

# An early warning system to predict the speculative house price bubbles

## REPLY TO THE REFEREE REPORT

Summarizing the suggestions of the referee:

1. Originality: the author(s) should state clearly mention which are his/her (their) own ideas and which are not. *Our reaction: The paper constructs an early warning system and is based on a variety of econometric techniques. The development of a bubble chronology based on statistical filtering and fundamental methods is a novel feature of the paper, as well as the joint application of a signal and probit/logit approach. Thus, the strength of the paper is to provide an indication to the robustness of the results. As a principal finding, credit and monetary indicators alone are insufficient to explain the historical bubbles insufficiently. At least, this result is in some contrast to the existing literature. In addition, note that the early warning system has important forecasting properties (out of sample results can be made available upon request). Because of the fact that bubbles in the real estate market need a relatively long time to evolve, a reliable indication has leading properties per se.*
2. p. 6 [eq. 1] → show the five variables in a figure and discuss some statistical properties of the time series. *Our reaction: The figure was added and properties were discussed.*
3. p. 7 [eq. 2] → show the estimated coefficients, t-statistics and diagnostic checking (without request) *Our reaction: The table was added.*
4. p. 7 → explain more precisely on a spline of(?) a regression. *Our reaction: Precise explanation is provided.*
5. p. 7 [... using the Hodrick-Prescott filter ...] → which  $\lambda$ ? *Our reaction: It is explained now in text.*
6. p. 7 [Various values of the boom threshold factor were tested and was chosen as the one providing the higher concordance between the deviations from fundamental values and booms.] → if the choice of the boom threshold factor for the second method (the HPfilter method) depends on the first method (the fundamental method), why do we need the second method? *Our reaction: It is explained now in text. Both methods are needed, since the fundamental method provides periods of overvalued house prices, which are not necessarily the periods of fast growing prices. Precisely these latter periods are identified using the HPF method.*
7. p. 7 [... higher than 0.5 standard deviation ...] → why just 0.5? *Our reaction: Because we tried various values and 0.5 turned out to be the optimal.*
8. p. 8 [Section 3 and 4] → Section 2 already identifies the speculative bubbles. Why do we need Section 3 and 4 to detect them? Explain. *Our reaction: Section 2 identifies the periods of house price speculative bubbles. Sections 3 and 4 detect the already identified bubbles using signalling and logit/probit models. The idea is to see, how well these methods capture the known bubbles in order to train them to predict the future bubbles, which are yet unknown.*

9. p. 9 [eq. 4] → One can minimize the sum of two types of errors regarding a statistical decision, but cannot maximize the sum of successes, because of the non-existence of an opposite function to a loss function. → You therefore need a loss function here. See Alessi/Detken, eq. (1) p. 523. *Our reaction: We use an approach, which is similar to that presented, for example, in Reinhart et al. (1998).*
10. p. 11 [The forecasting accuracy of the logit and probit models is relatively high. This implies that they can be used as an early warning system in order to predict the future speculative bubbles in the housing markets.] → What the models can detect in practical applications will merely be a description of the current real house price/bubble (i.e., a warning for the current situation), not a forecasting of future speculative bubbles (i.e., not an early warning). *Our reaction: Given that the logit/probit models include lagged variables, they can in principle allow predicting future bubbles.*
11. Discuss the empirical results with respect to those of Agnello, L. and L. Schuknecht (2009) and Alessi, L. and C. Detken (2011). *Our reaction: We have discussed the results of Agnello and Schuknecht (2009) and Alessi and Detken (2011) in the present paper version. However, note that the analysis of Alessi and Detken (2011) refer to an aggregate asset price indicator which is only partially comparable to the evolution of house prices.*

## References

- Agnello, L. and L. Schuknecht (2009). Booms and busts in housing markets — Determinants and implications. ECB Working Paper Series 1071.
- Alessi, L. and C. Detken (2011). Quasi real time early warning indicators for costly asset price boom/bust cycles: A role for global liquidity. *European Journal of Political Economy* 27(3), 520–533.
- Reinhart, C., G. Kaminsky, and S. Lizondo (1998). Leading indicators of currency crises. MPRA Paper 6981, University Library of Munich, Germany.