helpful for researchers to build and evaluate theoretical heterogeneous models about financing sources of banks.

*JEL* E44, E51, G21, G28

*Keywords* Debt finance, Equity finance, Banking sector, Business cycles

**ÖZ** Bu çalışmada bankaların bilanço kalemlerinin iş çevrimlerindeki hareketleri Türk ticari bankacılık sektörü verisi kullanılarak incelenmiştir. Bankalar öncelikle varlıklarının büyüklüğüne göre sıralanmış ve ardından farklı bilanço kalemlerinin ve kârlılık göstergelerinin iş çevrimlerindeki hareketleri analiz edilmiştir. Bu değişkenlerin davranışlarının yatay-kesitsel düzeyde şu farklılıkları gösterdiği göze çarpmaktadır: (i) Alt yüzde 25'lik dilimdeki bankalar varlıklarının yüzde 30'unu özsermaye ile finanse ederken, üst yüzde 25'lik dilimdeki bankalar için bu oran yüzde 12'dir, bu da büyük bankaların ekseriyetle borçla finansman sağladıklarını göstermektedir; (ii) banka varlıkları ve kredileri döngüsel hareket etmektedir, ancak bu döngüsellik büyük bankalar için daha zayıftır; (iii) küçük bankaların menkul kıymetleri ters-döngüsel hareket ederken büyük bankalarınki döngüsel hareket etmektedir; (iv) üst yüzde 25'lik dilimde yer alan bankalar hariç toplam mevduatlar döngüsel, özsermaye ise bazı gruplar için ters-döngüsel bazıları için ise döngüsel olmayan şekilde hareket etmektedir; (v) kredi ve mevduat faiz farkı küçük bankalar hariç ters-döngüsel hareket etmektedir, aktif ve özsermaye kârlılığı iş çevrimlerinden anlamlı bir şekilde etkilenmemektedir; (vi) borç ve öz kaynak finansmanı arasındaki geçişler en üst yüzde 25'lik dilimde yer alan büyük bankalar için daha belirgindir. Bu makalede yer alan bulgular bankaların finansman kaynaklarına dair heterojen modeller kurulması adına faydalı olacaktır.

**BANKA BİLANÇOLARININ YATAY KESİTSEL OLARAK İŞ ÇEVİRİMLERİNDEKİ HAREKETLERİ**

*JEL* E44, E51, G21, G28

*Anahtar Kelimeler* Borçla finansman, Özsermaye ile finansman, Bankacılık sektörü, İş çevrimleri

---

\*Central Bank of the Republic of Turkey, Istanbul School of Central Banking, Fenerbahçe Mahallesi, Atlıhan Sokak, No:30/A, Kadıköy, 34726 İstanbul, Turkey. ■ **ABBASOĞLU:** furkan.abbasoglu@tcmb.gov.tr ■ **GENÇ:** serife.genc@tcmb.gov.tr ■ **MİMİR:** yasin.mimir@tcmb.gov.tr ■ The views expressed in this paper belong to the authors only and do not represent those of the Central Bank of the Republic of Turkey or its staff.

## Introduction

Fluctuations in banks' financing sources play an important role in driving business cycles in economies with bank-based financial systems since banks are the main economic agents for efficiently transferring funds from savers (households) to borrowers (firms) which undertake investment activities. Banks experiencing severe frictions in obtaining external or internal finance during recessions might reduce their lending to non-financial sector, leading to a decline in firm investment and thus aggravating the recession. Recent exemplary theoretical papers are Gertler and Kiyotaki (2010), Gertler and Karadi (2011), Jermann and Quadrini (2012), and Gertler et al. (2012), all of which emphasize the role of debt and equity financing in business cycle fluctuations. The 2007-09 Global Financial Crisis has also reaffirmed that understanding the cyclical behavior of different sources of bank financing is crucial in capturing the dynamics of macroeconomic aggregates and has significant policy implications in both advanced and emerging economies. Although a vast body of literature studies cyclical changes in firm financing at both aggregate and cross-sectional levels, little work is done in investigating business cycle properties of bank financing.<sup>1</sup> In this paper, we study both aggregate and cross-sectional facts on banks' balance sheets by documenting the cyclical behavior of debt and equity issuance as well as other balance sheet items and their implications for the business cycle.

We study the topic both from aggregate and cross-sectional perspective since relying solely on aggregate data might lead to an ambiguous picture of the cyclical properties of balance sheet items at individual bank level as aggregate data are mainly driven by the behavior of a few number of very large banks. We use quarterly balance sheet data from the Banks Association of Turkey (TBB). Our dataset includes all commercial banks that operate during any time between 2003 and 2013. We rank these banks based on the size of their assets, and then systematically document cyclical facts of balance sheet items of different bank groups.<sup>2</sup> These bank groups are

---

<sup>1</sup> For firm financing, see Korajczyk and Levy (2003), Levy and Hennessy (2007), Covas and Den Haan (2011), Jermann and Quadrini (2012).

<sup>2</sup> Size is considered to be an important variable in the literature since banks with different sizes might experience different intensity of frictions in obtaining external or internal finance during booms and recessions. See Covas and Den Haan (2011) for the importance of the size variable in the cyclical behavior of

bottom and top 25 percent, lower and upper middle 25 percent, top 5 percent and bottom 95 percent, and finally all banks.

We first analyze some cross sectional and time series summary statistics for these bank groups. These statistics reveal that for small banks (bottom 25 percent) equity plays a more important role in their financing behavior, accounting for nearly 30 percent of their assets. The same ratio decreases to 16 percent for the [25,50] percent group and even further to 12 percent for other groups. For these banks debt financing plays a more significant role. This is apparent from the ratio of deposits to assets in these banks which varies between 53 to 66 percent. On the asset side the share of credits in assets reveals that credits are a smaller share of the assets for small banks. This ratio increases from 23 percent in bottom 25 percent group to 58 percent in the [50,75] group, declining back to 45 percent in top 25 percent group. Securities on the other hand are around 10 percent of all assets in banks below top 25 percent group. Furthermore, we observe that return on equity is monotonically increasing with size from 5.5 percent to 20.5 percent whereas return on assets is around 2 percent for all banks. Loan spread also does not vary much by size.

We then focus on the HP-filtered cyclical components of bank balance sheet items and those of aggregate macroeconomic variables.<sup>3</sup> At the aggregate level, we observe that total assets and deposits of banks are less volatile than output while total credits, net worth and leverage are more volatile. All these items are procyclical except for net worth.

We then proceed with individual bank level data and examine the cyclical properties of bank balance sheet items for different size groups. The results show that the cyclical behavior of banks' balance sheet items is quite heterogenous at cross-sectional level. In particular, bank assets and bank credits are highly procyclical for almost all bank groups and volatility of these items is much lower for banks above the third quartile. Security holdings are countercyclical for small banks and procyclical for large banks. Total deposits are procyclical except for top 25 percent and equity issuance is acyclical to countercyclical at best. Decomposition of total deposits indicates that domestic and foreign deposits are also procyclical except for top 25 percent. Leverage is procyclical for the top and bottom 25 percent.

---

debt and equity financing of non-financial firms over the business cycle, and Kashyap and Stein (2000) for the importance of the size variable in the differential impact of monetary policy on bank balance sheets.

<sup>3</sup> We use HP-filter as it is the most common filtering method in the business cycle literature. We define cyclical as the correlation between the cyclical components of the time series above and the cyclical component of GDP.

The results also show that lead-lag relationships of these variables with GDP mostly depend on bank size. Total deposits of bottom 25 percent banks increase three quarters before output starts to take off whereas those of top 5 percent and top 25 percent banks decline four quarters after output recovers. For the bottom 25 percent banks, domestic and foreign deposits positively lead the output by one and three quarters, respectively, whereas domestic deposits of top 25 percent show the opposite behavior, negatively lagging the output by three quarters. For all different bank groups, equity issuance lags the cycle by one to four quarters. In anticipation of an expansion in real economic activity, smaller banks increase deposits and reduce their equity issuance as they switch from equity financing to debt financing. Leverage of bottom 25 percent positively leads the cycle whereas that of top 5 percent negatively leads the cycle. The co-movement of debt and equity financing reveals that banks switch between the two and this behavior is more pronounced for top 25 percent banks.

The cyclical properties of profitability measures also reveal interesting cross-sectional differences. We find that return on assets (ROA) and return on equity (ROE) are acyclical while loan spread is strongly countercyclical except for small banks. Loan spreads of top 50 percent banks lag output by one to two quarters while those of [25,50] percent group lead the output by one quarter.

### 1.1. Related Literature

This paper is related to the literature on sources of financing, bank profitability and their relation to macroeconomic conditions. To the best of our knowledge, there does not exist any paper in the literature that studies the cross-sectional cyclical behavior of bank balance sheets in developed and emerging economies.<sup>4</sup> The empirical papers on capital structure choice mostly focus on firm financing behavior. Korajczyk and Levy (2003) estimate the relation between firms' debt ratio and firm-specific variables for financially constrained and unconstrained firms. Their results suggest that the leverage of unconstrained firms varies countercyclically with macroeconomic conditions and that of financially constrained firms are procyclical. Covas and Den Haan (2007) analyze the cyclical behavior of external financing for a set of Canadian firms. Sorting firms according to their sizes, they find that debt and equity financing are procyclical. Covas and Den Haan (2011) similarly document the cyclical behavior of debt and

---

<sup>4</sup> For developed economies, Mimir (2015, forthcoming) studies the cyclical behavior of bank credits, deposits, net worth, leverage ratio, and credit spreads using the aggregate data on the U.S. commercial banking sector.

equity financing for U.S. firms. The results they find are similar to the Canadian case with the exception that largest firms do not exhibit procyclical debt and equity financing behavior. They also document that procyclicality of equity financing is stronger for smaller U.S. firms.

Besides these empirical studies, several theoretical models have been developed to study the cyclical behavior of debt and equity finance. Based on the observation that firms' financial flows have become more volatile during a period of moderation in the U.S. output, Jermann and Quadrini (2006) build a model with financial frictions. They examine the impact of financial innovations and find that increased flexibility in the use of equity financing can explain the reduction in macroeconomic volatility coupled with a higher volatility in the financial structure of firms. Levy and Hennessy (2007) develop a computable general equilibrium model to address the empirical observations regarding the financing behavior of firms over the business cycles. The model incorporates managers which hold a minimum share of the firm's equity. The simulation results show that leverage ratios of firms with more relaxed constraints are counter-cyclical whereas that of more constrained firms display no systematic pattern.

Some recent theoretical models examine the link between financial crises, banks' balance sheets and monetary policy. Gertler and Karadi (2011) build a quantitative monetary DSGE model where financial intermediaries face endogenously determined balance sheet constraints. They analyze how unconventional monetary policies can moderate the impact of financial crises in such an environment. Gertler and Kiyotaki (2010) examine how disruptions in financial intermediation can induce a crisis that affects real activity in a business cycle model with financial intermediation. The financial market frictions are endogenized by introducing an agency problem between lenders and borrowers which creates a wedge between the cost of debt and equity financing. They also illustrate how various credit market interventions by central bank and treasury mitigate crisis. Gertler et al. (2012) make banks' risk exposure an endogenous choice by incorporating an intermediation sector that allows banks to issue outside equity as well as short term debt. They analyze how different degrees of fundamental risk in the economy affect the balance sheet structure of banks and macroeconomic aggregates. Jermann and Quadrini (2012) first document the cyclical behavior of debt and equity payout of U.S. firms. They then introduce debt and equity financing, financial frictions, and financial shocks in a standard real business cycle model and explore how financial shocks affect the dynamics of real and financial variables. Another strand of the literature

related to our paper examines bank profitability. Determinants of bank profitability are analyzed using bank-level data of various developing and developed countries.<sup>5</sup>

## 1.2. Turkish Banking Sector

Turkish banking sector has undergone substantial structural changes after the 2000-01 domestic banking crisis. 1990s were years where high budget deficits were mainly financed by domestic borrowing via issuing government debt. Annual interest rates on government securities floated close to and above 100 percent, even hiked to 300 percent, during the 1990s and bank balance sheets were mainly dominated by those government securities. After the severe economic crisis brought by the collapse in the domestic banking system, Turkey signed a stand-by agreement with IMF in order to solve fundamental macroeconomic problems such as high government budget deficits. A deliberate policy of restructuring the financial system followed these events and dramatic measures were taken in order to stabilize the financial system. As a result, the number of deposit banks went from 61 in 2000 to 32 in 2013.

Banking Regulation and Supervision Agency (BRSA), newly started operating right after the banking crisis, has played an important role in restructuring the banking sector by resolving banks overtaken by the Savings Deposit Insurance Fund (SDIF), in restructuring state banks, and in strengthening private banks and reinforcing supervisory and regulatory framework. Moreover, the role of the Central Bank to stabilize prices was clearly defined in the Central Bank Law and the Central Bank of the Republic of Turkey was delegated instrumental independence while Monetary Policy Committee was established.

As a result of the restructuring process, inflation and interest rates dropped to single-digits and the banking sector has grown rapidly since then. Bank assets almost tripled in real terms from 2000 to 2013 while total credits increased by about six fold. Assets to GDP ratio of the banking

---

<sup>5</sup> Pasiouras and Kosmidou (2007) use bank level data of 15 EU countries and analyze how bank specific characteristics, the financial market structure, and macroeconomic conditions affect the profitability of domestic and foreign banks. Athanasoglou et al. (2008) make a similar analysis for Greek banks for the 1985-2001 period. Albertazzi and Gambacorta (2009) examine the effects of macroeconomic financial shocks on banking profitability for both the Anglo Saxon and Euro area economies. Dietrich and Wanzenried (2011) study the determinants of bank profitability measures using data on Swiss commercial banks for the 1999-2009 period. Olson and Zoubi (2011) study the efficiency and profitability of banks for the MENA region. Bolt et al. (2012) study the link between bank profitability and business cycles. By allowing for asymmetry in the co-movement of bank profit and economic activity between recessions and expansions, they find a larger impact of output growth on the profits of banks.

sector went up from 60 percent in 2000 to over 100 percent in 2013. Credit to GDP ratio increased to about 60 percent from 20 percent over the same course. While household credits made up less than one percent of total credits in 2002, over 30 percent of total credits went to households in 2013. In this study we focus on the period starting from 2003, where banking sector data is more reliable and bank balance sheets are healthier.

The rest of the paper is structured as follows: Section 2 describes our data sources on banks' balance sheets and the methodology to construct the cyclical components of relevant variables. Section 3 presents the business cycle facts on financing sources of banks, particularly lead, lag and contemporaneous correlations between balance sheet variables and GDP for all bank groups. Section 4 concludes.

## **2. Data Description**

The data set consists of quarterly data from the Banks Association of Turkey (TBB) from 2003.Q1 to 2013.Q3. We only concentrate on commercial banks because investment banks do not collect deposits from or extend credit to households, therefore we cannot study the cyclical behavior of credit and deposits using their balance sheet data. We analyze important balance sheet items and profitability measures of banks. These are credits, securities, deposits (domestic and foreign), equity, leverage, return on equity, return on assets, and loan spread. Return on assets and return on equity are calculated in annual terms by dividing the stock of profits net of taxes in a given quarter to total assets and equities of a bank respectively. Loan spread is calculated as the difference between ratio of interest income on loans to total loans and the ratio of interest expense on deposits to total deposits. We divide all series by quarterly CPI index (2003=100) in order to obtain real variables.

**Table 1. Summary Statistics: Aggregate, Quarterly Data, 2003-2013**

	[0,25]	[25,50]	[50,75]	[75,100]	[95,100]	[0,95]	All Banks
No. of Banks	9	8	8	8	2	31	33
Assets (mean, in millions)	2023	9427	60659	341454	123676	289861	413643
Fraction of total assets	0.005	0.023	0.145	0.827	0.304	0.695	1.00
Equity/Assets	0.302	0.166	0.117	0.117	0.111	0.122	0.119
Liability/Assets	0.697	0.834	0.883	0.883	0.889	0.878	0.881
Deposit/Assets	0.342	0.533	0.614	0.663	0.704	0.629	0.652
Domestic Deposits/Assets	0.144	0.253	0.352	0.422	0.498	0.367	0.407
Foreign Deposits/Assets	0.193	0.280	0.262	0.241	0.206	0.262	0.244
Credit/Assets	0.234	0.448	0.581	0.446	0.363	0.510	0.464
Securities/Assets	0.102	0.109	0.125	0.199	0.240	0.162	0.186
$\Delta$ Assets/Assets	0.023	0.032	0.033	0.026	0.024	0.028	0.027
Return on Equity (percent)	5.5	11.7	14.6	18.2	20.5	16.1	17.3
Return on Assets (percent)	1.7	2.0	1.7	2.1	2.2	1.9	2.1
Loan Spread (percent)	5.7	5.7	6.8	4.6	4.9	5.1	5.0

Note 1: Return on equity, return on assets, and loan spreads are expressed in annual terms. The sample for these series starts from 2004Q1. All the remaining are quarterly series.

Note 2: In the Turkish accounting system, liabilities include equities. However, the liabilities variable we use in our analysis excludes the equities of the banks.

Table 1 provides summary statistics for different size groups of banks. Size groups are constructed by ranking banks according to their asset values in each quarter. The statistics presented in this table reflect the average values for the 2003.Q2-2013.Q3 sample.<sup>6</sup> An important observation is that top 25 percent banks hold 83 percent of all the assets in the banking system whereas the bottom 25 percent own only 0.5 percent of all the assets, which is a negligible share. The asset and liability composition of banks also varies by size. For small banks in the bottom 25 percent, 30 percent of assets is financed by equity whereas this ratio is 12 to 17 percent for other bank groups. Looking at the average ratio of liabilities to assets, we observe a different pattern. This ratio is around 70 percent for small banks and between 84 to 89 percent for the remaining ones, implying that small banks place more weight on equity in their financing whereas banks above bottom 25 percent depend more on debt. Deposits account for 35 percent of total assets of small banks which amount to half of their liabilities. Deposit to asset ratio is larger for banks in other groups and it is monotonically

<sup>6</sup> HP filtering distorts the 2003.Q1 value for some series resulting in striking jumps. Therefore we exclude this data point from our analysis.



increasing in size. It ranges between 53 to 66 percent for these banks which shows that deposits are 65 to 70 percent of their liabilities. This behavior shows that banks in bottom 25 percent are less able to collect deposits compared to the rest of the banking system. Decomposing deposits into domestic and foreign, we observe that the share of foreign among total deposits exhibits an inverse U-shape while domestic deposits increase with size.

On the asset side, credits account for 24 percent of assets of small banks whereas they account for 45 and 58 percent for other bank groups, exhibiting an inverse U-shape. On the other hand, securities monotonically increase with size starting from 10 percent of assets for small banks and increasing to 20 percent for top 25 percent group.

Finally looking at return on equity, return on assets and loan spread, we observe that return on equity is monotonically increasing with size from 5.5 percent to 20.5 percent. However, return on assets is around 2 percent for all banks. Loan spread also does not vary much by size. It displays an inverse U-shape peaking at 6.8 percent for banks in [50,75] percent.

### 3. Empirical Facts

In this section we document some business cycle facts about financial and real variables. The financial variables related to the banking sector are reported on aggregate level and for different size groups in order to analyze heterogeneity in bank behavior along the business cycles.<sup>7</sup> Table 2 presents the cyclical behavior of aggregate real and financial variables. Among the real variables of interest are consumption, investment, and output. Consumption is as volatile as output whereas investment is nearly three times as volatile as output. Both series have correlation coefficients above 90 percent implying strong procyclicality.

On the financial side we examine aggregate assets, credits, total, domestic and foreign deposits, net worth, leverage, return on equity, return on assets, and loan spread. Total assets of the banking system are less volatile than output whereas credits are 1.5 times more volatile. Both series are procyclical, however credits exhibit the strongest correlation with the second lag of output. This implies that output leads aggregate credits in the economy by two quarters. The cyclical behavior of deposits displays

---

<sup>7</sup> Tables in this section report correlations for the whole sample period. We also reproduce tables for the period 2010.Q3- 2013.Q3 in order to see whether the results are driven or at least substantially affected by the unconventional policies implemented after 2010 such as reserve option mechanism and asymmetric interest rate corridor. The results show that the key stylized facts about bank balance sheet items described in the paper are robust to the sample period taken although there are some negligible quantitative differences.

interesting features. Aggregate deposits are less volatile than output. However, decomposing deposits into domestic and foreign, we observe that these two deposit components are more volatile than output. This might suggest that banks switch between domestic and foreign deposit financing over the business cycle.

**Table 2. Cyclical Behavior of Real and Financial Variables: Aggregate, Quarterly Data, 2003-2013**

	Relative Volatility	Contemporaneous Correlation	Cyclicity	Phase Shift
<b>Real Variables</b>				
Output	3.65	1.00**	Procyclical	Coincidental
Consumption	0.97	0.92**	Procyclical	Coincidental
Investment	2.88	0.94**	Procyclical	Coincidental
<b>Financial Variables</b>				
Assets	0.80	0.45**	Procyclical	Coincidental
Credits	1.46	0.54**	Procyclical	Lag (2 qtr, 0.67)
Total Deposits	0.67	0.28*	Procyclical	Coincidental
Domestic Deposits	1.06	0.30*	Procyclical	Lead (2 qtr, 0.38)
FX Deposits	1.23	-0.02	Acyclical	Lag (3 qtr, 0.38)
Net Worth	1.12	-0.14	Acyclical	Not clear
Leverage Ratio	1.57	0.38**	Procyclical	Lag (2 qtr, 0.52)
Return on Equity	0.04	0.03	Acyclical	Lag (3 qtr, -0.14)
Return on Assets	0.04	-0.10	Acyclical	Lag (3 qtr, -0.29)
Loan Spread	0.06	-0.46**	Countercyclical	Lag (1 qtr, -0.49)

Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output ( $\text{std}(x)/\text{std}(Y)$ ).

Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

Domestic deposits have a positive contemporaneous correlation with output which is significant at 10 percent. Foreign deposits display an acyclical contemporaneous relation. However, they have a positive significant correlation coefficient with the third lag of output implying that they lag the business cycle by 3 quarters. One possible explanation for this behavior might be that foreign depositors wait for a safe environment in order to channel their savings. They also might not be able to withdraw their deposits immediately as the economy enters a recession due to possible exchange rate fluctuations. This behavior is reversed for the procyclical domestic deposits which lead the output by two quarters.

Net worth, which is measured as the sum of equities of all banks, is slightly more volatile than output. It exhibits a weak contemporaneous relation with the business cycle. Bank leverage is 1.5 times more volatile than output. It moves procyclically and this behavior is mostly driven by the procyclicality of liabilities since equity does not seem to have any significant contemporaneous correlation with output. The strongest correlation coefficient arises with the second lag of output which means bank leverage lags output by two quarters.

We also examine the cyclical properties of various profitability measures for banks. These are return on equity, return on assets and loan spread. All profitability measures are less volatile than output. Return on equity and assets are acyclical whereas loan spread is strongly countercyclical. Return on assets negatively lags output by 3 quarters. Loan spread also negatively lags output, but by 1 quarter.

### **3.1. Cyclical Behavior of Assets, Credits, and Securities**

In this subsection we investigate the cyclical behavior of assets and credits for different size groups. Bank size is an important factor in explaining the volatility of assets and credits. Except for the top 25 percent we observe that assets are 2.4 to 4 times more volatile than output. However, assets of banks above the upper quartile are less volatile than output.

For credits a similar situation arises where credits of banks in the bottom 75 percent are 3 to 7 times more volatile than output while those of top 25 percent are 1.5 times more volatile. Since credits are an important chunk of assets, we can argue that except for top 25 percent banks, credits drive the cyclical behavior of assets. The correlation coefficients with leads and lags of output illustrate that assets of banks above the upper quartile are acyclical. Looking at the remaining banks we observe that assets of banks below the bottom 75 percentile all move procyclically. Assets of banks in the bottom 25 percent lead the cycle by one quarter and those in [25,50] percent lag the cycle by one quarter. The correlation coefficients for credits reveal that credits of banks in the top and bottom 25 percent are acyclical whereas credits of banks in other groups move procyclically. Credits of bottom 25 percent banks lead the cycle by 3 quarters while the rest lag by 1 to 2 quarters. This implies that larger banks act in a more precautionary manner in extending credits. They observe output changes and make their credit decisions accordingly.

**Table 3. Cyclical Behavior of Assets: Quarterly Data, 2003-2013**

	Relative Volatility	Contemporaneous Correlation	Cyclical	Phase Shift
<b>Assets</b>				
[0, 25]	4.16	0.44**	Procyclical	Lead (1 qtr, 0.47)
[25, 50]	2.43	0.61**	Procyclical	Lag (1 qtr, 0.65)
[50, 75]	3.07	0.65**	Procyclical	Coincidental
[75, 100]	0.71	0.04	Acyclical	Lag (3 qtr, -0.17)
[0, 95]	0.82	0.49**	Procyclical	Coincidental
[95, 100]	1.16	0.21	Acyclical	Not clear
All banks	0.80	0.45**	Procyclical	Coincidental
<b>Credit</b>				
[0, 25]	7.31	0.20	Acyclical	Lead (3 qtr, 0.40)
[25, 50]	3.32	0.59**	Procyclical	Coincidental
[50, 75]	3.65	0.69**	Procyclical	Lag (1 qtr, 0.73)
[75, 100]	1.55	0.21	Acyclical	Lag (2 qtr, 0.43)
[0, 95]	1.53	0.52**	Procyclical	Lag (2 qtr, 0.64)
[95, 100]	1.64	0.47**	Procyclical	Lag (1 qtr, 0.61)
All banks	1.46	0.54**	Procyclical	Lag (2 qtr, 0.67)
<b>Securities</b>				
[0, 25]	14.40	-0.14	Acyclical	Not clear
[25, 50]	7.69	-0.35**	Countercyclical	Lead (1 qtr, -0.39)
[50, 75]	5.96	0.64**	Procyclical	Coincidental
[75, 100]	3.63	0.55**	Procyclical	Lead (1 qtr, 0.65)
[0, 95]	2.87	0.47**	Procyclical	Lead (1 qtr, 0.53)
[95, 100]	4.86	0.66**	Procyclical	Lead (1 qtr, 0.75)
All banks	3.40	0.62**	Procyclical	Lead (1 qtr, 0.70)

Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output (std(x)/std(Y)).

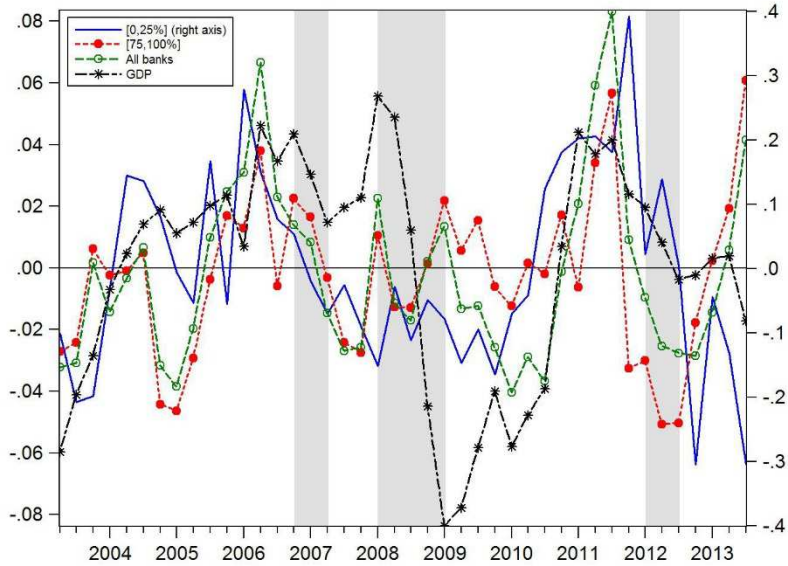
Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

Cyclical component of securities of different bank groups exhibits significant volatility compared to that of GDP. Securities of bottom 25 percent banks are 14 times more volatile than output while those of top 25 percent are nearly 4 times more volatile. The volatility of securities decreases with size. Regarding the cyclical behavior, we observe that securities of bank groups in the top 50 percent show a procyclical behavior whereas those of [25,50] percent banks exhibit a countercyclical pattern. These banks increase their credit extension and reduce their securities during boom times

while banks in the top 50 percent raise both of these balance sheet components. Finally, we see that securities of all bank groups except the [0,25] and [50,75] percent banks lead the cycle by one quarter, implying that these banks raise their security holdings in advance of the rise in output.

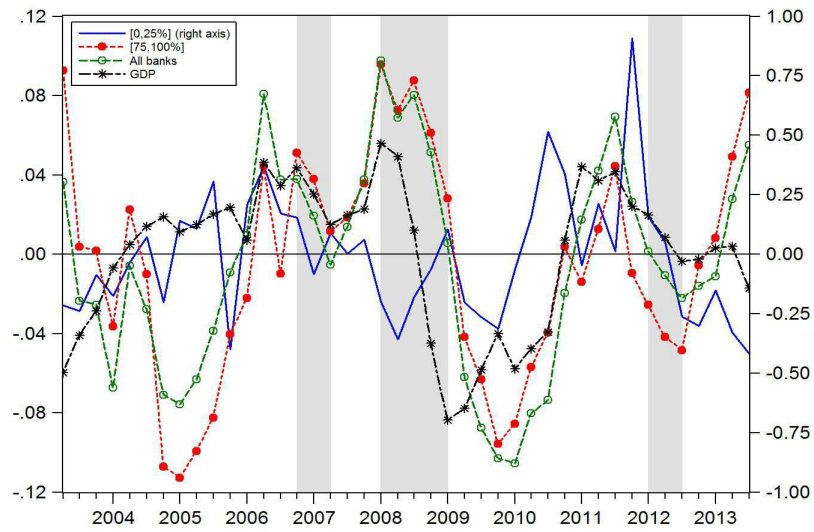
**Figure 1. Cyclical Behavior of Assets**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

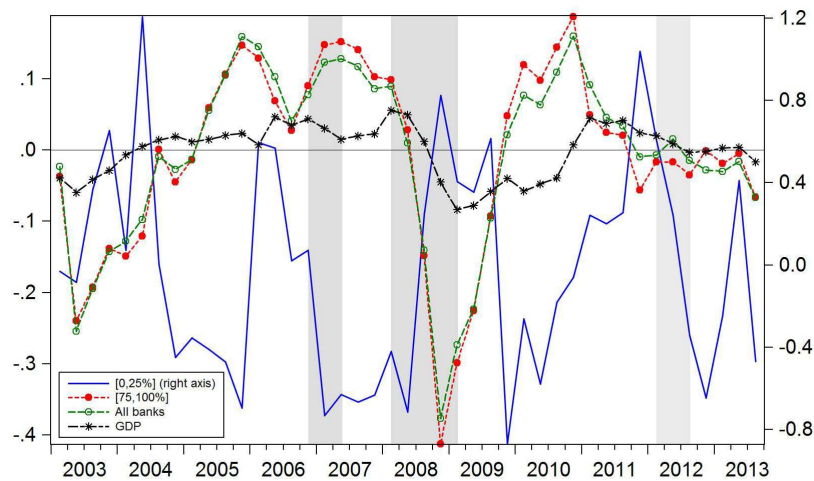
Figure 1 displays the cyclical behavior of assets of bottom 25 percent, top 25 percent, all banks and GDP. All numbers are percentage deviations from their respective long run trend. Assets of top 25 percent move ahead of bottom 25 percent over the business cycle. These two series differ from each other in three periods: 2008.Q1-2008.Q3, 2012.Q1-2012.Q2 and 2013.Q1-2013.Q3. In the first two sub-periods, which are recessions, assets of small banks increase whereas those of large banks decline. During the last sub-period, assets of larger banks start to recover while smaller banks' assets deteriorate.

**Figure 2. Cyclical Behavior of Credits**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

**Figure 3. Cyclical Behavior of Securities**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

Figure 2 plots the cyclical component of credits for the top and bottom 25 percent banks along with output. Between 2008.Q2 and 2009.Q1, credits of top 25 percent and bottom 25 percent move in opposite directions where credits of smaller banks increase by nearly 45 percentage points and those of larger banks decrease by 5 percentage points.

Figure 3 plots the cyclical component of securities for the top and bottom 25 percent banks along with output. The figure shows that securities of bottom 25 percent banks and those of top 25 percent banks generally move in opposite directions over the given period. During 2008-2009 recession, small banks increase their security holdings while big banks reduce them.

Small banks raise their securities by more than 100 percent whereas big banks decrease them by nearly 50 percent. On the other hand, from 2006.Q4 to 2007.Q2, this pattern is reversed, where small banks reduce their securities by about 70 percent while large banks increase by nearly 10 percent. This also indicates the substantial volatility of securities of small banks compared to that of big banks over the cycle.

### 3.2. Cyclical Behavior of Total, Domestic and Foreign Deposits

Table 4 reports the volatilities of cyclical components of total, domestic and foreign deposits and their correlations with the cyclical component of GDP. The results indicate that total deposits of middle 50 percent banks exhibit positive association with output at 5 percent significance level whereas those of bottom 25 percent and 95 percent banks display positive co-movement with GDP at 10 percent significance level. These findings suggest that total deposits are procyclical for nearly all bank categories, implying that banks increase their deposit financing as the economy recovers.

For domestic deposits, we observe a procyclical pattern for [0,25], [50,75] and [0,95] percent groups. The foreign deposits of the middle 50 percent banks have a significant positive contemporaneous correlation with the output while those of top 25 percent have a negative one. This implies that foreign deposits of middle 50 percent are procyclical whereas those of top 25 percent are countercyclical. This difference might arise because larger banks have the ability to borrow from foreign financial intermediaries at lower rates in boom times as they have sufficient creditworthiness to do so. Hence they might not need to issue foreign deposits. However, the reverse situation holds for middle-sized banks since they are not able to fund themselves from foreign banks at cheaper rates. Therefore they use foreign deposit financing instead of borrowing from international banks.

**Table 4. Cyclical Behavior of Deposits, Quarterly Data, 2003-2013**

	Relative Volatility	Contemporaneous Correlation	Cyclicity	Phase Shift
<b>Total Deposits</b>				
[0, 25]	8.91	0.29*	Procyclical	Lead (3 qtr, 0.44)
[25, 50]	3.15	0.43**	Procyclical	Coincidental
[50, 75]	2.94	0.67**	Procyclical	Coincidental
[75, 100]	0.78	-0.18	Acyclical	Lag (4 qtr, -0.39)
[0, 95]	0.67	0.30*	Procyclical	Lag (2 qtr, 0.47)
[95, 100]	1.45	0.12	Acyclical	Lag (4 qtr, -0.60)
All banks	0.67	0.28*	Procyclical	Coincidental
<b>Domestic Deposits</b>				
[0, 25]	13.23	0.32**	Procyclical	Lead (1 qtr, 0.44)
[25, 50]	3.66	0.23	Acyclical	Lag (1 qtr, -0.33)
[50, 75]	3.53	0.60**	Procyclical	Coincidental
[75, 100]	1.18	0.01	Acyclical	Lag (3 qtr, -0.48)
[0, 95]	0.96	0.35**	Procyclical	Coincidental
[95, 100]	1.89	0.15	Acyclical	Lag (4 qtr, -0.62)
All banks	1.06	0.30*	Procyclical	Lead (2 qtr, 0.38)
<b>FX Deposits</b>				
[0, 25]	8.40	0.18	Acyclical	Lead (3 qtr, 0.43)
[25, 50]	4.72	0.40**	Procyclical	Coincidental
[50, 75]	2.58	0.60**	Procyclical	Lag (3 qtr, 0.68)
[75, 100]	1.24	-0.31**	Countercyclical	Lead (2 qtr, -0.47)
[0, 95]	1.36	0.01	Acyclical	Lag (3 qtr, 0.46)
[95, 100]	1.52	-0.08	Acyclical	Lead (4 qtr, 0.18)
All banks	1.23	-0.02	Acyclical	Lag (3 qtr, 0.38)

Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output ( $\text{std}(x)/\text{std}(Y)$ ).

Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

Lead-lag patterns of deposits with respect to GDP indicate that cyclical component of total deposits of bottom 25 percent banks positively leads the cycle by 3 quarters while that of top 5 percent and 25 percent banks negatively lag the output by 4 quarters. Deposits of bottom 25 percent banks increase well before GDP starts to take off whereas those of top 5 percent and top 25 percent banks decline well after output recovers. This latter behavior might be explained by the flight to quality motive of investors following a recession as they find deposits a safer saving instrument. They increase their deposit holdings following an economic downturn since returns on all other assets are also low. After the recession, they allocate a

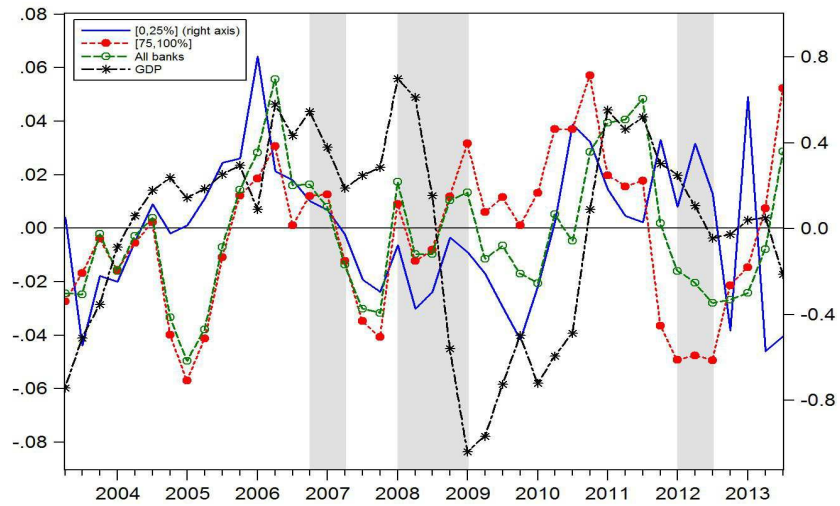


lower share of their income to deposits as returns on other assets on average are expected to be higher compared to deposits. For the bottom 25 percent banks, domestic and foreign deposits positively lead the output by 1 and 3 quarters, respectively. Domestic deposits of the top 25 percent show the opposite behavior. They negatively lag the output by 3 quarters. Foreign deposits of the same group negatively lead the cycle by 2 quarters. These findings show that domestic deposits of top 25 percent banks decline after the output starts to recover and their foreign deposits decline before GDP picks up. For top 5 percent banks, domestic deposits negatively lag the output by 4 quarters while their foreign deposits do not have any significant relationship. Finally, standard deviations of cyclical components of these deposit measures show that deposits of bottom 25 percent banks are 9 times more volatile than output. The volatility of total domestic and foreign deposits decline monotonically with size. When we decompose deposits into domestic and foreign, we observe that domestic deposits are about 1.5 times more volatile than foreign deposits.

Figures 4, 5, and 6 plot the cyclical components of GDP, total deposits, domestic and foreign deposits for all, bottom and top 25 percent banks. Figure 4 indicates that total deposits of the bottom 25 percent and top 25 percent banks generally move together except for two sub-periods: 2012.Q1-2012.Q3 and 2013.Q1-2013.Q3. In the former sub-period, total deposits of bottom 25 percent rise while those of top 25 percent decline. In the latter period, we observe the opposite behavior.

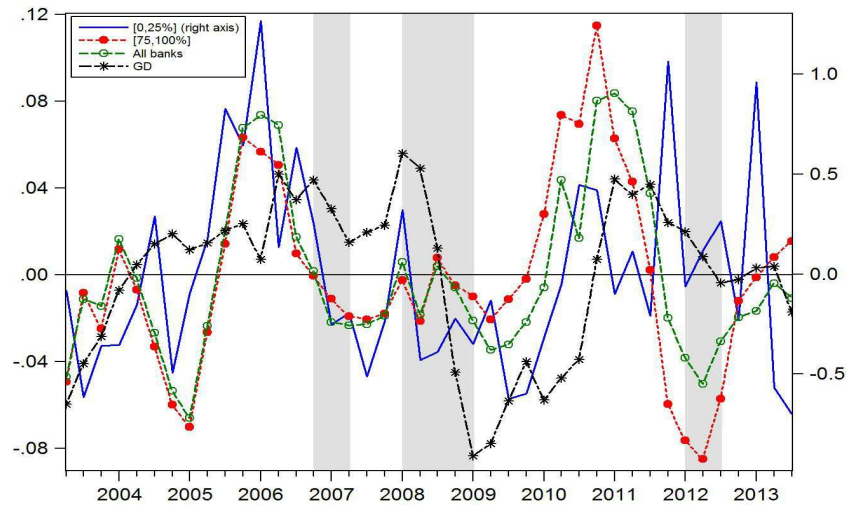
Figures 5 and 6 decompose total deposits as domestic and foreign. These plots suggest that smaller and larger banks differ from each other after 2011Q3. Domestic deposits of top 25 percent banks decline until 2012.Q2 whereas those of bottom 25 percent first increase in 2011.Q3, then fluctuate. Foreign deposits of all banks start declining in 2004.Q3. In 2010.Q1, foreign deposits of bottom 25 percent pick up whereas those of top 25 percent keep declining until 2011.Q1. In 2013.Q1 foreign deposits of top 25 percent increase substantially while those of bottom 25 percent decline.

**Figure 4. Cyclical Behavior of Total Deposits**



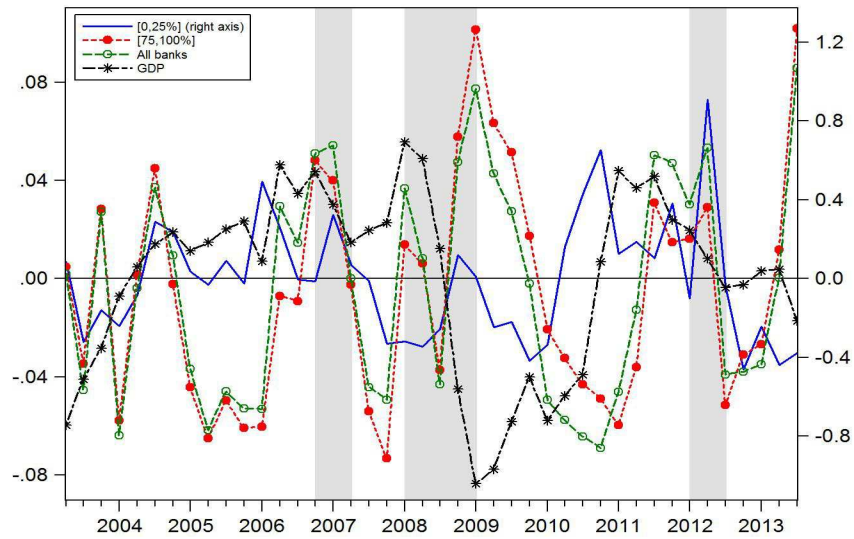
Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

**Figure 5. Cyclical Behavior of Domestic Deposits**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

**Figure 6. Cyclical Behavior of Foreign Deposits**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

### 3.3. Cyclical Behavior of Equity

Table 5 displays the cyclical pattern of equity. We observe that contemporaneous correlations between the cyclical components of equity and output in all groups are insignificant at 5 percent. However, we find a correlation coefficient of -0.28 for the upper 25 percent and 0.28 for the [50,75] percent group, both of which are significant at 10 percent.

For all bank groups, correlation coefficients are mostly negative and significant when previous periods' GDP levels are used, suggesting that equity issuance lags the business cycle. In particular, equity of bottom and top 25 percent negatively lag the cycle by 2 quarters. This result might suggest that these bank groups reduce their equity positions by switching to debt financing after the expansion takes off. However, for top 5 percent, we observe a positive co-movement between equity and leads of GDP. Equity of top 5 percent banks leads the output by 3 quarters. A possible explanation might be that these banks increase their assets by raising their equity positions when they expect an economic expansion in the following quarters. Finally, volatility results indicate that cyclical components of

equity of all bank groups up to bottom 75 percent are 4 to 5 times more volatile than output while that of top 5 percent is 2 times more volatile.

**Table 5. Cyclical Behavior of Equity, Quarterly Data, 2003-2013**

	Relative Volatility	Contemporaneous Correlation	Cyclical	Phase Shift
[0, 25]	4.61	-0.21	Acyclical	Lag (2 qtr, -0.40)
[25, 50]	4.92	0.06	Acyclical	Lag (4 qtr, 0.35)
[50, 75]	4.43	0.28*	Procyclical	Lag (1 qtr, 0.33)
[75, 100]	1.40	-0.28*	Countercyclical	Lag (2 qtr, -0.63)
[0, 95]	1.08	-0.25	Acyclical	Lag (2 qtr, -0.46)
[95, 100]	2.01	0.11	Acyclical	Lead (3 qtr, 0.73)
All banks	1.12	-0.14	Acyclical	Not clear

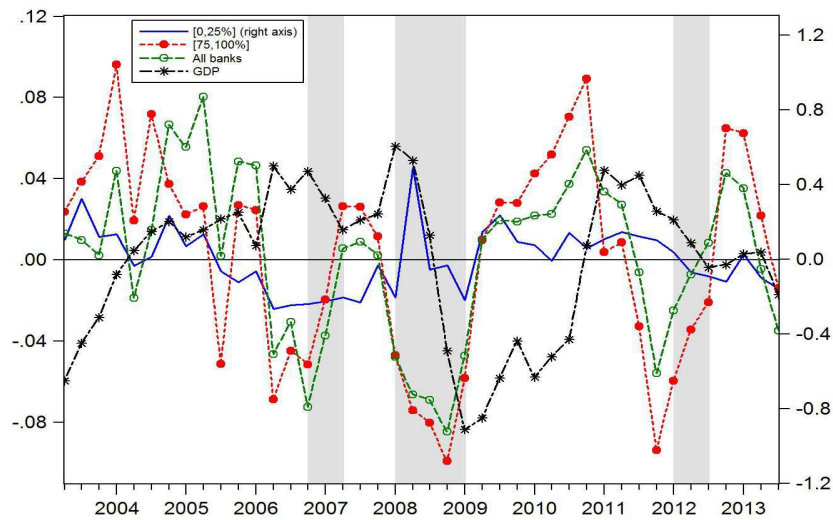
Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output (std(x)/std(Y)).

Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

**Figure 7. Cyclical Behavior of Equity**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.

Note 2: Shaded areas are recession dates.

Figure 7 displays the cyclical components of GDP and equity for bottom 25 percent, top 25 percent, and all banks. We find three sub-periods during which the cyclical behavior of equity of smallest and largest banks look different from each other. The first period is between 2008.Q1 and 2008.Q2, right after the global financial crisis started. In this sub-period, equity issuance of bottom 25 percent banks rises dramatically whereas that of top 25 percent banks declines. Equity issuance of smaller banks only starts to fall one quarter after the decline in GDP. The second sub-period is 2009.Q4-2010.Q2, where the equity of smaller banks falls and that of larger banks increases. Here we find that equity issuance of larger banks begins to rise just before output recovers. Finally, the third sub-period is between 2011.Q4-2012.Q4. In this sub-period, equity of bottom 25 percent banks declines whereas that top 25 percent banks increases.

### 3.4. Cyclical Behavior of Leverage

Changes in leverage reflect the changes in debt relative to equity. Table 6 shows that leverage is more volatile than output both for the aggregate banking sector and all bank groups. Smaller banks have higher volatility in their leverage. Specifically, leverage of bottom 75 percent banks is 3.5 to 5.5 times more volatile than output while that of top 5 percent is twice as volatile as output.

**Table 6. Cyclical Behavior of Leverage, Quarterly Data, 2003-2013**

	Relative Volatility	Contemporaneous Correlation	Cyclical	Phase Shift
[0, 25]	5.55	0.51**	Procyclical	Lead (3qtr, 0.51)
[25, 50]	4.63	0.28*	Procyclical	Lag (4 qtr, -0.29)
[50, 75]	3.55	0.19	Acyclical	Coincidental
[75, 100]	1.64	0.33**	Procyclical	Lag (2 qtr, 0.56)
[0, 95]	1.65	0.45**	Procyclical	Lag (2 qtr, 0.55)
[95, 100]	2.01	0.03	Acyclical	Lead (3qtr, -0.55)
All banks	1.57	0.38**	Procyclical	Lag (2 qtr, 0.52)

Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output ( $\text{std}(x)/\text{std}(Y)$ ).

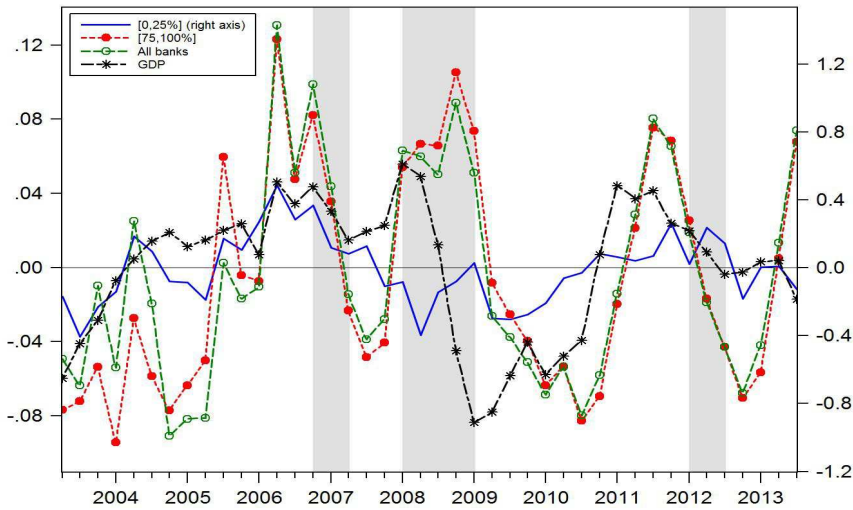
Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

For the top and bottom 25 percent banks, leverage is procyclical while for the middle 50 percent there is no significant cyclicity at 5 percent. Leverage of bottom 25 percent has the highest contemporaneous correlation with output. This supports our previous observation that banks prefer debt financing over equity financing in good times as they have easier access to the former in those times.

Leverage of bottom 25 percent and top 5 percent banks both lead the cycle by 3 quarters. While the former has a positive correlation, the latter has a negative one. This might be due to the expectations of top 5 percent banks that GDP will decline in the future, so they increase their leverage beforehand by reducing equity relatively more than debt. On the other hand, bottom 25 percent banks decrease leverage by increasing equity and decreasing debt in bad times. All other bank groups lag the cycle with positive correlation except the middle 50 percent.

**Figure 8. Cyclical Behavior of Leverage**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

Figure 8 plots the cyclical component of leverage for top, bottom 25 percent and all banks as well as that of GDP. Leverages of top and bottom 25 percent banks mostly move together except for the first three quarters of

2008 and first quarter of 2012, which are recession dates. We also observe that changes in the bottom 25 percent are much larger compared to top 25 percent. Movement in the leverage of all banks is mostly driven by the top 25 percent, especially after 2006.

### 3.5. Co-movement of Debt and Equity Financing

Table 7 reports the cross correlations of equity with leads, lags and current level of debt, denoted by  $D$ . Debt has negative contemporaneous correlation with equity for bottom 95 percent banks and the aggregate banking sector.

**Table 7. Co-movement of Debt and Equity Financing, Quarterly Data, 2003-2013**

	$D_{t-4}$	$D_{t-3}$	$D_{t-2}$	$D_{t-1}$	$D_t$	$D_{t+1}$	$D_{t+2}$	$D_{t+3}$	$D_{t+4}$
[0, 25]	0.25	<b>0.31**</b>	0.08	-0.05	-0.20	-0.26*	-0.16	-0.17	-0.32**
[25, 50]	0.00	-0.02	-0.07	-0.30*	-0.30*	-0.23	-0.01	0.23	<b>0.45**</b>
[50, 75]	0.15	0.24	0.34**	0.39**	<b>0.46**</b>	0.35**	0.18	0.04	-0.09
[75, 100]	0.04	0.10	0.07	-0.09	-0.26*	<b>-0.29*</b>	-0.28*	-0.19	-0.06
[0, 95]	0.20	0.11	-0.01	-0.30*	<b>-0.65**</b>	-0.61**	-0.51**	-0.36**	-0.10
[95, 100]	0.08	0.18	0.29*	<b>0.31**</b>	0.19	0.19	0.12	0.16	0.29*
All banks	0.44**	0.38**	0.28*	-0.04	-0.45**	<b>-0.46**</b>	-0.46**	-0.32**	-0.09

Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output ( $\text{std}(x)/\text{std}(Y)$ ).

Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

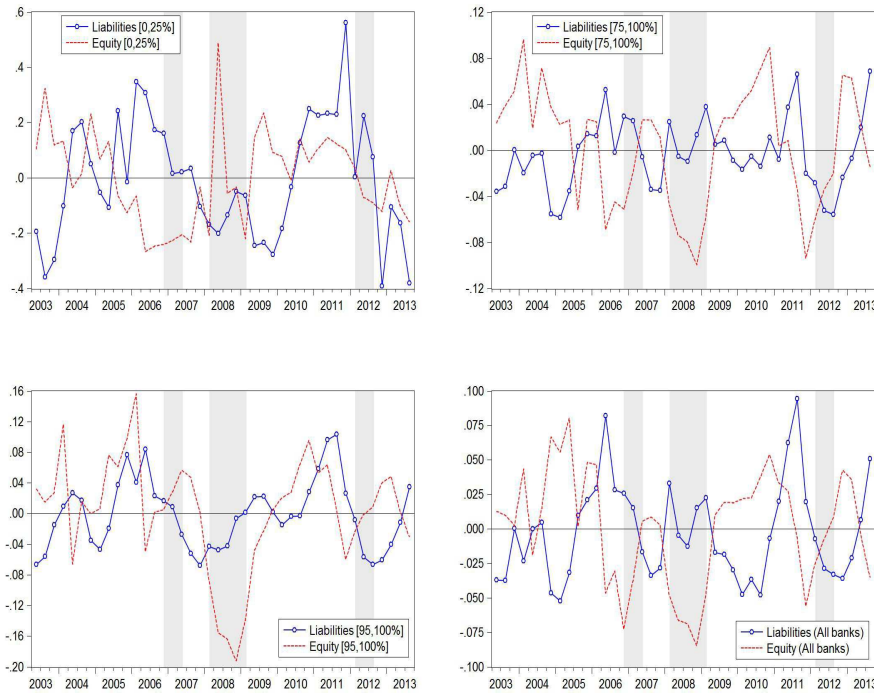
Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

Behavior of top 5 percent banks and [50,75] percent group diverge from the aggregate banking sector with their positive contemporaneous correlation between debt and equity. For the bottom 25 percent, debt leads equity by 3 quarters. This might arise from the need for equity financing to meet capital requirements after an increase in debt is observed. For the [25,50] percent group, equity leads debt by 4 quarters. A similar reasoning might hold here. Higher equity increases banks' capacity to borrow, hence they increase debt financing.

Figure 9 illustrates the co-movement of debt and equity for top 25 percent, bottom 25 percent, top 5 percent and the aggregate banking sector. Switching between debt and equity financing is more pronounced for top 25

percent and the aggregate banking sector compared to bottom 25 percent and top 5 percent.

**Figure 9. Co-movement of Debt and Equity Financing**



Note 1: All the series are deviations of trend from cyclical components of HP-filtered series.  
 Note 2: Shaded areas are recession dates.

### 3.6. Cyclical Behavior of Profitability Measures

Table 8 displays the cross sectional correlations of different profitability measures as well as loan spreads with GDP and its leads and lags. Contemporaneous correlations show that ROA and ROE are acyclical while loan spread is strongly countercyclical except for bottom 25 percent banks. ROA of top 25 percent and top 5 percent negatively lag the cycle by 3 quarters while that of [25,50] percent group positively lags the cycle by 4 quarters. Only ROA of [50,75] percent group positively leads the output by 4 quarters. For top 25 percent, since assets are acyclical, a rise in GDP leads to a decline in ROA through reduced net profits. For ROE, similar story



applies except for [50,75] percent group, for which ROE positively lags output by 4 quarters. Loan spreads of top 50 percent banks lag output by 1 to 2 quarters while those of [25,50] percent group lead the output by 1 quarter.

**Table 8. Cyclical Behavior of Profitability Measures, Quarterly Data, 2003-2013**

	Relative Volatility	Contemporaneous Correlation	Cyclicality	Phase Shift
<b>Return on Assets</b>				
[0, 25]	0.32	-0.24	Acyclical	Lead (1 qtr, -0.25)
[25, 50]	0.11	0.00	Acyclical	Lag (4 qtr, 0.58)
[50, 75]	0.07	0.12	Acyclical	Lead (4 qtr, 0.32)
[75, 100]	0.06	-0.10	Acyclical	Lag (3 qtr, -0.32)
[0, 95]	0.06	-0.08	Acyclical	Lag (3 qtr, -0.19)
[95, 100]	0.03	-0.16	Acyclical	Lag (3 qtr, -0.56)
All banks	0.04	-0.10	Acyclical	Lag (3 qtr, -0.29)
<b>Return on Equity</b>				
[0, 25]	0.38	-0.15	Acyclical	Lead (1 qtr, -0.16)
[25, 50]	0.10	0.10	Acyclical	Lag (4 qtr, 0.57)
[50, 75]	0.06	0.30*	Acyclical	Lag (4 qtr, 0.35)
[75, 100]	0.05	-0.01	Acyclical	Lag (3 qtr, -0.20)
[0, 95]	0.06	0.07	Acyclical	Coincidental
[95, 100]	0.03	-0.19**	Countercyclical	Lag (2 qtr, -0.43)
All banks	0.04	0.03	Acyclical	Lag (3 qtr, -0.14)
<b>Loan Spread</b>				
[0, 25]	0.44	0.03	Acyclical	Not clear
[25, 50]	0.08	-0.39**	Countercyclical	Lead (1 qtr, -0.44)
[50, 75]	0.05	-0.53**	Countercyclical	Lag (1 qtr, -0.55)
[75, 100]	0.07	-0.43**	Countercyclical	Lag (2 qtr, -0.50)
[0, 95]	0.06	-0.45**	Countercyclical	Lag (1 qtr, -0.47)
[95, 100]	0.07	-0.46**	Countercyclical	Lag (2 qtr, -0.54)
All banks	0.06	-0.46**	Countercyclical	Lag (1 qtr, -0.50)

Note 1: Business cycle statistics in the table are based on HP-filtered cyclical components of quarterly empirical time series (smoothing parameter: 1600).

Note 2: The standard deviation of output is expressed in percent; standard deviations of the remaining variables are normalized by the standard deviation of output (std(x)/std(Y)).

Note 3: \*: Significant at 10 percent; \*\*: Significant at 5 percent.

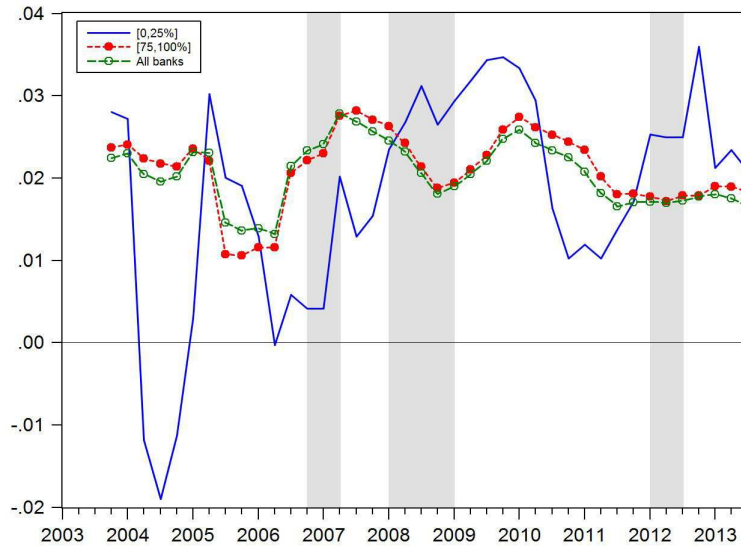
Note 4: In the Phase Shift column, numbers in parentheses indicate the lead-lag quarter and the corresponding correlation coefficient, respectively.

Figures 10, 11 and 12 show the annualized levels of ROA, ROE, and loan spreads, respectively. While we observe a substantial difference between the top and bottom 25 percent banks in terms of all aforementioned profitability measures, it can be seen that the behavior of the aggregate banking sector almost coincides with that of top 25 percent. Starting from 2005.Q2, ROA

and ROE of top 25 percent banks decrease sharply. Profitability of bottom 25 percent goes sharply negative in 2004.

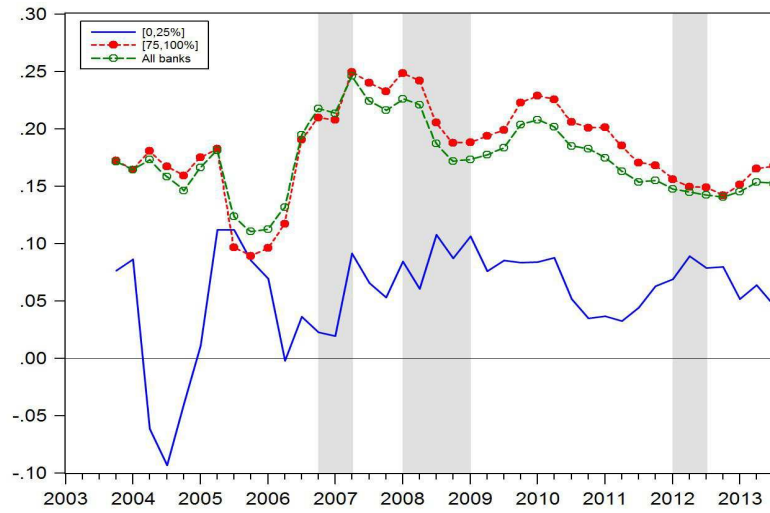
Loan spread for the bottom 25 percent stays below that of top 25 percent and is more volatile until the 2008 recession. After 2008, loan spread of the bottom 25 percent banks remains more volatile but goes above that of top 25 percent. This is possibly because smaller banks are increasing their profits by charging relatively higher loan rates in order to support their worsening equity positions.

**Figure 10. Return on Assets**



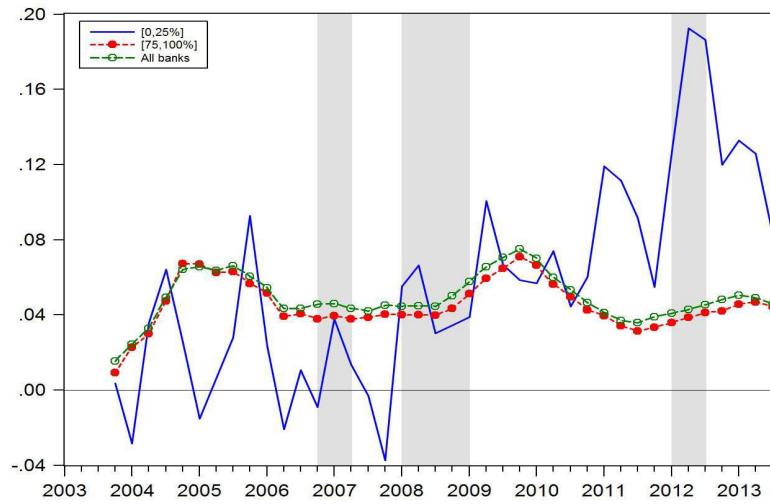
Note 1: All the series are denoted in levels.  
 Note 2: Shaded areas are recession dates.

**Figure 11. Return on Equity**



Note 1: All the series are denoted in levels.  
 Note 2: Shaded areas are recession dates.

**Figure 12. Loan Spread**



Note 1: All the series are denoted in levels.  
 Note 2: Shaded areas are recession dates.

#### 4. Conclusion

Understanding the financing behavior and profits of financial intermediaries over the business cycle is essential for capturing the dynamics of real and financial macroeconomic aggregates and deriving policy implications. This paper studies the business cycle dynamics of banks' balance sheet items as well as important profitability measures using Turkish bank-level data for the 2003.Q1-2013.Q3 period. An important novelty in this paper is that we conduct our analysis for different size groups of banks and document the volatility and correlations of the cyclical components of asset and liability side variables as well as return on assets, return on equity, leverage, and loan spread.

Our findings reveal that banks' financing patterns along the business cycle vary both across time and within different size groups. Small banks finance a significant fraction of their asset growth with equity whereas large banks depend more on debt financing. We also observe that most bank groups switch between debt and equity financing over the business cycle. At the aggregate level, assets and deposits of banks are less volatile than output while credits, net worth, and leverage are more volatile. All of these variables but net worth move procyclically. At the cross-sectional level, assets and credits are procyclical for nearly all size groups and the volatility declines sharply for top 25 percent banks. Securities are countercyclical for small banks and procyclical for larger ones. Deposits display a procyclical pattern for all size groups except for [75,100] percent size group. Decomposing deposits into foreign and domestic, we observe a similar pattern. Banks in the top 25 percent differ from the rest whose foreign and domestic deposits are procyclical. Equity issuance on the other hand is acyclical or countercyclical for all banks groups and bank credits are highly procyclical. The lead-lag patterns of bank balance sheet items also vary with size. In terms of the cyclical movements of credits, bottom 25 percent banks behave differently compared to those above the second quartile by leading the cycle. Deposits of banks in top 5 and 25 percent lag the cycle whereas those of the rest lead the cycle. Equity lags the cycle for all banks groups. Finally return on assets and equity are acyclical for all bank groups while loan spread is strongly countercyclical except for bottom 25 percent.

These results highlight the fact that bank size is a significant factor in explaining the cyclicity of bank financing, implying the importance of incorporating heterogeneity in modeling the financing behavior of banks. From this perspective, this paper provides a rich set of empirical facts about the cyclicity of bank balance sheets that should be helpful to construct and

assess theoretical heterogeneous models about financing sources of banks. Although our findings suggest major differences in bank balance sheets across size groups in terms of cyclicality, identifying the determinants of observed heterogeneity in the degree of cyclicality requires further investigation.

The fact that balance sheet items of banks of different sizes exhibit heterogeneous behavior over the business cycle might have different policy implications as policy decisions targeting the aggregate banking sector might not always lead to better outcomes for all bank groups. Monetary and macroprudential policy authorities might calibrate their policy decisions based on the bank size, leading to welfare-improving outcomes for the entire economy.

## References

- Albertazzi, Ugo and L. Gambacorta. 2009. “Bank Profitability and the Business Cycle” *Journal of Financial Stability*, 5 (4), 393 – 409.
- Athanasoglou, Panayiotis P., S. N. Brissimis, and M. D. Delis. 2008. “Bank-specific, Industry-specific and Macroeconomic Determinants of Bank Profitability”. *Journal of International Financial Markets, Institutions and Money*, 18 (2), 121 – 136.
- Bolt, Wilko, L. de Haan, M. Hoeberichts, M. R.C. van Oordt, and J. Swank. 2012. “Bank Profitability During Recessions”. *Journal of Banking & Finance*, 36 (9), 2552 – 2564.
- Covas, Francis and W. J. Den Haan. 2007. “Cyclical Behavior of Debt and Equity Using a Panel of Canadian Firms”. *Working Papers 07-44*, Bank of Canada.
- Covas, Francisco and W. J. Den Haan. April 2011. “The Cyclical Behavior of Debt and Equity Finance,” *American Economic Review*, 101 (2), 877–99.
- Dietrich, Andreas and G. Wanzenried. 2011. “Determinants of Bank Profitability Before and During the Crisis: Evidence from Switzerland”. *Journal of International Financial Markets, Institutions and Money*, 21 (3), 307 – 327.
- Gertler, Mark and N. Kiyotaki. 2010. “Chapter 11 - Financial Intermediation and Credit Policy in Business Cycle Analysis,” in Benjamin M. Friedman and Michael Woodford, eds., Vol. 3 of *Handbook of Monetary Economics*, Elsevier, pp. 547 – 599.
- Gertler, Mark and P. Karadi. 2011. “A model of Unconventional Monetary Policy”. *Journal of Monetary Economics*, 58 (1), 17 – 34. Carnegie-Rochester Conference Series on Public Policy: The Future of Central Banking April 16-17, 2010.
- Gertler, Mark, N. Kiyotaki, and A. Queralto. 2012. “Financial Crises, Bank Risk Exposure and Government Financial Policy”. *Journal of Monetary Economics*, 59, Supplement (0), S17 – S34. Supplement issue: October 15-16 2010 Research Conference on ‘Directions for Macroeconomics: What Did We Learn from the Economic Crises’ Sponsored by the Swiss National Bank (<http://www.snb.ch>).
- Jermann, Urban and V. Quadrini. 2006. “Financial Innovations and Macroeconomic Volatility”. *Proceedings*, (Nov).
- Jermann, Urban and V. Quadrini. 2012. “Macroeconomic Effects of Financial Shocks”. *American Economic Review*, 102 (1), 238–71.

- Kashyap, Anil K. and J. C. Stein. 2000. “What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?”. *American Economic Review*, 90 (3), 407–428.
- Korajczyk, Robert A. and A. Levy. April 2003. “Capital Structure Choice: Macroeconomic Conditions and Financial Constraints”. *Journal of Financial Economics*, 68 (1), 75–109.
- Levy, Amnon and C. Hennessy. September 2007. “Why Does Capital Structure Choice Vary with Macroeconomic Conditions?”. *Journal of Monetary Economics*, 54 (6), 1545–1564.
- Mimir, Yasin. 2015. Forthcoming. “Financial Intermediaries, Credit Shocks and Business Cycles”. *Oxford Bulletin of Economics and Statistics*.
- Olson, Dennis and T. A. Zoubi. 2011. “Efficiency and Bank Profitability in MENA Countries”. *Emerging Markets Review*, 12 (2), 94 – 110.
- Pasiouras, Fotios and K. Kosmidou. June 2007. “Factors Influencing the Profitability of Domestic and Foreign Commercial Banks in the European Union”. *Research in International Business and Finance*, 21 (2), 222–237.