

Berlin

5th FMM summer school
Keynesian Macroeconomics and
European Economic Policies

28 July 2015

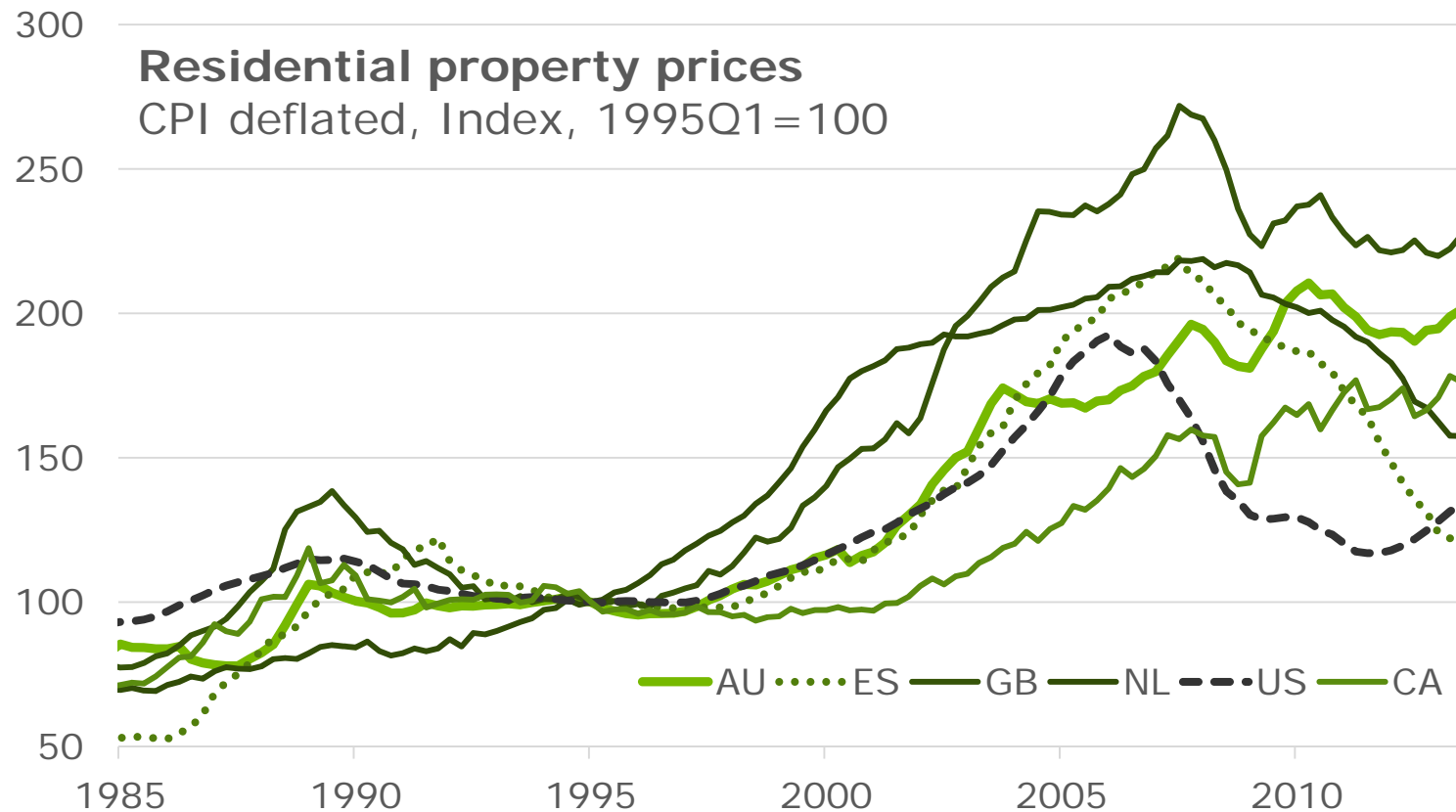


Does monetary policy drive housing market bubbles?

Heike Joebges, part of a joint project with Sebastian Dullien and Alejandro Márquez-Velázquez, preliminary results.

Project funded by the IMK Düsseldorf.

1. Motivation: Did “loose” monetary policy cause the recent housing bubbles?



1. Motivation: Did “loose” monetary policy cause the recent housing bubbles?

- I. **Yes**, by deviating too much from a Taylor rule
(e.g. Taylor 2007, 2008)
- II. **Yes**, by ignoring asset price inflation
(Borio/ Lowe, 2002, 2004, White 2006)
- III. **No**, capital inflows from emerging economies depressed long-term interest rates (e.g. Bernanke 2010)
- IV. **No**, financial innovations/changes in financial regulation allowed a stronger expansion of mortgage markets
(Basco 2014, Dokko et al. 2011, Marqués et al. 2010)

1. Motivation (cont'd)

Stylized facts for all arguments

- **Monetary policy was “loose”** according to a standard Taylor rule for the US and other countries ...
- ... **but** “looseness” is not related to bubble formation (see e.g. IMF WEO 2009, Dokko et al. 2011)
- ... **and** stance could be justified by other/ non-symmetrical Taylor rule settings (e.g. Dokko et al. 2011)
- **Gross capital flows** increased worldwide
- **Financial innovations** increased and thereby financing conditions for housing eased

1. Research focus



Research Question: Did “loose” monetary policy drive housing bubbles in advanced economies?

Hypothesis: Financial market developments (including regulatory changes) were more important.

Research approach:

Literature review, Case studies,

Cross-country-time-series regressions

Research results:

Monetary policy shocks contribute to bubble formation, but effects depend on the financial system.

Agenda

1. Motivation and research focus
2. Literature review: theory
3. Literature review: empirics
4. Estimation approach
5. Estimation results
6. Case studies
7. Conclusions

2. Literature review: Theory

Bubble definition:

- Price “exceeding its fundamental value” (Brunnermeier 2008)

Bubble formation:

- Convincing models are missing (Brunnermeier 2008), especially regarding monetary policy’s role (Dokko et al. 2011)

House price levels:

- Net present value models of future cash/utility flows (Scherbina 2013) leave a role for the interest rate: the lower, the higher house price levels

Agenda

1. Motivation and research focus
2. Literature review: theory
3. Literature review: empirics
4. Estimation approach
5. Estimation results
6. Case studies
7. Conclusions

Literature review: empirics (for cross-country studies)

Identification of bubbles:

- Mostly pragmatic: price hikes followed by price busts

Regression approaches:

- Due to a lack of a theoretical basis, stylized facts, early warning models (Probit), or VARs dominate

Contradictory results for bubble formation:

- Few studies attempt to explain bubble formation; even fewer consider monetary policy. The few that do, have diverging conclusions

(see e.g. Bordo/Landon-Lane 2013a,b; Dokko et al. 2011).

Agenda

1. Motivation and research focus
2. Literature review: theory
3. Literature review: empirics
4. Estimation approach
5. Estimation results
6. Case studies
7. Conclusions

4. Estimation approach

Aim: To control for the role of monetary policy and financial market developments in boom formation of housing prices in a cross-country-time-series approach

Approach:

- ⇒ Bivariate
- ⇒ **POS.:** robust
- ⇒ **POS.:** country-specific coefficients
- ⇒ **POS.:** less strict distribution assumptions (otherwise)
- ⇒ **Neg.:** coefficient interpretation
- ⇒ ... no common coefficients for all countries
- ⇒ ... system of country equations
- ⇒ ... for cross-country-shocks (SUR)
- ⇒ Outcomes not restricted to $[0; 1]$!!

4. Estimation approach: Sample - based on BIS data

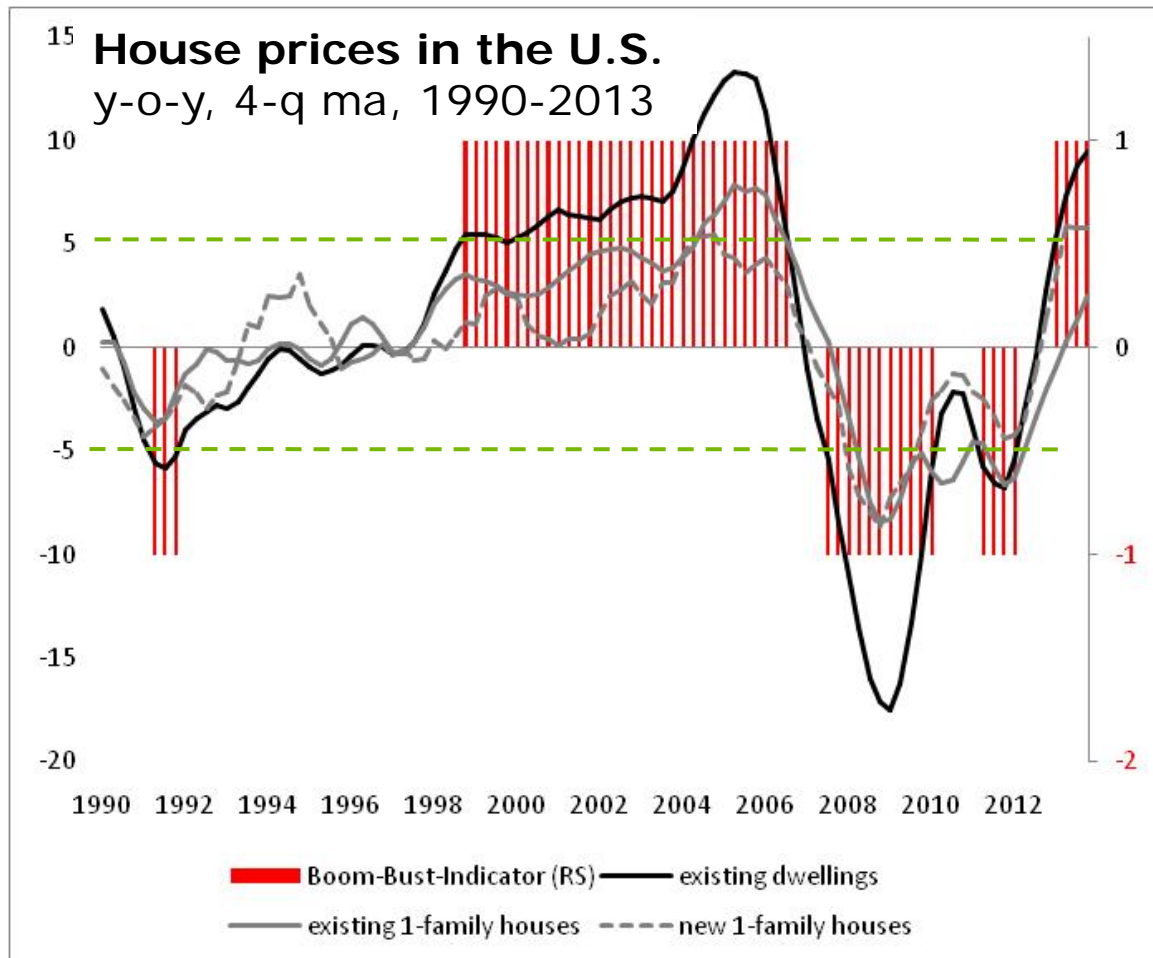
Abbreviation	Country	Sample 1 1990-2012	Sample 2 1985-2012
AT	Austria	X	-
AU	Australia	X	X
BE	Belgium	X	X
CA	Canada	X	X
CH	Switzerland	X	X
DE	Germany	X	X
ES	Spain	X	X
FI	Finland	X	-
FR	France	X	X
GB	UK	X	X
IT	Italy	X	X
JP	Japan	-	X
NL	Netherlands	X	X
NO	Norway	X	X
NZ	New Zealand	X	X
PT	Portugal	X	-
SE	Sweden	X	X
US	U.S.	X	X
Total		16 countries	15 countries

4. Estimation approach: Endogenous

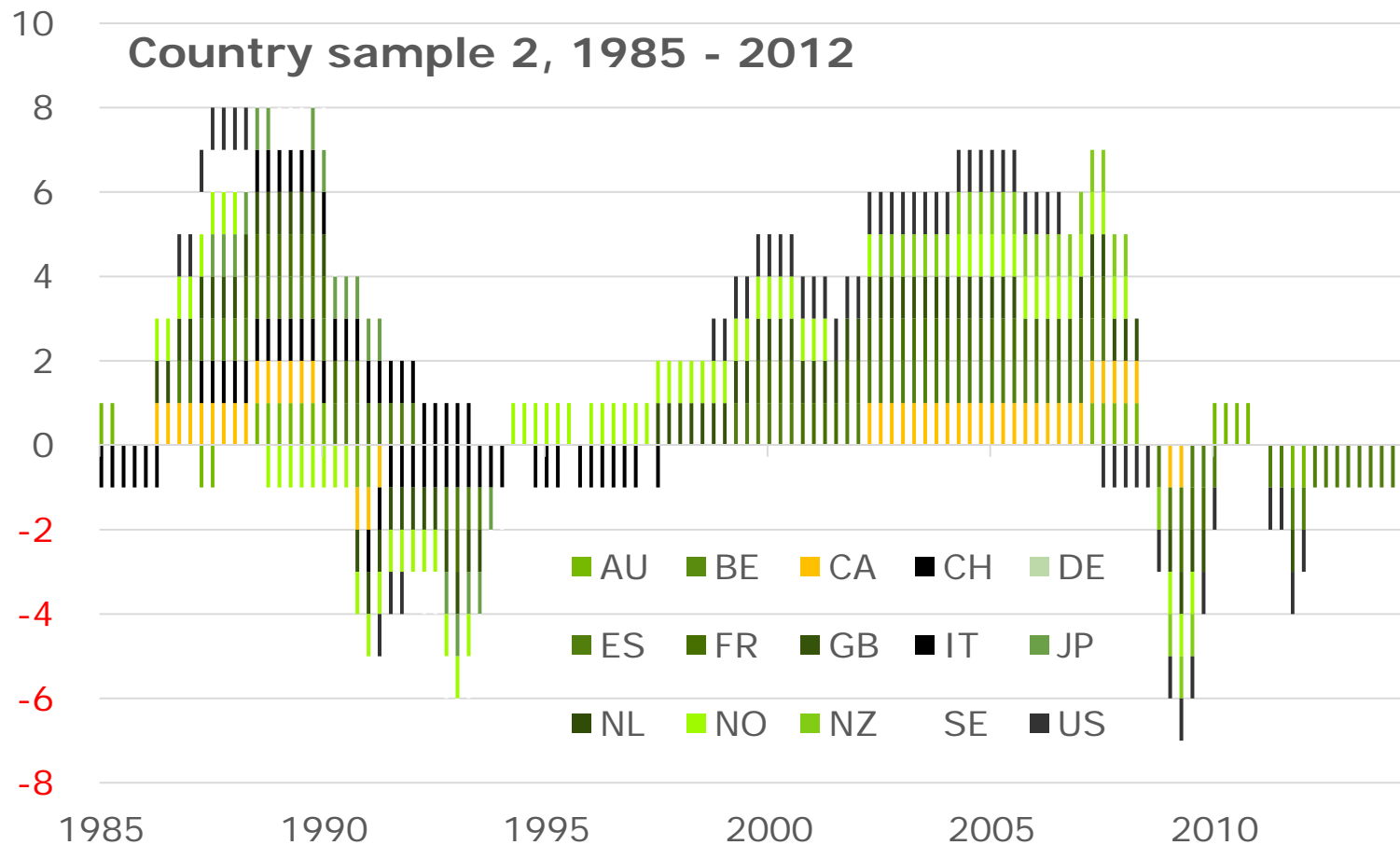
Binary boom indicator:

- Real house price data (CPI deflated)
- Bubbles are identified by a “**BOOM**” in real house prices that is followed by a “**BUST**”
- **BOOM** = four-quarter moving average of the annual growth rate of the real house price exceeds 5 %
- **BUST** = four-quarter moving average of the annual growth rate of the real house price falls below -5% (follows IMF WEO 2009)

4. Estimation approach: Endogenous Bubble indicator: example United States



4. Estimation approach: Endogenous Cumulated boom and bust signals



4. Estimation approach: Exogenous variables

Indicators for ...

1. ... economic activity
 2. ... foreign capital
 3. ... monetary policy
 4. ... **financial market** developments and regulation
- plus interactions** of (3) and (4)

All variables are included ...

- ... as deviations from past trends [\Leftrightarrow non-stationarity]
- ... in logarithms [besides ratios]
- ... in lags [to avoid endogeneity issues]

Agenda

1. Motivation and research focus
2. Literature review: theory
3. Literature review: empirics
4. Estimation approach
5. Estimation results
6. Case studies
7. Conclusions

5. Regression results

Robust results for “BASELINE” regression

- **Bubbles depend MAINLY on past developments**
(the lagged endogenous is positive and highly significant with a coefficient around 0.7)
- **Booms are furthered by high activity growth**
(GDP/household consumption is positive and highly significant)
- **Shock contagion plays an important role** (SUR improves the fit of the regression)

=> In line with models stressing herding behavior

5. Regression results - cont'd

- **Monetary policy shocks further bubbles**
 - Statistically significant in a robust way, if measured
 - as deviations from past **REAL** interest rates
 - (deviations from a Taylor rule are not significant)
 - **Yet, effect is small and depends on financial system:** Shock transmission is higher for the group with high credit to GDP / high securitization levels

Agenda

1. Motivation and research focus
2. Literature review: theory
3. Literature review: empirics
4. Estimation approach
5. Estimation results
6. Case studies
7. Conclusions

6. Case studies for 2000-2014

	Monetary policy in line w/ Taylor rule?	Bubble?	Why?
UK	Yes, fulfilled	YES!	Securitization!?
US	No, too loose	YES!	Securitization!?
AT	No, too loose	NO!	Little securitization, but public sector support for low rents; low incentives to invest into housing

Agenda

1. Motivation and research focus
2. Literature review: theory
3. Literature review: empirics
4. Estimation approach
5. Estimation results
6. Case studies
7. Conclusions

7. Conclusions

Explanation of bubble formation in our sample:

- Lagged endogenous dominates explanation
- Plus: economic activity, shocks from other countries
- Transmission of monetary shocks depends on the development and the regulation of the financial system
- Effect of decreasing inflation seems to be important
- Capital inflows are not significant
- Case studies seem to underline the relevance of the financial system, especially regarding the role of securitization



Hochschule für Technik
und Wirtschaft Berlin

University of Applied Sciences

Thank you for your attention!

5. Regression results

Robustness checks

- Results of the “baseline” regression plus indicator for monetary policy, for the two groups separated by financial system indicator, are very robust to different specifications:
 - ... of the endogenous: e.g. ternary indicator
 - ... of the two sample: time period (1990-2012 vs. 1985-2012) with slightly varying samples
 - ... of the estimation approach: pooled OLS, system equation, no evidence for FE/RE effects
- Residuals are neither auto-correlated nor non-stationary

4. Estimation approach: Exogenous Variables

Monetary policy indicators

1. **Taylor rule deviations** of the nominal policy rate
 - policy rate: 3 months interbank rate
 - equal weights for inflation (2 %) and output goal
 - output trend measured by HP filter
2. **Real policy rate deviations** from an eight year trailing moving average
 - CPI deflated

4. Estimation approach: Exogenous Variables Financial market indicators

1. **Domestic credit** to the private sector, as percent of GDP
 - deviation from past trend or from OECD developments
2. **Securitization** indicator based on the “quantitative de jure mortgage backed securitization indicator” used by Sa et al. (2014)
3. **Housing regulation**: indicator for changes based on the Shim et al. (2013) database for policy actions on housing markets (transformed to numerical values: +1 tightening, -1 lowering regulation; 0 no change).

5. Regression results for monetary policy: groups according to credit/GDP

Sample 1 (16 countries, 1990-2012), cross-section SUR							
Endogenous variable: Binary Boom-Indicator							
		full sample		subsample "high" credit to GDP		subsample "low" credit to GDP	
		Coefficient	Significance	Coefficient	Significance	Coefficient	Significance
Regression with policy rate							
Constant		0.03	***	0.02		0.01	
binary boom-indicator (lag)		0.74	***	0.81	***	0.68	***
deviation from GDP trend (lag)		0.02	***	0.02	***	0.00	**
dev. from past policy rate (lag)		-0.00	***	-0.01	*	-0.00	*
<i>Weighted R-Squared</i>		0.90		0.71		0.63	
<i>Unweighted R-Squared</i>		0.58		0.60		0.55	
Regression with policy rate and an additional control for credit developments							
Constant		0.05	***	0.02		0.02	
binary boom-indicator (lag)		0.75	***	0.82	***	0.70	***
deviation from GDP trend (lag)		0.01	***	0.01	***	0.00	
dev. from past policy rate (lag)		-0.01	***	-0.01	*	-0.01	**
dev. from past credit trend (lag)		-0.00	***	0.00		-0.00	*
<i>Weighted R-Squared</i>		0.86		0.73		0.64	
<i>Unweighted R-Squared</i>		0.58		0.59		0.56	

*Significant at 10 % level, **... at 5 % level, *** at 1 % level

5. Regression results for monetary policy: groups according to credit/GDP

Sample 2 (15 countries, 1985-2012), cross-section SUR							
Endogenous variable: Binary Boom-Indicator							
		full sample		subsample "high" credit to GDP		subsample "low" credit to GDP	
		Coefficient	Significance	Coefficient	Significance	Coefficient	Significance
Regression with policy rate							
Constant		0.02	**	-0.00		0.01	
binary boom-indicator (lag)		0.69	***	0.73	***	0.74	***
deviation from GDP trend (lag)		0.02	***	0.01		0.01	**
dev. from past policy rate (lag)		-0.013	***	-0.02	***	-0.01	***
	<i>Weighted R-Squared</i>	0.72		0.64		0.63	
	<i>Unweighted R-Squared</i>	0.57		0.60		0.53	
Regression with policy rate and an additional control for credit developments							
Constant		0.01		-0.03		0.01	
binary boom-indicator (lag)		0.70	***	0.68	***	0.74	***
deviation from GDP trend (lag)		0.02	***	0.02	**	0.01	**
dev. from past policy rate (lag)		-0.01	***	-0.02	***	-0.01	***
dev. from past credit trend (lag)		0.00	***	0.00	***	0.00	
	<i>Weighted R-Squared</i>	0.73		0.64		0.63	
	<i>Unweighted R-Squared</i>	0.57		0.61		0.53	

*Significant at 10 % level, **... at 5 % level, *** at 1 % level

5. Regression results for monetary policy Signs of country specific coefficients

	1991-2012		1994-2012	
	Significant coefficients	Expected sign?	Significant coefficients	Expected sign?
AT	-	-	Positive***	NO
AU	-	-	-	-
BE	-	-	Positive***	NO
CA	-	-	-	-
CH	Positive***	NO	Positive***	NO
DE	-	-	Positive***	NO
ES	Negative**	YES	Negative***	YES
FR	Negative*	YES	Negative**	YES
GB	Positive*	NO	Positive*	NO
IT	-	-	Negative***	YES
NL	Positive*	NO	-	-
NO	-	-	-	-
NZ	-	-	Negative***	YES
PT	Negative**	YES	Positive***	NO
SE	-	-	-	-
US	-	-	-	-

*Significant at 10 % level, **... at 5 % level, *** at 1 % level

Estimation results – monetary policy

System of equations for 16 countries, cross-section SUR, with common coefficients for all variables but monetary policy, 1991-2012			System of equations for 16 countries, cross-section SUR, with common coefficients for all variables but monetary policy, 1994-2012		
Endogenous variable: Binary Boom-Indicator			Endogenous Variable: Binary Boom-Indicator		
Exogenous variables (in lags)	Coefficient	Significance	Exogenous variables (in lags)	Coefficient	Significance
Constant	0.04	***	Constant	0.04	***
Past Booms: binary boom-indicator (lag)	0.70	***	Past Booms: binary boom-indicator (lag)	0.70	***
Activity: deviation from GDP trend (lag)	0.02	***	Activity: deviation from GDP trend (lag)	0.02	***
Mon. Policy: dev. from Taylor rule (lag) - country specific coefficients			Mon. Policy: dev. from Taylor rule (lag) - country specific coefficients		
AT	0.00		AT	0.02	***
AU	-0.01		AU	0.01	
BE	0.00		BE	0.01	***
CA	0.00		CA	0.00	
CH	0.01	***	CH	0.01	***
DE	0.00		DE	0.01	***
ES	-0.01	**	ES	-0.02	***
FR	-0.01	*	FR	-0.01	**
GB	0.05	*	GB	0.05	*
IT	0.00		IT	-0.05	***
NL	0.05	*	NL	-0.02	
NO	0.00		NO	-0.05	
NZ	-0.02		NZ	-0.04	***
PT	-0.03	**	PT	0.01	***
SE	0.00		SE	0.00	
US	-0.01		US	-0.03	
Weighted R-Squared	0.84		Weighted R-Squared	0.76	
Unweighted R-Squared	0.59		Unweighted R-Squared	0.61	

Estimation results

Baseline plus one additional regressor

Endogenous	Binary Boom-Indicator	Coefficient estimates and significance level									
Exogenous variables plus constant											
Past Booms	binary boom-indicator (lag)	0.73***	0.73**	0.73***	0.73***	0.74***	0.72***	0.72***	0.73***	0.73***	0.72***
Activity	deviation from GDP growth (lag)	0.02***	0.02***	0.02***	0.02***	0.01***	0.02***	0.02***	0.01***	0.02***	0.02***
Mon. Policy	dev. past policy rate (lag)		-0.01***								
	dev. from Taylor rule (lag)		!	-0.00***							
Financial system	Change in housing market regulation (lag)		!	!	-0.00			(?)		!	
	dev. of credit to GDP from OECD average		Expected sign, significant	Expected sign, significant	Expected sign, but not significant	-0.00***		Sign in line with other studies, significant		Expected sign, significant	!
	credit to GDP average over period				?	-0.00					!
	standarddev. of dev. from OECD av.				?	?		0.00***			!
	Securitization indicator (lag)				Wrong sign, significant	Wrong sign, not significant		?	0.03***		!
Foreign Capital	Current account to GDP (lag)									-0.00***	!
	dev. From current account to GDP (lag)										0.00***
	weighted adjusted R-square	0.87	0.90	0.89	0.84	0.84	0.86	0.87	0.80	0.87	0.86

Baseline model: boom indicator explained by a constant, the lagged boom indicator, lagged deviations from economic activity, estimated in a cross-country-time-series SUR approach with common coefficients.