Cross-Sectional Facts on Bank Balance Sheets over the Business Cycle

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April 28, 2014

The views expressed in this paper are those of the authors and do not necessarily reflect the official views or the policies of the Central Bank of the Republic of Turkey.

Motivation

- Fluctuations in financing sources of banks contribute to the business cycles
  - Banks transfer funds from savers (households) to borrowers (non-financial firms)
  - Frictions in obtaining finance $\rightarrow$ reduce lending $\rightarrow$ decline in investment $\rightarrow$ recession aggravates
- Why do fluctuations in banks balance sheet matter for output fluctuations? Banking sector is an important share of the economy
  - Total assets/GDP: Between 0.5-1.28 for 2003-2013 period in Turkey
  - Total credits/GDP: In the 0.13-0.78 range during the same period
- Conjecture: Aggregate data gives an ambiguous picture. Why?
  - Large banks might drive the cyclical behavior of aggregate data
  - The financing behavior of banks might vary with size
- First attempt to analyze bank's balance sheets at the cross-sectional level.

Research Question

- How does the cyclical behavior of balance sheet items, financing behavior and profitability of banks vary at the cross-sectional level with size?

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  Profitability items: Return on equity, return on assets, loan spread.
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- Panel data analysis that relates credit growth to bank-specific and macroeconomic determinants

Preview of Results

Variable	Small	Large	All
Equity growth/asset growth	73%	11%	10%
Deposit growth/asset growth	30%	60%	56%
Assets	Procyclical	Acyclical	Procyclical
Credits	Procyclical	Acyclical	Procyclical
Deposits	Procyclical	Acyclical	Procyclical
Loan Spread	Acyclical	Countercyclical	Countercyclical
Return on assets	Acyclical	Acyclical	Acyclical
Return on equity	Acyclical	Acyclical	Acyclical

Preview of Results (cont'd)

Determinants of credit growth	Small	Large	All
Bank-specific			
Deposit growth (10% increase)	1%	4%	1.1%
Loan rate(10% increase)	-2.6%	9.2%	insig.
Equity growth(10% increase)	insig.	0.7	insig.
Macro variables			
GDP growth(10% increase)	27.9%	7.9%	18.7%
Financial crisis	-0.8%	-0.3%	-0.3%

Methodology and Data

- Quarterly Turkish bank-level data from 2003 to 2013
- Focus on commercial banks, rank them based on asset size
- Seasonally adjusted and HP-filtered
- Cyclicality: Correlation between the cyclical components of balance sheet items and GDP
- Fixed and random effect panel estimation

Summary Statistics

	[0,25]	[25,50]	[50,75]	[75,100]	[95,100]	[0,95]	All Banks
Size variables							
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 (%)	0.5	2.3	14.5	82.7	3.04	69.5	100
Total assets/GDP(%)	0.35	1.66	10.42	61.01	22.03	51.65	73.35
Total credits/GDP(%)	0.08	0.78	6.42	28.26	8.64	27.59	36.61
Profitability							
Return on Equity ((%))	5.5	11.7	14.6	18.2	20.5	16.1	17.3
Return on Assets ((%))	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

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Financing behavior							
Δ Equity/Δ Assets(%)	73.2	11.4	7.9	11.0	9.1	11.1	10.6
Δ Liability/Δ Assets(%)	30.1	89.3	91.9	88.6	90.8	88.8	89.2
Δ Deposit/Δ Assets(%)	29.9	54.2	55.7	56.9	59.2	55.3	56.3
Δ Domestic Deposits/ΔAssets(%)	7.5	36.7	45.2	42.1	45.3	41.1	42.2
Δ FX Deposits/Δ Assets(%)	19.3	18.6	10.2	14.2	13.6	13.7	13.6
Δ Credit/Δ Assets(%)	8.6	68.0	78.5	79.4	83.0	77.1	78.6

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Cyclical Behavior of Real and Financial Variables

	Relative Volatility	Contamporaneous Correlation	Cyclicality	Phase Shift
Real Variables				
Output	3.65	1.00**	Procyclical	Coincidental
Consumption	0.97	0.92**	Procyclical	Coincidental
Investment	2.88	0.94**	Procyclical	Coincidental
Financial Variables				
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)
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)

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Cyclical Behavior of Assets

	Relative Volatility	Contamporaneous Correlation	Cyclicality	Phase Shift
Assets				
[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
Credit				
[0, 25]	7.31	0.20	Acyclical	Lead(3 qtr,0.40)
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Cyclical Behavior of Liabilities

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Total Deposits				
[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

Cyclical Behavior of Liabilities

	Relative Volatility	Contamporaneous Correlation	Cyclicality	Phase Shift
Total Deposits				
[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)
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[75, 100]	0.78	-0.18	Acyclical	Lag(4 qtr, -0.39)
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[95, 100]	1.45	0.12	Acyclical	Lag(4 qtr, -0.60)
All banks	0.67	0.28*	Procyclical	Coincidental

Cyclical Behavior of Liabilities,cnt'd

	Relative Volatility	Contamporaneous Correlation	Cyclicality	Phase Shift
Domestic Deposits				
[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)
FX Deposits				
[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)

Cyclical Behavior of Liabilities,cnt'd

	Relative Volatility	Contamporaneous Correlation	Cyclicality	Phase Shift
Domestic Deposits				
[0, 25]	13.23	0.32**	Procyclical	Lead(1 qtr, 0.44)
[25, 50]	3.66	0.23	Acyclical	Lag(1 qtr, -0.33)
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[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)

Cyclical Behavior of Equity

	Relative Volatility	Contamporaneous Correlation	Cyclicality	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

Cyclical Behavior of Equity

	Relative Volatility	Contamporaneous Correlation	Cyclicality	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)
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[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

Cyclical Behavior of Leverage

	Relative Volatility	Contamporaneous Correlation	Cyclicality	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)

Cyclical Behavior of Leverage

	Relative Volatility	Contamporaneous Correlation	Cyclicality	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)

Cyclical Behavior of Leverage

	Relative Volatility	Contamporaneous Correlation	Cyclicality	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)
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All banks	1.57	0.38**	Procyclical	Lag(2 qtr, 0.52)

Cyclical Behavior of Profitability

	Relative Volatility	Contamporaneous Correlation	Cyclicality	Phase Shift
Return on Assets				
[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)
Return on Equity				
[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)
Loan Spread				
[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)

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[0, 25]	0.32	-0.24	Acyclical	Lead (1 qtr, -0.25)
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Econometric Model

Objective: Explore the cross sectional and macroeconomic determinants of credit growth and how financial crisis affects it.

$$\Delta CR_{i,t} = \alpha_i + \beta_1 Z_{i,t} + \beta_2 X_t + \beta_3 I_{i,t} + u_{i,t}$$

- $\Delta CR_{i,t}$: Credit growth
- $Z_{i,t}$: Bank specific variables including lagged credit growth
- X_t: Macroeconomic variables
- $I_{i,t}$: Dummy variables for crisis, interaction of crisis and public, and interaction of crisis and foreign
- α_i: Fixed effect
- $u_{i,t}$: Error term

Determinants of Credit Growth

Variable	Definition	Expected sign
Credit growth(-1)	Lag of real growth rate of total credits	+
Deposit growth	Real growth rate of total deposits	+
Equity growth	Real growth rate of equity (net worth)	+
NPL growth	Real growth rate of non-performing loans	-
Liquid asset ratio	Liquid assets over total assets	-
Profitability	Total profits over total assets	+
Solvency	Total equity over total assets	?
Loan rate	Total interest revenue from credits over total credits	?
Inflation rate	Percentage change in CPI	-
Real GDP growth	Percentage change in GDP	+
Exchange rate depreciation	Percentage change in real effective exchange rate	-
Financial crisis	Binary variable equal to one for the quarters 2008.Q1-2010.Q4 and zero otherwise	-
Public	Binary variable equal to one if bank is public and zero otherwise	
Foreign	Binary variable equal to one if bank is foreign and zero otherwise	

Panel Estimation Results

	[0,25]	[25,50]	[50,75]	[75,100]	All Banks
Bank-specific variables					
Credit growth(-1)	0.037	0.010	0.061	0.086	0.131
	(0.264)	(0.110)	(0.058)	(0.076)	(0.212)
Deposit growth	0.101***	-0.001	0.228***	0.376***	0.111***
	(0.015)	(0.034)	(0.040)	(0.107)	(0.015)
Equity growth	-0.200	0.066	0.215**	0.076**	-0.035
	(0.192)	(0.047)	(0.081)	(0.028)	(0.067)
NPL growth	-3.502	-2.005	2.261	-1.949*	-2.950
	(9.734)	(1.619)	(1.333)	(0.945)	(4.318)
Liquid asset ratio	-0.184	-0.710**	-0.159	-0.057	-0.208
	(0.353)	(0.314)	(0.091)	(0.055)	(0.247)
Profitability	11.211	1.432*	2.229	0.735**	4.653
	(10.034)	(0.688)	(1.275)	(0.261)	(6.884)
Solvency	0.210	-0.515	0.338*	-0.267**	0.524
	(0.883)	(0.296)	(0.167)	(0.093))	(0.552)
Loan rate	-0.266***	-0.470	-1.216*	0.923**	-0.161
	(0.083)	(0.348)	(0.623)	(0.309)	(0.120)

Panel Estimation Results

	[0,25]	[25,50]	[50,75]	[75,100]
Macro variables				
Inflation rate	-2.664	-1.153	-0.473***	-0.026
	(2.245)	(0.739)	(0.136)	(0.245)
Real GDP growth	1.876	2.793***	1.025***	0.797***
	(2.341)	(0.937)	(0.190)	(0.116)
Exchange rate depreciation	-0.395	0.046	-0.207	-0.267***
	(0.871)	(0.262)	(0.122)	(0.040)
Financial crisis	-0.078**	0.011	-0.043***	-0.028***
	(0.032)	(0.038)	(0.011)	(0.004)
Public x Crisis	-	-	-	0.016*
	-	-	-	(0.008)
Foreign x Crisis	-0.020	-0.057	0.003	-
	(0.148)	(0.058)	(0.015)	-
Observations	222	284	341	326
$R^2_{overall}$	0.047	0.052	0.360	0.441
$R^2_{between}$	0.006	0.001	0.409	0.500
R^2_{within}	0.108	0.217	0.423	0.451

Conclusion

- We investigate cross-sectional business cycle facts of banks' balance sheet items.
- We also explore the cross-sectional and macroeconomic determinants of credit growth.
- Size matters!