Banks' business models and performance: the impact of interest rates and capital requirements

Eugenio Avisoa, Boubacar Camara, Sébastien Frappa, ***Oana Toader***

2018 EBA Policy Research Workshop

London, 28-29 November 2018

Outline

I. Motivation : context and research questions

II. Dataset and econometric specification

III. Main results

IV. Conclusion and policy implications

V. Additional future research

I - Motivation : context and research questions

I – Context

Post-crisis environment

- **Since the crisis, banks are facing some "tectonic" changes**
- **Close monitoring of all these changes** (profitability, stability)

Profitability became a key priority

- ECB, 2015: "Weak bank profitability has been highlighted as a key risk for euro area financial stability." (Financial Stability Review, May 2015)
- ECB, 2016: "**Profitability drivers** and **business models** are key priority for European banking supervision." (Thematic review on profitability)
- IMF, 2017: rebuilding **sustainable levels of bank profitability** became a key priority […]

I - Motivation

Existing literature

- **Interest rates and bank profitability**
  - higher real interest rates are associated with higher interest margin and profitability (Demirgüç-Kunt and Huizinga,1999)
  - low interest rates are contributing to weaker net interest margins (Claessens, Coleman and Donnelly, 2017)
  - nonlinear relationship between interest rate level and the slope of the yield curve on one side, and ROA on the other side (Borio, Gambacorta and Hofmann, 2017)
- **Regulatory requirements and bank profitability**
  - positive effect of capital ratios on ROE for US banks (Berger, 1995; Berger and Bouwman, 2013)
  - additional capital holdings, beyond the minimum required, positively affect the performance of French large banks (Bandt et al., 2017)

I - Motivation

Existing literature

Business model assessment

- Classifications:
  - clustering (Ayadi et al., 2011, 2012, 2014, 2016; Roengpitya et al., 2014, 2017)
  - supervisory classification (Cernov and Urbano, 2018)
  - balance sheet indicators (Martel et al., 2012)
- Choice of business model and impact on risk and returns:
  - banks with a strong reliance on wholesale funding were significantly more likely to fail during the crisis (Demirgüç-Kunt and Huizinga, 2010)
  - banks with a more diversified income structure were found to be more stable during periods of stress (Altunbas et al., 2011)

I - Motivation

Our paper

Analyzes how changes in bank profitability are explained by bank-specific factors and macroeconomic conditions and their differentiated impact depending on banks' business models.

Our contribution to the literature

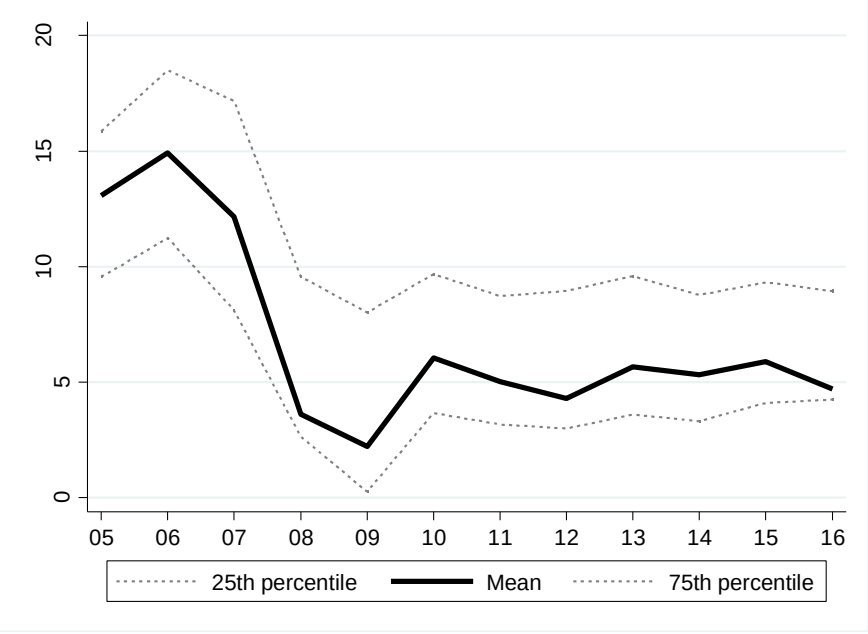
- **How interest rates could affect differently bank profitability across business models ?**
- **How banks' specific capital buffers could affect the performance of banks across business models?**

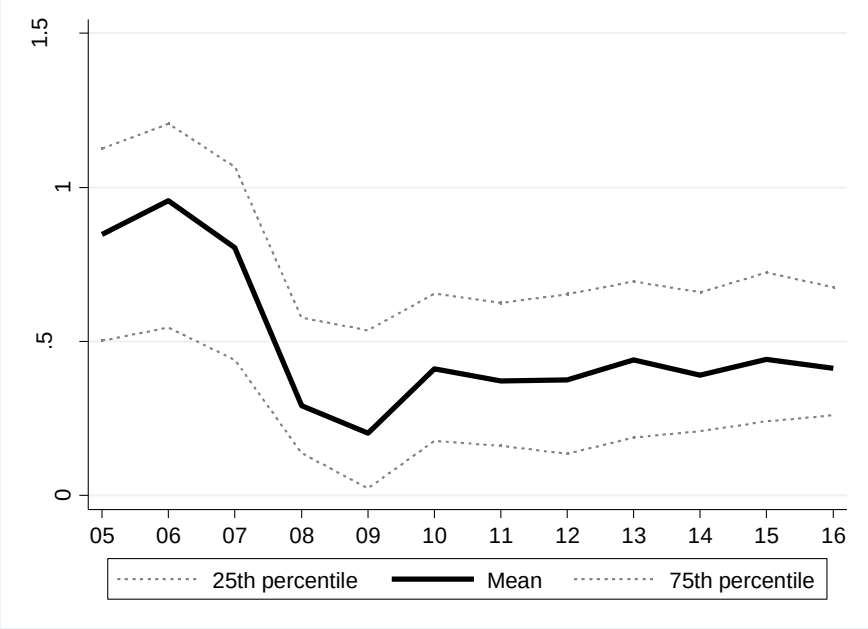
I – Motivation

Profitability indicators: some stylized facts

$$Return\ on\ equity:\ ROE = \frac{Net\ income}{Total\ equity}$$

$$Return\ on\ assets:\ ROA = \frac{Net\ income}{Total\ assets}$$



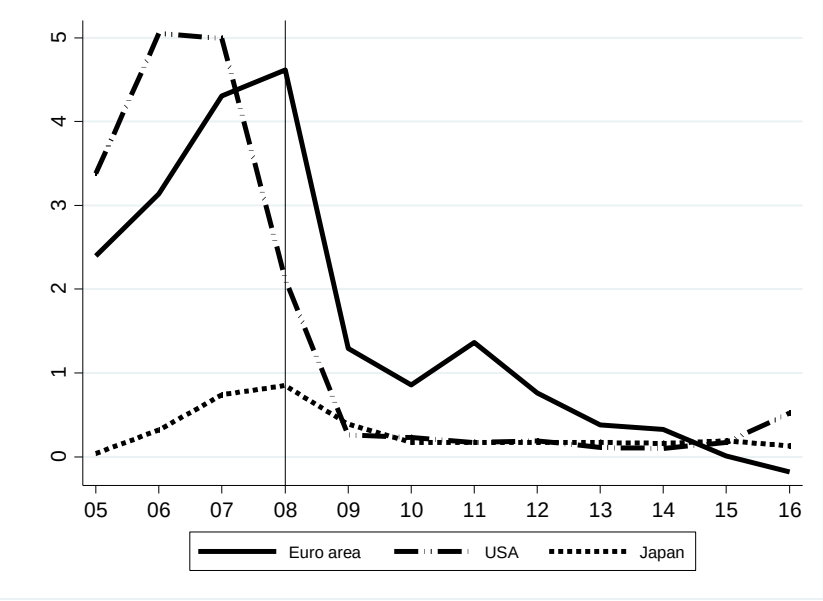


Source: SNL. Authors' calculations. Notes: Annual means for the sample of 217 international banks.

I – Motivation

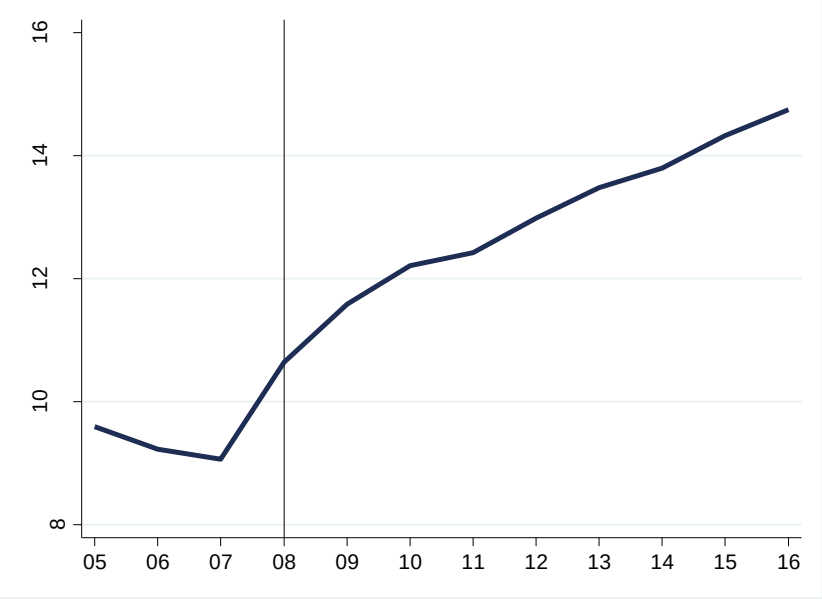
Short-term interest rates

Low-interest rate environment affects banks' revenues



Regulatory capital

Increasing capital, driven by new regulation and market pressure, tends to mechanically reduce the ROE



Source: SNL and Bloomberg. Authors' calculations. Notes: (left) Annual means for the short term interest rates as defined by the 3M maturity money market interest rate (country/monetary zone specific). (right) Annual mean of the prudential ratio of Tier 1 capital to risk-weighted assets calculated for the sample of 217 international banks.

II- Dataset and econometric identification

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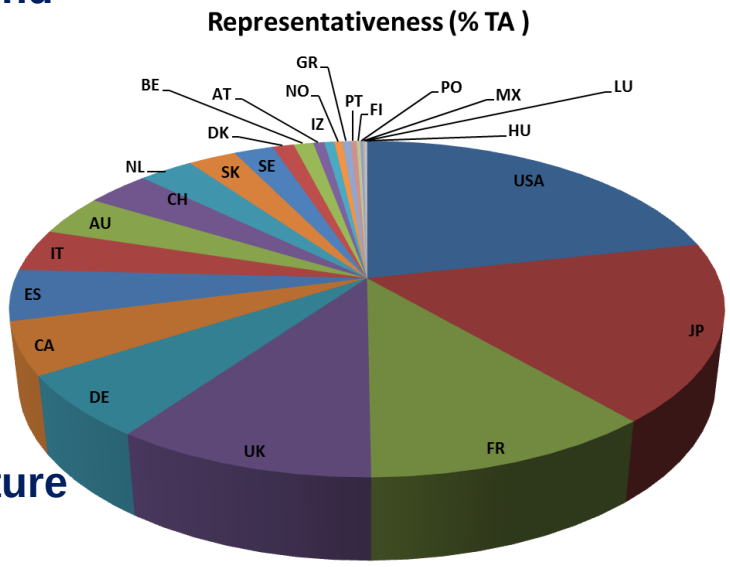
Dataset description

- 217 large banks with total assets > €30 bn (end-2016)
- 25 OECD countries
- Highest level of consolidation
- Frequency : annual
- Time span : 2005 - 2016
- Micro data on banks' balance sheet structure and income statement, prudential ratios, etc.
- Country-specific macroeconomic and financial variables
- Data retrieved from SNL database (accounting data)
- Neutralization of very extreme values



II – Dataset and econometric identification

Business model classification

- **Data driven classification** using clustering techniques (Ayadi et al., 2012, 2014; Roengpitya et al., 2014, 2017)
- Business models → nature and scope of activities
- **Our definition** based on **involvement in market based activities** (ie share of securities as of total assets)
  - additional definitions has been tested, combining assets and liabilities patterns → less relevant clusters
  - advantage of definition based on assets structure: avoid qualitative judgement (as in Ayadi et al., 2012, 2014; Roengpitya et al., 2014, 2017)
- Assuming that banks' business model is a long-term strategy, we retain a **constant classification in time** based to the most recent point in time (ie. end-2016).
- We obtain : **Commercial-oriented banks** (51) | **Universal banks** (132) | **Trading-oriented banks** (34)

RECALL

Clustering = ***statistical classification*** *method proposed by Ward (1963) who allows to group observations that are the closest to each other . The algorithm evaluates the distance between two observations by the sum of squared differences and then* ***group observations with similar values****.*

II – Dataset and econometric identification

Empirical strategy

Dependent variables		Explanatory variables	Method	Data
Profitability	**ROE**	**Macroeconomic conditions** Short-term interest rates Spreads **Bank-specific factors** Capital buffer	Unbalanced panel regressions Cross section and time dimensions Sample and sub-sample levels Fisher Unitroot test Least Square Dummy Variable (LSDV) Bank-fixed effects Heteroscedasticity robust standard errors	Bank level Annual frequency
	ROA			

II – Dataset and econometric identification

Empirical strategy

$$Y_{i,j,t,b} = \alpha_i + \beta_1 Short\_ir_{j,t} + \beta_2 Short\_ir_{j,t}^2 + \gamma_1 Spread\_ir_{j,t-1} + \gamma_2 Spread\_ir_{j,t-1}^2 + \delta_1 Buffer\_low_{i,j,t-1} + \varphi_s X_{i,j,t-1,b} + \omega_m Z_{j,t} + \partial_1 Crisis_{1t} + \partial_2 Crisis_{2t} + \varepsilon_{i,j,t,b}$$

Dependent variables		
Profitability		ROE, ROA
Explanatory variables		
Short-term interest rate	*Non-linear*	Money market interest rate of 3M maturity
Interest rate spread	*Non-linear*	Difference between 10Y country-specific bond rate and 3M money market interest rate
Buffer low	-	dummy variable, equals 1 if bank capital buffer is lower than the median value of the sample, and 0 otherwise *capital buffer = Tier1 ratio – Basel minimum requirements*
Control variables		
		+ + +(/-)
Other bank characteristics:		equity ratio, deposit ratio, RWA density
		+ +
Other macroeconomic financial controls:		GDP growth, Stock return
Crisis		Dummy variables ; Crisis1 equals 1 for 2007-2008 and 0 otherwise; Crisis2 equals 1 for 2010-2012 and 0 otherwise

III - Main results

III – Main results

Business models, interest rates, capital buffer and return on equity

	ROE			
	All banks	Commercial	Universal	Trading
	(1)	(2)	(3)	(4)
Short_ir$_{j,t}$	0.860	1.960**	0.638	1.485
	(0.608)	(0.958)	(0.748)	(1.669)
Short_ir$_{j,t}^2$	0.106	-0.161	0.198*	-0.052
	(0.097)	(0.135)	(0.112)	(0.340)
Spread_ir$_{j,t-1}$	-2.014***	-2.242***	-1.723***	-2.822*
	(0.481)	(0.676)	(0.628)	(1.583)
Spread_ir$_{j,t-1}^2$	0.103**	0.168***	0.061	0.149
	(0.043)	(0.032)	(0.054)	(0.376)
Buffer_low$_{i,t-1}$	0.387	2.927	-0.196	-0.073
	(0.773)	(2.185)	(0.907)	(1.365)
Equity ratio$_{i,t-1}$	0.346*	0.633***	-0.132	0.381
	(0.196)	(0.231)	(0.409)	(0.573)
Deposit ratio$_{i,t-1}$	0.098	0.100	0.261***	-0.007
	(0.061)	(0.105)	(0.094)	(0.094)
RWA density$_{i,t-1}$	0.069*	0.122	0.029	-0.036
	(0.037)	(0.081)	(0.040)	(0.101)
GDP growth$_{j,t}$	0.587***	1.040***	0.606***	-0.454
	(0.148)	(0.324)	(0.189)	(0.393)
Stock return$_t$	0.123***	0.046	0.108***	0.315***
	(0.025)	(0.048)	(0.032)	(0.070)
Crisis$_{1,t}$	-4.753***	-2.172	-4.964***	-7.234**
	(0.970)	(2.074)	(1.169)	(2.954)
Crisis$_{2,t}$	-0.202	-0.312	-0.342	0.770
	(0.544)	(1.217)	(0.693)	(1.180)
Constant	-11.292*	-13.946	-15.803**	2.191
	(6.419)	(9.735)	(7.961)	(8.547)
Number of obs.	1,893	425	1,150	318
Adj. R^2	0.324	0.412	0.301	0.370
F(Prob>F)	20.01 (0.00)	7.59 (0.00)	12.38 (0.00)	5.43 (0.00)

Key findings

- **Positive relation between short-term interest rates and ROE**
- **The sensitivity to interest rates differs according to their business strategy**
- Banks exposed to higher sovereign spreads are less profitable in a relative unfavorable macroeconomic context
- The coefficient associated with the control variables generally present the expected sign

III – Main results

Business models, interest rates, capital buffer and assets profitability

	ROA			
	All banks	Commercial	Universal	Trading
	(1)	(2)	(3)	(4)
Short_ir$_{j,t}$	0.043	0.167***	-0.004	0.046
	(0.034)	(0.050)	(0.044)	(0.075)
Short_ir$_{j,t}^2$	0.012*	-0.019***	0.027***	0.003
	(0.007)	(0.007)	(0.009)	(0.015)
Spread_ir$_{j,t-1}$	-0.157***	-0.187***	-0.153***	-0.144*
	(0.037)	(0.047)	(0.048)	(0.087)
Spread_ir$_{j,t-1}^2$	0.009**	0.015***	0.007	0.008
	(0.004)	(0.003)	(0.005)	(0.024)
Buffer_low$_{i,t-1}$	0.018	0.155	0.014	-0.022
	(0.041)	(0.101)	(0.055)	(0.078)
Equity ratio$_{i,t-1}$	0.039***	0.035***	0.039*	0.033
	(0.010)	(0.011)	(0.023)	(0.036)
Deposit ratio$_{i,t-1}$	0.011***	0.010**	0.020***	-0.004
	(0.004)	(0.005)	(0.006)	(0.008)
RWA density$_{i,t-1}$	-0.002	-0.000	-0.005*	0.001
	(0.002)	(0.004)	(0.003)	(0.008)
GDP growth$_{j,t}$	0.048***	0.064***	0.054***	-0.012
	(0.009)	(0.018)	(0.013)	(0.016)
Stock return$_t$	0.005***	0.005*	0.004*	0.015***
	(0.001)	(0.003)	(0.002)	(0.003)
Crisis$_{1,t}$	-0.368***	-0.139	-0.450***	-0.305**
	(0.068)	(0.116)	(0.088)	(0.154)
Crisis$_{2,t}$	0.001	0.026	0.015	-0.016
	(0.035)	(0.059)	(0.050)	(0.067)
Constant	-1.002***	-2.124***	0.681**	0.255
	(0.369)	(0.575)	(0.277)	(0.673)
Number of obs.	1,899	426	1,154	319
Adj. R^2	0.439	0.552	0.423	0.513
F(Prob>F)	19.81 (0.00)	7.23 (0.00)	13.60 (0.00)	4.20 (0.00)

Key findings

- Positive relationship between short-term interest rates and ROA for commercial and universal banks
  - But still no significant evidence for trading banks
- The effect of the sovereign spread is negative

Main results

- ✓ Robustness checks
  - ✓country and time fixed effects
  - ✓deterministic trend
- ✓ Overall stable results

Additional results

Business models, interest rates, capital buffer and banks' profitability in crisis periods

III – Additional results : Crisis periods (2007-2012)

	ROE				ROA			
	All	Commercial	Universal	Trading	All	Commercial	Universal	Trading
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Short_ir$_{j,t}$	-2.395**	0.670	-3.051***	-3.573	-0.128***	0.089	-0.232***	0.020
	(0.941)	(1.245)	(1.150)	(3.229)	(0.049)	(0.069)	(0.067)	(0.133)
Short_ir$_{j,t}^2$	0.412***	-0.059	0.573***	0.438	0.027***	-0.009	0.047***	-0.006
	(0.137)	(0.197)	(0.154)	(0.533)	(0.008)	(0.011)	(0.011)	(0.022)
Spread_ir$_{j,t-1}$	-2.938***	-1.547	-2.910***	-4.060	-0.091***	-0.075	-0.092**	-0.245
	(0.755)	(1.273)	(0.950)	(2.889)	(0.033)	(0.055)	(0.044)	(0.165)
Spread_ir$_{j,t-1}^2$	0.182*	-0.067	0.215*	-0.074	-0.004	-0.006	-0.002	0.030
	(0.105)	(0.206)	(0.115)	(0.892)	(0.003)	(0.004)	(0.005)	(0.051)
Buffer_low$_{i,t-1}$	-3.045**	-1.952	-2.249	-3.555	-0.107*	-0.055	-0.063	-0.194
	(1.405)	(2.957)	(1.779)	(2.458)	(0.064)	(0.137)	(0.087)	(0.117)
Equity ratio$_{i,t-1}$	0.163	-0.099	0.238	1.263	0.038	-0.004	0.064	0.021
	(0.540)	(0.907)	(0.756)	(1.057)	(0.029)	(0.047)	(0.041)	(0.065)
Deposit ratio$_{i,t-1}$	0.116	0.012	0.447*	-0.290	0.013**	0.011	0.028***	-0.004
	(0.139)	(0.183)	(0.230)	(0.253)	(0.006)	(0.008)	(0.009)	(0.012)
RWA density$_{i,t-1}$	0.076	0.222	-0.003	-0.110	-0.003	0.002	-0.007	-0.000
	(0.054)	(0.141)	(0.055)	(0.147)	(0.003)	(0.007)	(0.005)	(0.009)
GDP growth$_{j,t}$	0.416**	0.951**	0.438**	-1.391**	0.015	0.034*	0.021	-0.070***
	(0.185)	(0.391)	(0.214)	(0.562)	(0.010)	(0.018)	(0.013)	(0.021)
Stock return$_t$	0.168***	0.048	0.148***	0.544***	0.009***	0.005*	0.007***	0.026***
	(0.039)	(0.053)	(0.050)	(0.119)	(0.002)	(0.003)	(0.003)	(0.005)
Constant	-12.185	-3.354	0.704	27.469	-1.143**	-0.051	-0.634	0.408
	(13.907)	(5.132)	(3.313)	(24.474)	(0.573)	(0.206)	(0.827)	(1.130)
Number of obs.	971	215	587	169	978	216	592	170
Adj. R^2	0.308	0.355	0.317	0.394	0.523	0.480	0.557	0.542

IV – Conclusion and policy implications

IV – Conclusion and policy implications

We show in this paper that :

- **Banks' performance is explained by both cyclical and structural factors with different sensitivities across business models.**

- **The sensitivity of bank profitability to interest rates changes across business models.**

  - A nonlinear relationship between interest rates and the performance of commercial and universal banks, however more significant for commercial than for universal banks.

  - Unclear relationship for trading banks.

- **Sizeable holdings of capital buffers seem beneficial** during crisis periods

  - Better capitalized banks have higher capacity to seize investment opportunities and benefit of more favorable financing conditions in periods of stress.

IV – Conclusion and policy implications

Policy implications

- Business models patterns are a key factor to consider when comparing and benchmarking financial risks.
- Claudio Borio (BIS), 2017: "*On average a high interest rate is positive for the banks but you have to ask yourself what the context is*."
  - The position in the economic cycle and compliance with new regulatory standards should be considered as well when assessing banks' performance.

V - Additional future research

- **Alternative definitions of business model**
  - Time changing classification
  - Alternative base for clustering
- **Recognize more dependency between macro and balance sheet variables**

$$Y_{i,j,t,b} = \alpha_i + \varphi_s X_{i,j,t-1,b} + \omega_m Z_{j,t} + \partial_{sm} X_{i,j,t-1,b} \times Z_{j,t} + \varepsilon_{i,j,t,b}$$

- **Try to disentangle panel cross-section and time dimensions**
- **Isolate the effect of liquidity requirements**, both market and structural, when analyzing the profitability since liquidity holdings should also differ across business models
  - Some preliminary results using the share of deposits as of total assets

Thank you for your attention !

Annex

Definition of variables

Variable	Definition	Mean (%)	SD (%)	1st decile (%)	Median (%)	9th decile (%)
Bank-specific variables						
ROE	Net income over total equity	6.24	10.15	0.30	6.74	15.12
ROA	Net income over total assets	0.46	0.64	0.02	0.42	1.09
Tier 1 Capital ratio	Prudential ratio of Tier 1 capital to risk-weighted assets	12.37	5.73	7.70	11.57	17.08
Equity ratio	Accounting equity over total assets	6.78	2.94	3.57	6.15	11.23
Deposit ratio	Customer deposits over total assets	58.74	22.70	25.97	61.41	87.93
RWA density	Risk-weighted assets over total assets	58.77	22.68	25.99	61.49	87.93
Macrofinancial variables						
Short_ir	Money market interest rate of 3M maturity ; country-specific/monetary zone variable	1.38	1.72	0.10	0.57	4.63
Spread_ir	Difference between 10Y country-specific bond and 3M money market interest rate	1.27	1.46	- 0.18	0.96	2.71
GDP growth	Growth rate of gross domestic product ; country-specific variable	1. 29	2.25	-1.70	1.61	3.67
Stock return	Stock market return	4.09	13.05	-17.03	7.94	17.01

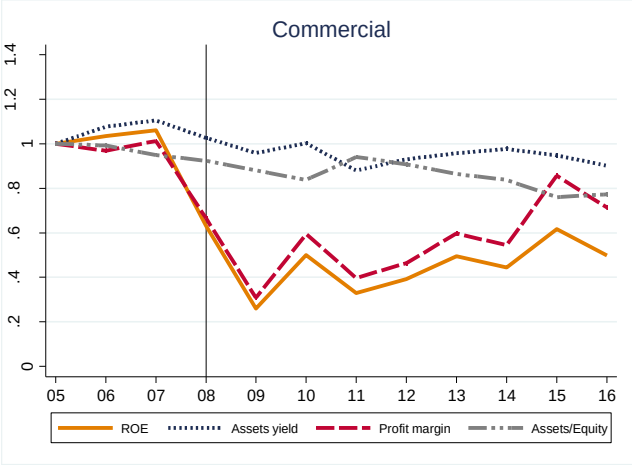
Descriptive statistics by business model and period

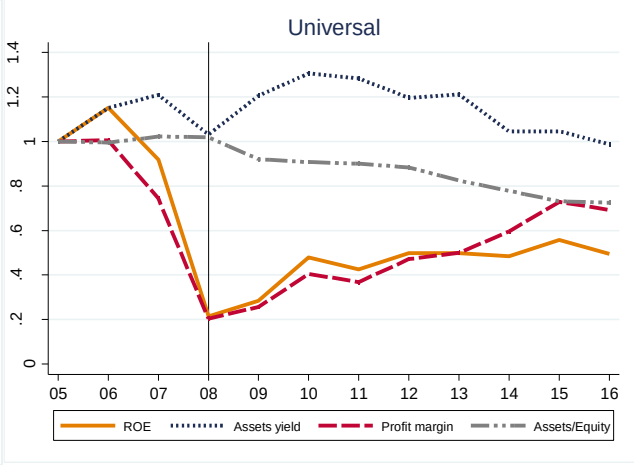
Mean	all period				pre-crisis				crisis				post-crisis			
	All banks	Commercial	Universal	Trading	All banks	Commercial	Universal	Trading	All banks	Commercial	Universal	Trading	All banks	Commercial	Universal	Trading
ROA	0,46	0,46	0,47	0,41	0,91	0,81	0,96	0,87	0,39	0,40	0,41	0,34	0,42	0,42	0,43	0,39
ROE	6,24	5,78	6,41	6,25	14,06	12,58	14,15	16,20	5,27	5,33	5,38	4,86	5,39	4,35	5,69	5,72
retail ratio	116,06	132,91	116,55	91,77	106,91	125,05	106,45	77,95	115,57	131,38	116,99	91,63	119,10	137,06	118,62	95,36
Loans (%TA)	57,31	74,21	57,45	34,15	56,45	72,01	55,24	34,90	57,35	74,12	58,18	34,07	57,49	74,95	57,11	34,08
Total securities (%TA)	26,54	13,42	25,36	48,84	25,21	15,17	24,40	45,49	27,30	14,53	25,57	49,53	25,94	11,58	25,34	48,72
Trading assets (%TA)	7,66	4,00	6,13	16,40	12,91	6,56	10,02	29,12	8,10	4,37	6,32	17,10	6,08	3,02	5,18	12,75
Risk density	49,96	53,48	52,42	36,28	58,16	60,75	60,08	46,02	50,42	53,26	53,49	36,39	47,20	51,63	49,08	33,72
Tier 1 ratio	12,37	12,35	11,72	14,77	9,40	9,25	9,57	8,96	11,62	11,49	10,85	14,42	14,10	14,29	13,36	16,69
Leverage ratio	5,71	6,08	5,86	4,67	5,36	5,58	5,57	4,14	5,45	5,75	5,62	4,48	6,14	6,60	6,24	5,07
Equity ratio	6,78	7,11	6,88	6,00	6,49	6,48	6,77	5,39	6,52	6,84	6,63	5,76	7,19	7,61	7,21	6,48
Deposits (%TA)	58,77	58,71	59,10	57,62	50,46	53,04	51,21	43,06	58,25	57,26	58,82	57,57	61,61	62,11	61,51	61,28

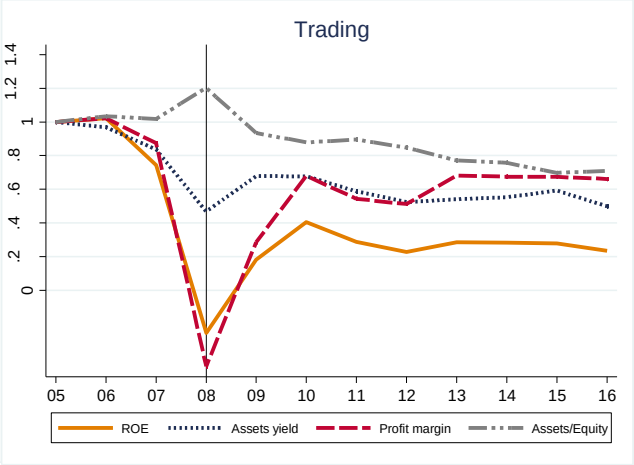
Stylized facts

DuPont Analysis by banks' business models

- In response to new regulatory requirements and market pressure, **changes occurred differently across business models.**







Definition of *Buffer_low*

Higher capital buffer
→ *buffer_low*=0

Capital buffer = Tier 1 ratio – min. required ⟶ **Median capital buffer**

Lower capital buffer
→ *buffer_low*=1

Basel Committee on Banking Supervision
BANK FOR INTERNATIONAL SETTLEMENTS

Basel III phase-in arrangements
(All dates are as of 1 January)

Phases	2013	2014	2015	2016	2017	2018	2019
Minimum Tier 1 Capital	4.5%	5.5%	6.0%				6.0%

return