



The impact of housing markets and real estate exposure on
the risk-taking behavior of banks:
Evidence from CESEE countries

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Outline

- I. Motivation
- II. Literature
- III. Data
- IV. Methodology
- V. Results
- VI. Conclusions

I. Motivation

Housing markets are important for the economy

- one of the main components of household wealth
- linkages with the construction sector
- linkages with the banking and financial sector

Research questions

- How do housing market and real estate exposure influence banks stability in CESEE countries?
- Do the real estate banks (REB) behave differently from the non real estate bank (NonREB)?

II. Literature (I)

- Housing markets are closely linked to the financial sector (Borio and Drehmann, 2009; Cerutti, Dagher and Dell-Ariccia, 2017);

House price dynamic and bank stability channel.

- «Collateral value hypothesis»- positive relation between banks' stability & housing markets (Allen et al. 1995; Daglish 2009;)
- «Deviation hypothesis» -risk taking channel- negative relation between banks' stability & housing markets (Blasko and Sinkey 2006; Morgan and Zhan, 2016)

II: Literature (II)

Single countries studies

Blasko and Sinkey, (2006) –US banks
(1989-1996)

Koetter and Poghosyan (2010)-German
banks (1994-2004)

Rebi (2016)-Albanian banks (2002-2014)

Banai and Vago (2018)-Hungarian banks
(1998-2016)

Cross –countries studies

Morgan and Zhang (2015)-Asian emerging
economies

Gibilaro and Mattarocci (2016)-Western
European Banks (2004-2011)

Altunbas et al (2017)-US and EU banks

III. Data (I)

Table 1: Sample coverage

Coverage of banks

Number of banks per country included in the sample

CESEE EU Member States			
Bulgaria	22	Latvia	17
Croatia	26	Lithuania	6
Czech Republic	20	Romania	24
Estonia	9	Slovakia	13
Hungary	23	Slovenia	13
Poland	31		
Western Balkan countries			
Albania	15	Montenegro	11
Bosnia and Herzegovina	20	Serbia	29
FYR Macedonia	14		

Source: authors' calculations.

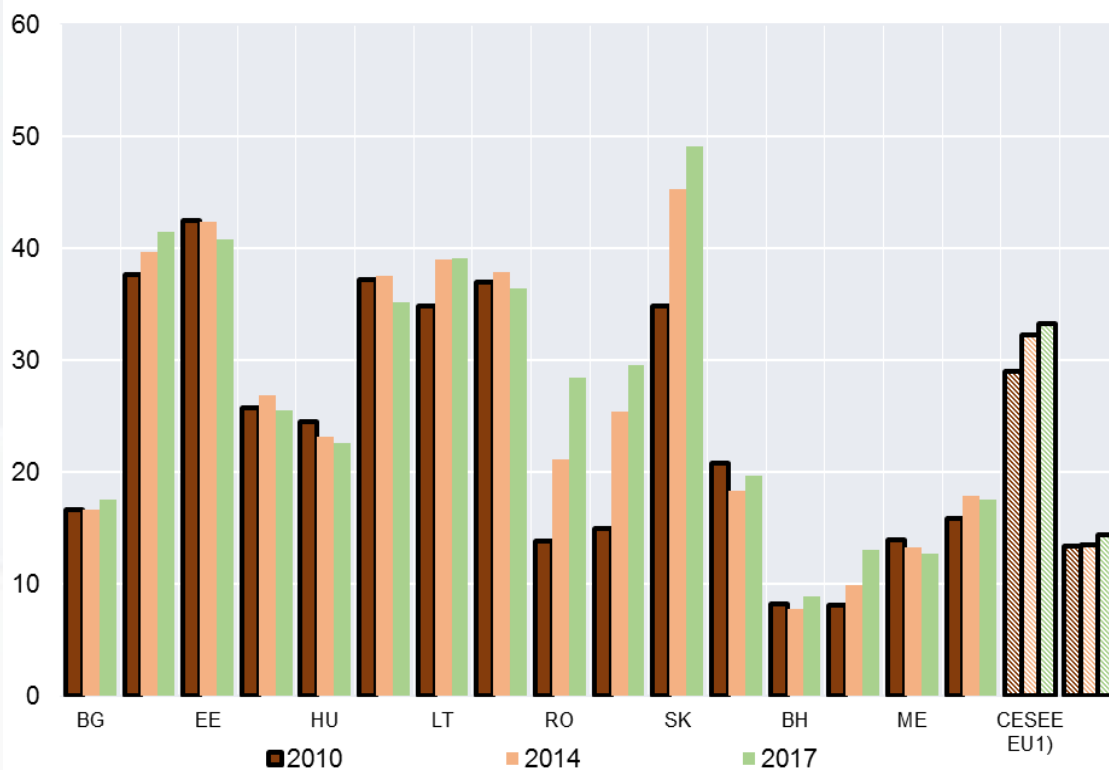
III. Data (II)

Large exposure of banks to the housing market in most countries

Diverse pattern of house price dynamics in 2010-2017

Share of housing loans to total loans

in %

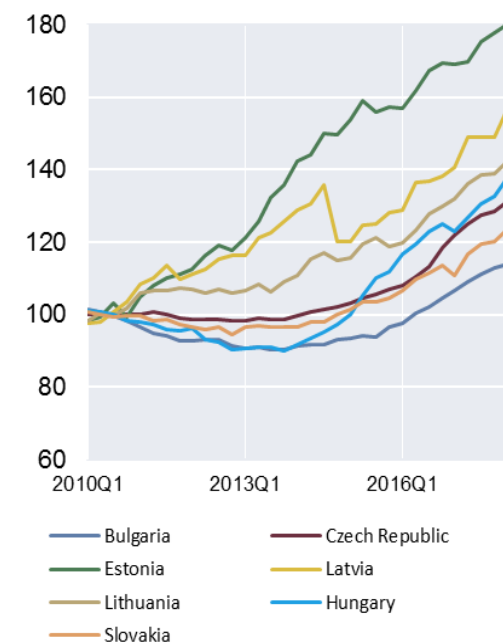


1) 2): unweighted average.

Source: ECB, national central banks.

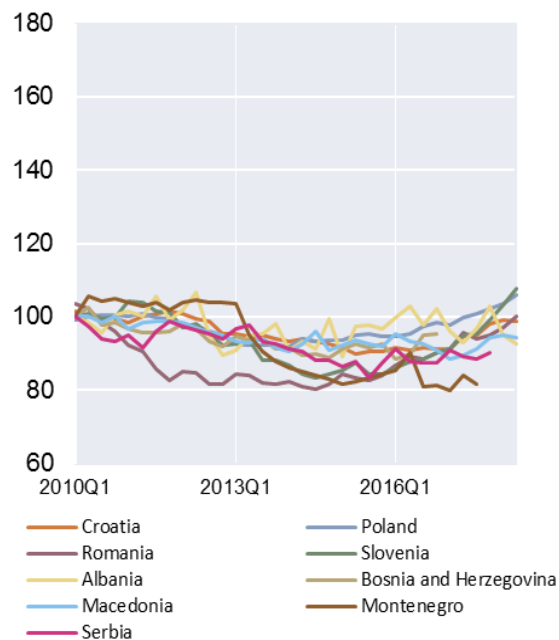
House prices: Countries with dynamic house price growth

index, 2010Q1=100



House prices: countries with moderate or downward house price growth

index, 2010Q1=100



Source: BIS, Eurostat, national central banks.

III. Data (III)

- **Bank stability indicator**

$$Z_{score,i,t} = \frac{roa_{i,t-3} - cap_{i,t}}{\sigma_{roa}}; \text{NPL}$$

- **Bank specific variables**

- Tier 1 (bank capital)
- Roe (return on equity)
- NII (net interest income)
- LLP (loan loss provisions)

- **Control variables**

- GDP (real GDP growth)
- HPI (house price growth)

- **Housing market exposure**

- *Real estate ratio* $_{i,j,t} = \frac{\text{housing loans}}{\text{total loans}}$

- *Dummy estate ratio* $_{i,j,t} = \begin{cases} 1, & \text{Real estate ratio} \geq 40 \% \\ 0, & \text{Real estate ratio} < 40 \% \end{cases}$

III.Data (IV)

Table 2: Bank level data and macroeconomic variable

Descriptive statistics: Full sample

	Obs.	Mean			Std. Dev			Min			Max		
		Total	Re banks	Non_Re banks	Total	Re banks	Non_Re banks	Total	Re banks	Non_Re banks	Total	Re banks	Non_Re banks
z-score	1064	39.3	43.2	38.4	35.1	39.0	34.2	3.3	3.6	3.3	153.0	153.0	152.5
NPL	1909	15.9	10.8	17.1	17.8	12.7	18.6	0.0	0.0	0.0	100.0	99.8	100.0
LLP	1410	1.4	1.1	1.5	1.1	0.9	1.1	0.0	0.0	0.0	4.5	4.3	4.5
Tier1	1909	18.4	18.7	18.4	12.8	11.5	13.1	0.4	1.6	0.4	100.0	77.6	100.0
ROE	1314	4.0	6.4	3.5	6.7	6.6	6.6	-15.9	-15.7	-15.9	15.1	15.1	15.1
Real estate ratio	1909	22.6	55.2	15.4	19.6	13.8	11.8	0.0	40.0	0.0	100.0	100.0	40.0
NII	1527	3.0	2.7	3.0	0.9	0.9	0.9	1.5	1.5	1.5	5.1	5.1	5.1
GDP growth		1.8	1.8	1.8	1.8	1.8	1.8	-2.7	-2.7	-2.7	7.6	7.6	7.6
HPI		100.7	100.9	100.9	20.6	20.9	20.9	66.8	66.8	66.8	172.5	172.5	172.5

Note: number of observations is different for some variables because of missing data and due to method of calculations, especially for z-score.

Source: authors' calculations, Eurostat, IMF, national central banks, S&P Market database.

IV. Methodology

Based on the work of Blasko and Sinkey, (2005), Morgan and Zhang, (2015), Gibilaro and Mattarocci (2016).

$$finstab_{i,j,t} = \alpha + \beta re_{i,j,t} + \theta X_{i,j,t} + \lambda C_{j,t} + \varepsilon_{i,j,t} \quad (1)$$

$$finstab_{i,j,t} = \alpha + \beta re_{i,j,t} + \underbrace{\gamma_{i,t} hpi_{j,t}} + \theta X_{i,j,t} + \lambda C_{j,t} + \varepsilon_{i,j,t} \quad (2)$$

$$finstab_{i,j,t} = \alpha + \beta re_{i,j,t} + \gamma hpi_{j,t} + \underbrace{\delta re_{i,j,t} hpi_{j,t}} + \theta X_{i,j,t} + \lambda C_{j,t} + \varepsilon_{i,j,t} \quad (3)$$

V. Empirical Results (I)

Table 3: Z-score panel fixed effect regressions

CESEE EU member states and Western Balkan countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TIER1	0.84***	0.90***	0.94***	0.89**	0.82***	0.89***	0.94***	0.88***
<i>p-value</i>	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
ROE	0.27**	0.27***	0.27***	0.27***	0.26***	0.261***	0.27***	0.26***
<i>p-value</i>	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)
NII	-0.26	-0.46	-0.69	-0.18	-0.49	-0.73	-0.94	-0.48
<i>p-value</i>	(0.93)	(0.11)	(0.83)	(0.96)	(0.87)	(0.81)	(0.76)	(0.88)
LLP	-2.56**	-2.14**	-2.33*	-2.16*	-2.61**	-2.21	-2.51**	-2.23*
<i>p-value</i>	(0.05)	(0.00)	(0.08)	(0.10)	(0.04)	(0.10)	(0.05)	(0.09)
real GDP growth	0.58	0.79	0.73	0.78	0.63	0.83	0.74	0.82
<i>p-value</i>	(0.32)	(0.17)	(0.20)	(0.17)	(0.28)	(0.15)	(0.19)	(0.15)
Real estate ratio	0.37**	0.31**	0.32**	0.31**				
<i>p-value</i>	(0.02)	(0.05)	(0.05)	(0.05)				
Dummy real estate					0.15***	12.22**	12.01**	11.87**
<i>p-value</i>					(0.01)	(0.04)	(0.04)	(0.05)
HPI		0.43				0.41		
<i>p-value</i>		(0.13)				(0.15)		
Real estate ratio * HPI			0.01					
<i>p-value</i>			(0.29)					
Dummy real estate*HPI				0.51			0.67	0.46
<i>p-value</i>				(0.42)			(0.27)	(0.46)
Dummy non-real estate *HPI				0.41				0.40
<i>p-value</i>				(0.19)				(0.22)
Bank fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	672	661	661	661	661	672	661	661
R-squared	0.55	0.56	0.56	0.56	0.55	0.56	0.56	0.56

Note: *p-value* indicates: * denotes significant at 10 percent, ** at 5 percent, *** at 1 percent.

Source: authors' calculations.

V. Empirical Results (II)

Table 4: Z-score panel fixed effect regressions

CESEE EU member states

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real estate ratio	0.24	0.21	0.20	0.20				
p-value	(0.13)	(0.29)	(0.20)	(0.20)				
Dummy real estate					10.91*	9.22	8.65	8.42
p-value					(0.09)	(0.15)	(0.18)	(0.19)
HPI		0.02*				0.55*		
p-value		(0.08)				(0.07)		
Real estate ratio * HPI			0.57**					
p-value			(0.05)					
Dummy real estate*HPI*DEU				0.88		1.04		0.83
p-value				(0.17)		(0.10)		(0.20)
Dummy non-real estate*HPI*DEU				0.38				0.38
p-value				(0.25)				(0.27)
Bank fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	672	661	661	661	661	672	661	661
R-squared	0.55	0.56	0.56	0.56	0.55	0.56	0.56	0.56

Note: p-value indicates: * denotes significant at 10 percent, ** at 5 percent, *** at 1 percent.

Source: authors' calculations.

Table 5: Z-score panel fixed effect regressions

Western Balkan countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real estate ratio	0.679*	0.63	0.59	0.74				
p-value	(0.06)	(0.14)	(0.18)	(0.10)				
Dummy real estate					33.29**	27.66*	25.71	25.38
p-value					(0.03)	(0.09)	(0.16)	(0.16)
HPI		-0.70				-0.80		
p-value		(0.36)				(0.30)		
Real estate ratio * HPI			0.08**					
p-value			(0.00)					
Dummy real estate*HPI				-7.17***		-6.41***		-
p-value				(0.00)		(0.00)		(0.00)
Dummy non-real estate*HPI				0.79				0.58
p-value				(0.38)				(0.52)
Bank fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	672	661	661	661	661	672	661	661
R-squared	0.55	0.56	0.56	0.56	0.55	0.56	0.56	0.56

Note: p-value indicates: * denotes significant at 10 percent, ** at 5 percent, *** at 1 percent.

Source: authors' calculations.

VI. Robustness checks

Table 5: Npl panel fixed effect regressions

CESEE EU member states and Western Balkan countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TIER1	-0.22	-0.15	-0.10	-0.16	-0.23	-0.15	-0.17	-0.16
<i>p-value</i>	0.00	0.03	0.09	0.02	0.00	0.03	0.01	0.02
ROE	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05
<i>p-value</i>	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
NII	1.07	1.12	-0.11	1.09	1.00	1.11	1.32	1.08
<i>p-value</i>	0.14	0.11	0.80	0.11	0.17	0.10	0.06	0.11
LLP	1.83	1.70	1.53	1.69	1.83	1.70	1.79	1.69
<i>p-value</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
real GDP growth	-0.09	-0.05	-0.06	-0.06	-0.08	-0.05	-0.11	-0.06
<i>p-value</i>	0.49	0.71	0.56	0.67	0.51	0.71	0.41	0.67
Real estate ratio	0.05	0.01	-0.05	0.00				
<i>p-value</i>	0.28	0.77	0.06	0.90				
Dummy real estate					1.48	0.33	0.08	0.04
<i>p-value</i>					0.26	0.72	0.93	0.96
HPI		-0.13				-0.13		
<i>p-value</i>		0.01				0.01		
Real estate ratio * HPI			-0.00					
<i>p-value</i>			0.00					
Dummy real estate*HPI				0.19			0.06	0.19
<i>p-value</i>				0.02			0.44	0.02
Dummy non-real estate *HPI				-0.21				-0.21
<i>p-value</i>				0.00				0.00
Bank fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations								
R-squared	0.78	0.79	0.80	0.72	0.71	0.72	0.72	0.72

Note: *p-value* indicates : * denotes significant at 10 percent, ** at 5 percent, *** at 1 percent. Constant is included but not reported.

Source: authors' calculations.

VI. Conclusions & future work

- Exposure of banks to housing market and house price dynamics affect positively bank stability.
- RE_banks and non RE_banks do not differ in the total sample, but:
 - CESEE EU member states: In both type of banks housing market exposure and house price dynamics increase financial stability.
 - Western Balkan countries: real estate banks feature higher risk than non-real estate banks.

VI. Conclusions & future research work

- Inclusion of institutional variables to take account of country and housing market differences.
- Look at non-linearity between real estate loans and banks stability.
- Application of different threshold of real estate exposure.
- Using a broader indicator for banks' exposure to the housing market.



Thank you for your attention !

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Annex.

Descriptive statistics: CESEE EU member states

	Obs.	Mean	Std. Dev	Min	Max
z-score	717	37.2	33.8	3.4	153.0
NPL	1,304	14.6	15.5	0.0	100.0
LLP	948	1.4	1.1	0.0	4.5
Tier1	1,304	17.5	12.2	0.4	99.6
ROE	1,304	4.3	6.8	-15.9	15.1
NII	1,041	2.7	0.8	1.5	5.1
GDP growth	1,304	1.9	1.9	-2.7	7.6
Real estate ratio	1,304	24.2	21.0	0.0	100.0
HPI	1,304	97.2	15.6	66.8	163.9

Note: number of observations is different for some variables because of missing data and due to method of calculations, especially for z-score.

Source: authors' calculations, Eurostat, IMF, national central banks, S&P Market database.

Descriptive statistics: Western Balkan countries

	Obs.	Mean	Std. Dev	Min	Max
z-score	346	43.5	37.5	3.3	152.5
NPL	606	18.5	21.4	0.0	100.0
LLP	462	1.5	1.0	0.0	4.5
Tier1	606	20.6	14.0	3.4	100.0
ROE	606	3.4	6.5	-15.9	15.1
NII	606	3.5	0.8	1.5	5.1
GDP growth	606	1.6	1.6	-2.7	3.8
Real estate ratio	606	19.2	15.9	0.0	82.4
HPI	575	108.7	27.2	89.7	172.5

Note: number of observations is different for some variables because of missing data and due to method of calculations, especially for z-score.

Source: authors' calculations, Eurostat, IMF, national central banks, S&P Market database.

Institutional differences between CESEE EU member states and the Western Balkans

Institutional indicators

	Ease of Doing Business Rank*	Dealing with Construction Permits*	Registering Property*	Resolving Insolvency*	Enforcing Contracts*	Getting Credit*	Corruption Perception Index**
Czech Republic	30.0	127.0	32.0	25.0	91.0	7.0	5.7
Estonia	12.0	8.0	6.0	44.0	11.0	7.0	7.1
Hungary	48.0	90.0	29.0	62.0	13.0	10.0	4.5
Latvia	19.0	49.0	22.0	53.0	20.0	9.0	5.8
Lithuania	16.0	12.0	3.0	70.0	4.0	6.0	5.9
Poland	27.0	41.0	38.0	22.0	55.0	7.0	6.0
Slovakia	39.0	91.0	7.0	42.0	84.0	7.0	5.0
Slovenia	37.0	100.0	36.0	10.0	122.0	3.0	6.1
EU member states average***	28.5	64.8	21.6	41.0	50.0	7.0	5.8
(EU accession in 2004)							
Bulgaria	50.0	51.0	67.0	50.0	40.0	9.0	4.3
Croatia	45.0	150.0	45.0	51.0	17.0	9.0	4.9
Romania	51.0	126.0	59.0	60.0	23.0	5.0	4.8
EU member states average***	48.7	109.0	57.0	53.7	26.7	7.7	4.7
(EU accession after 2004)							
Albania	65.0	106.0	103.0	41.0	120.0	8.0	3.8
Bosnia and Herzegovina	86.0	166.0	97.0	40.0	71.0	7.0	3.8
Macedonia	11.0	26.0	48.0	30.0	35.0	10.0	4.4
Montenegro	42.0	78.0	76.0	37.0	42.0	12.0	4.6
Serbia	43.0	10.0	57.0	48.0	60.0	6.0	4.1
Western Balkan Countries average***	49.4	77.2	76.2	39.2	65.6	8.6	4.1

Notes: *rank out of 190 countries ** relates to the degree to which corruption is perceived to exist among public officials and politicians by business people and country analysts. Score ranges between 10 (highly clean) and 0 (highly corrupt), ***unweighted average.

Source: World Bank Doing Business, Transparency International.