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## LEADING INDICATORS OF HOUSE PRICE BUBBLES

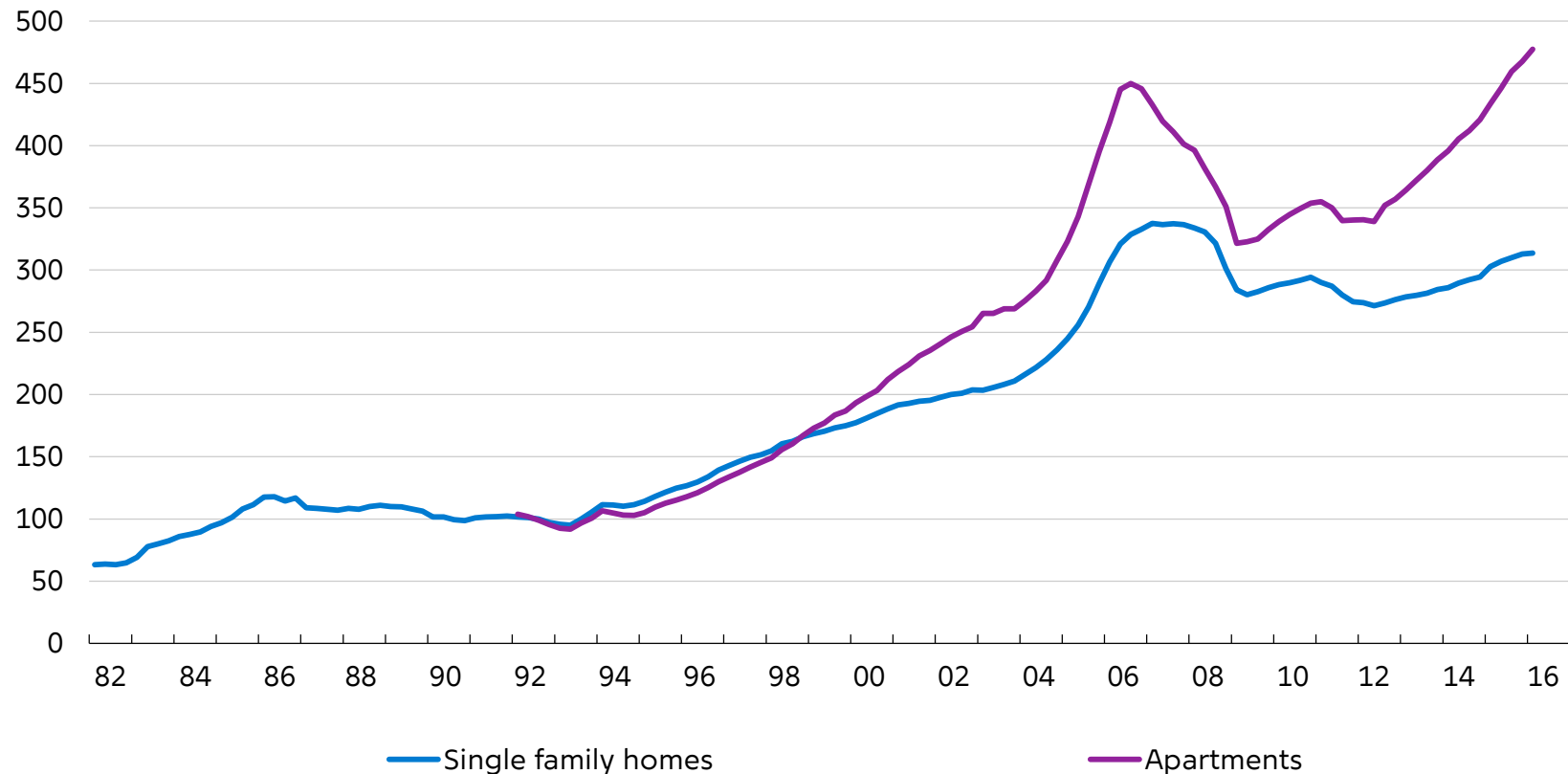
Simon Juul Hviid



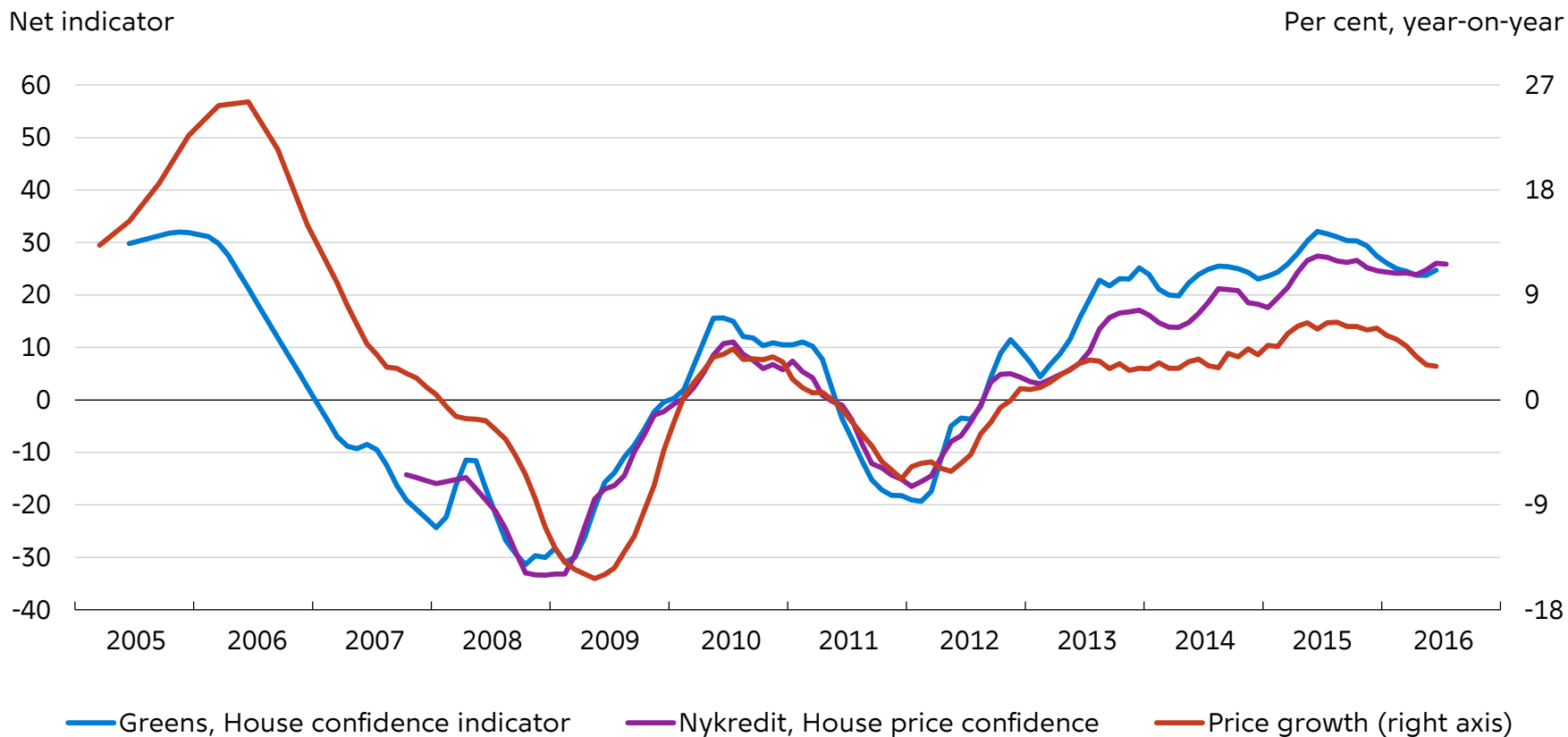
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# Danish nominal house prices

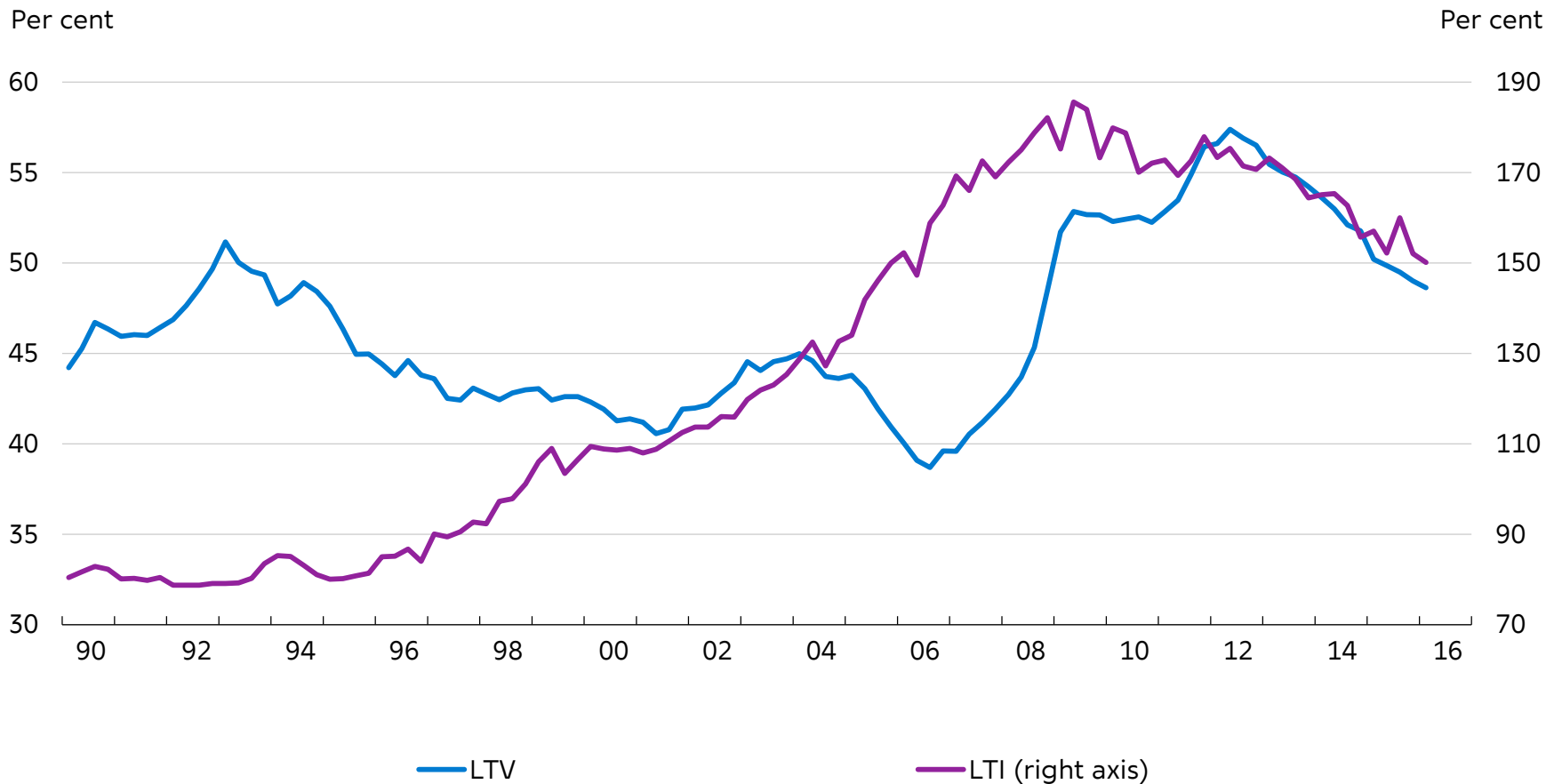
Index, 1992 = 100



# House price expectations are high



# Danish households are consolidating



# Introduction

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*“While these events clearly look like bubbles ex post, even at their height , prices could be reconciled with standard models of real estate evaluation.” - Glaeser (2013).*

# Fundamentals and bubbles in house prices

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Asset price model without a transversality condition

$$P_t = E_t \left[ \sum_{i=0}^{\infty} \frac{R_{t+i}}{\prod_{j=0}^i (1 + \gamma_{t+j})} \right] + bB_t$$

$R_t$  is the flow utility of holding the housing unit.

$\gamma_t$  is user cost excluding expected capital gain (discount rate).

$B_t$  is the bubble component, which satisfies  $B_t = E_t \left( \frac{B_{t+1}}{1 + \gamma_t} \right)$

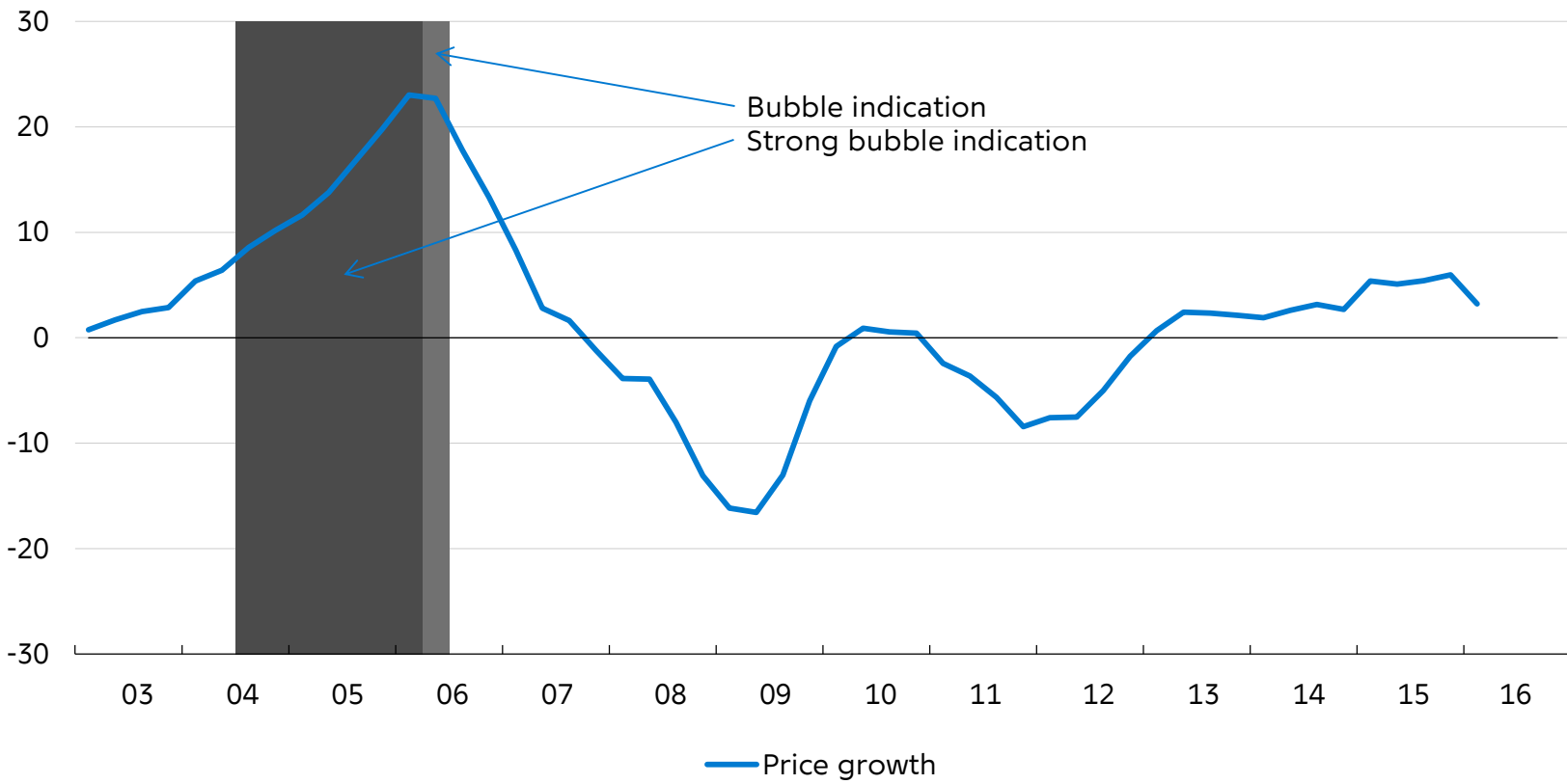
This also implies that any rational bubble component will evolve explosively(!).



We apply the test by Phillips et al. (2015)

# Test of self-reinforcing prices of Danish single family homes

Per cent, year-on-year



# Actual vs. fundamental house prices

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The standard input to univariate tests is price, price/income or price/rent indices.

Use the S-D model, from which we can create a new index that can be used as an input to the univariate tests.

$$\text{index}_t \approx \frac{\gamma_t P_t}{Y_t / H_t}$$

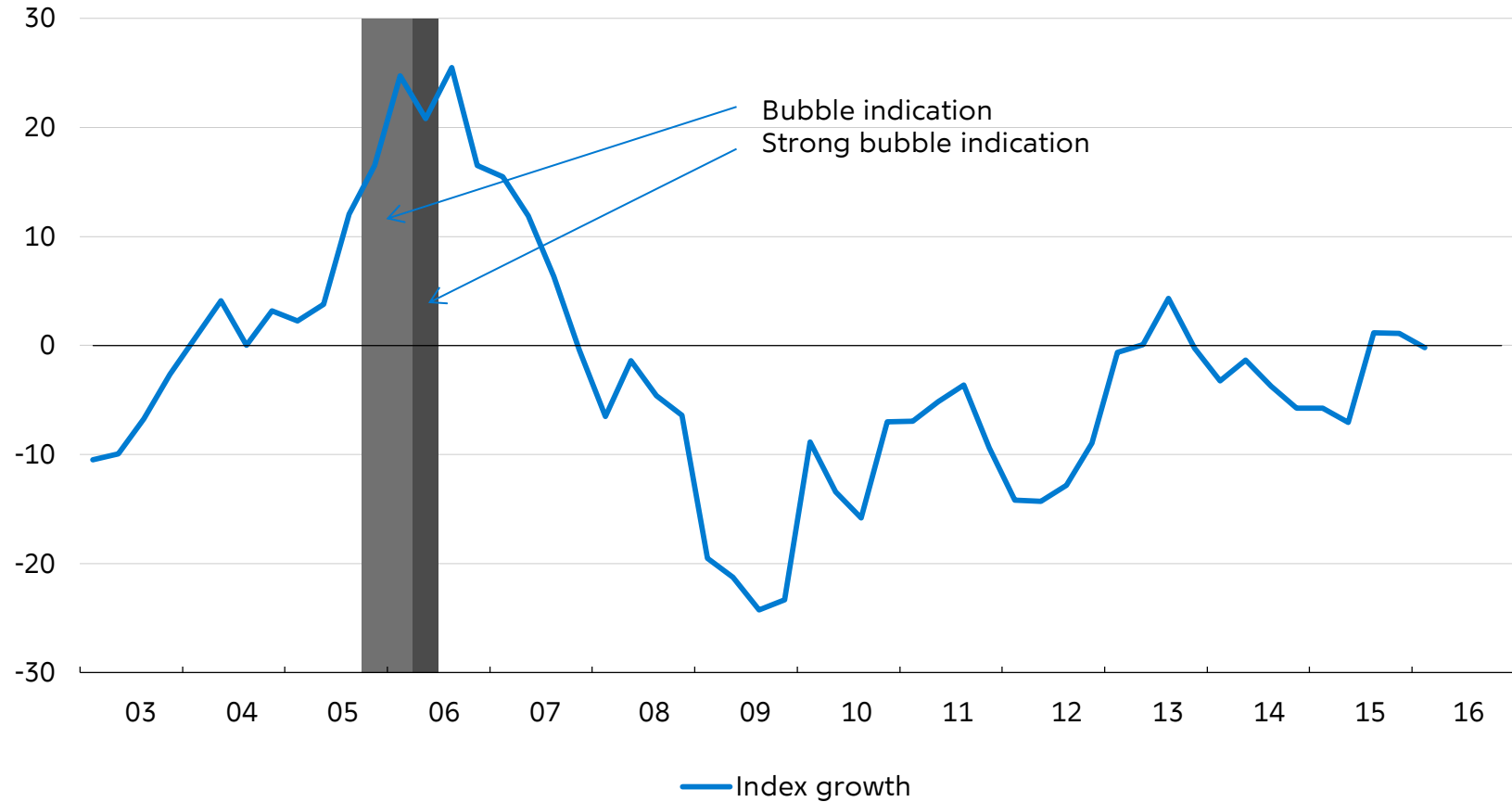
$Y_t$  is disposable income and  $H_t$  is the housing stock.

- This can be thought of as a housing burden per housing unit.
- If a rational bubble is present the index will evolve explosively.



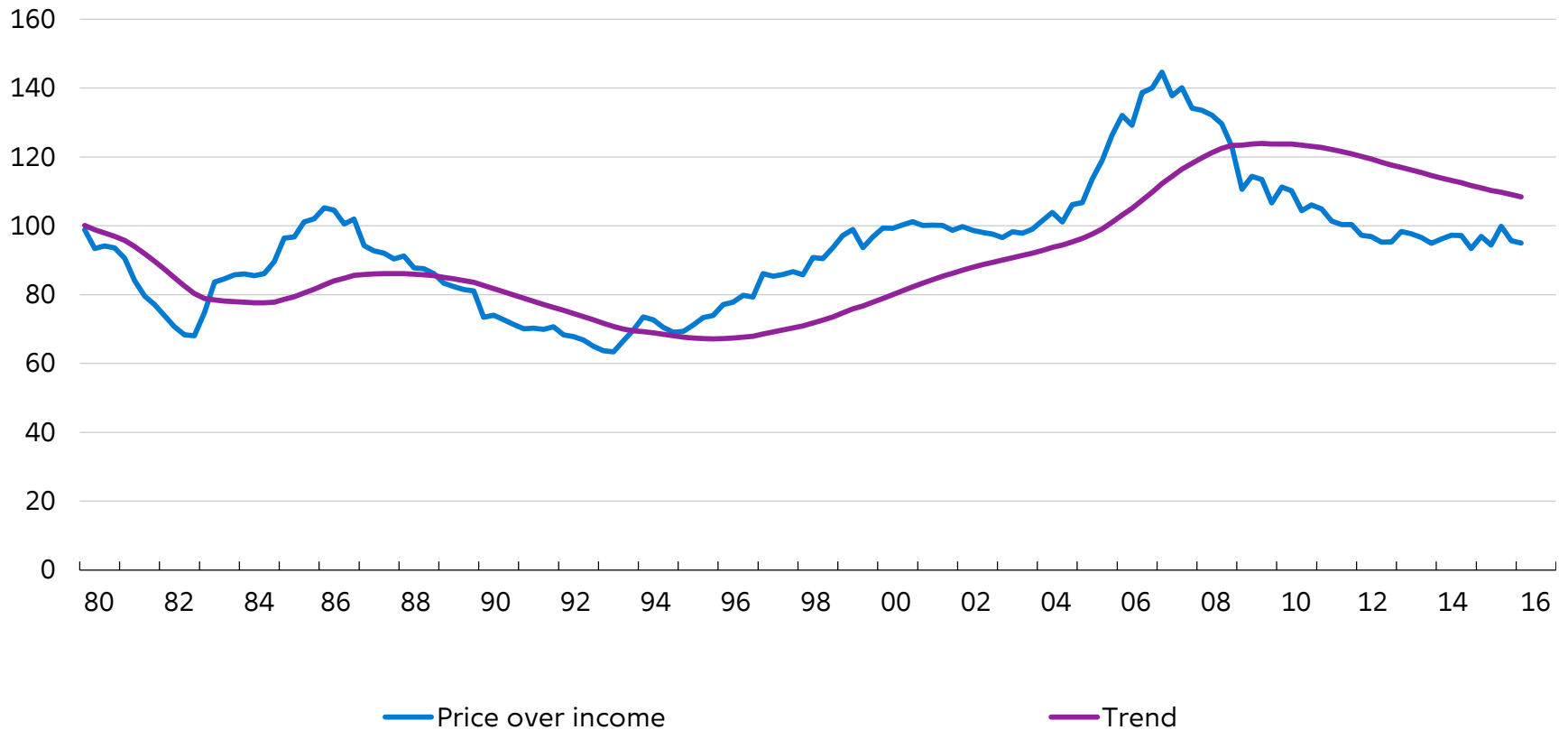
# Test of self-reinforcing prices

Per cent, year-on-year



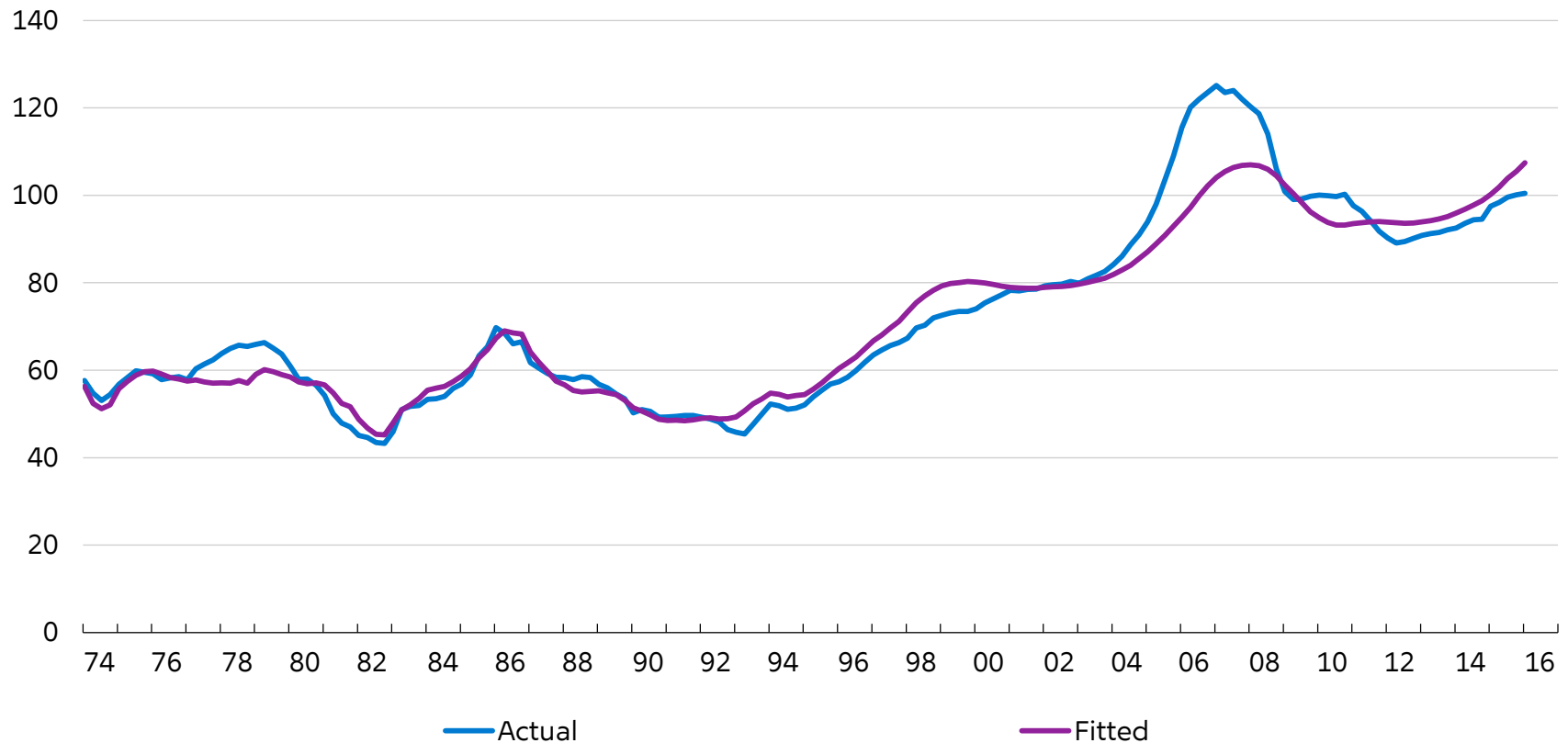
# The Hodrick-Prescott filter

Index, 2000 = 100



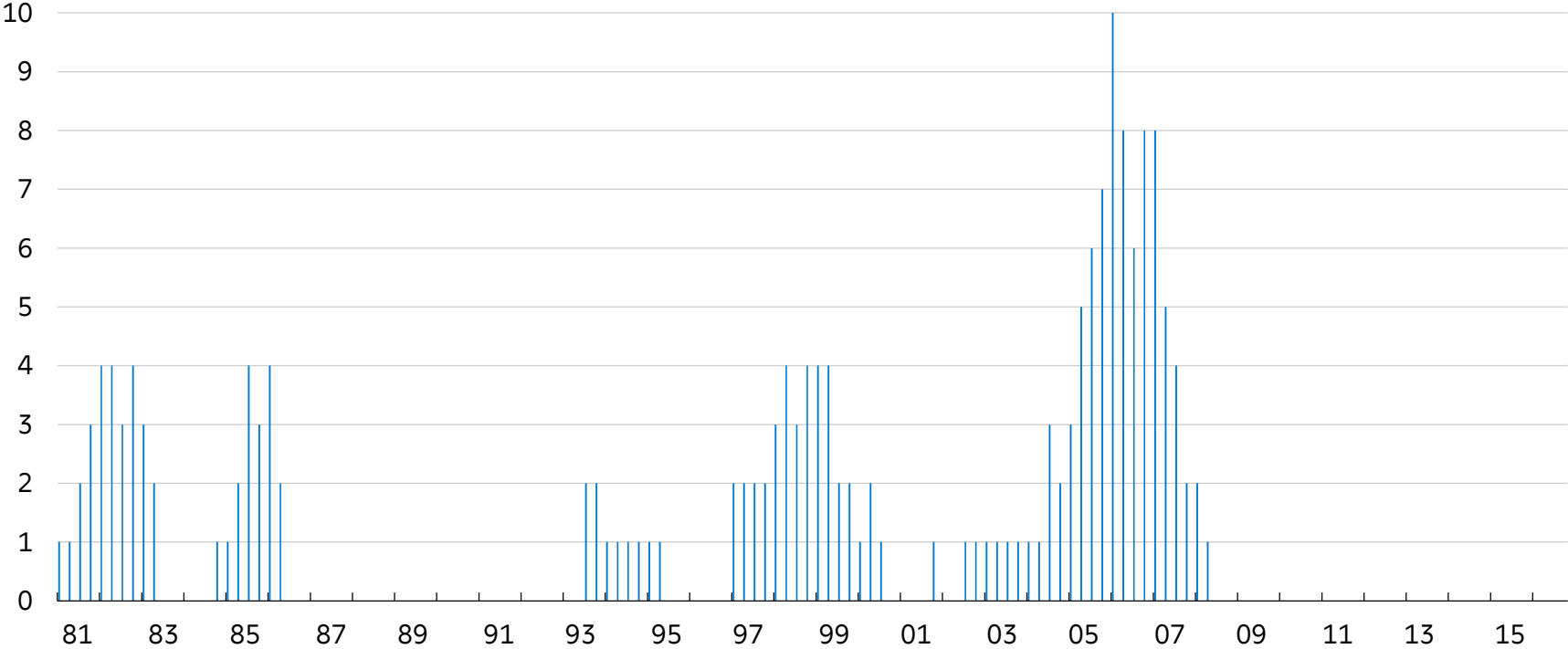
# House prices in the macroeconomic model MONA

Index, 2010 = 100



# Aggregation of bubble indicators

Number

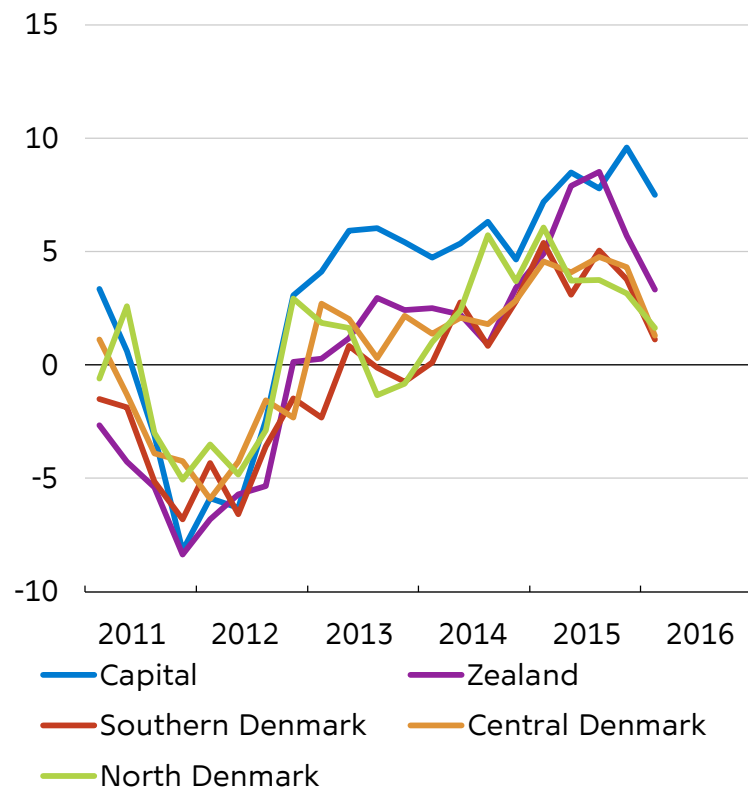


■ Bubble indications

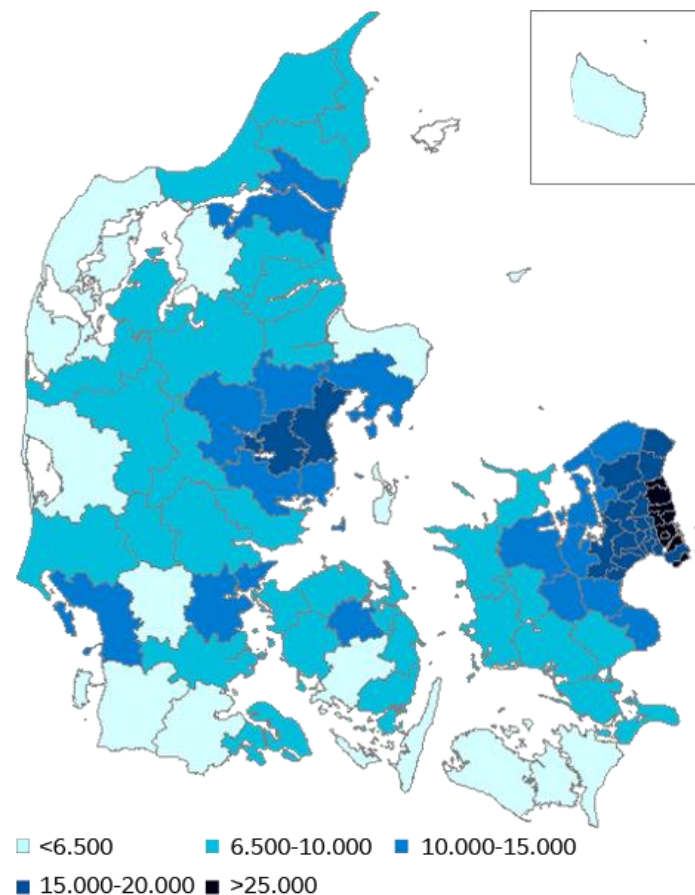
# Regional differences

## Growth in house prices by region

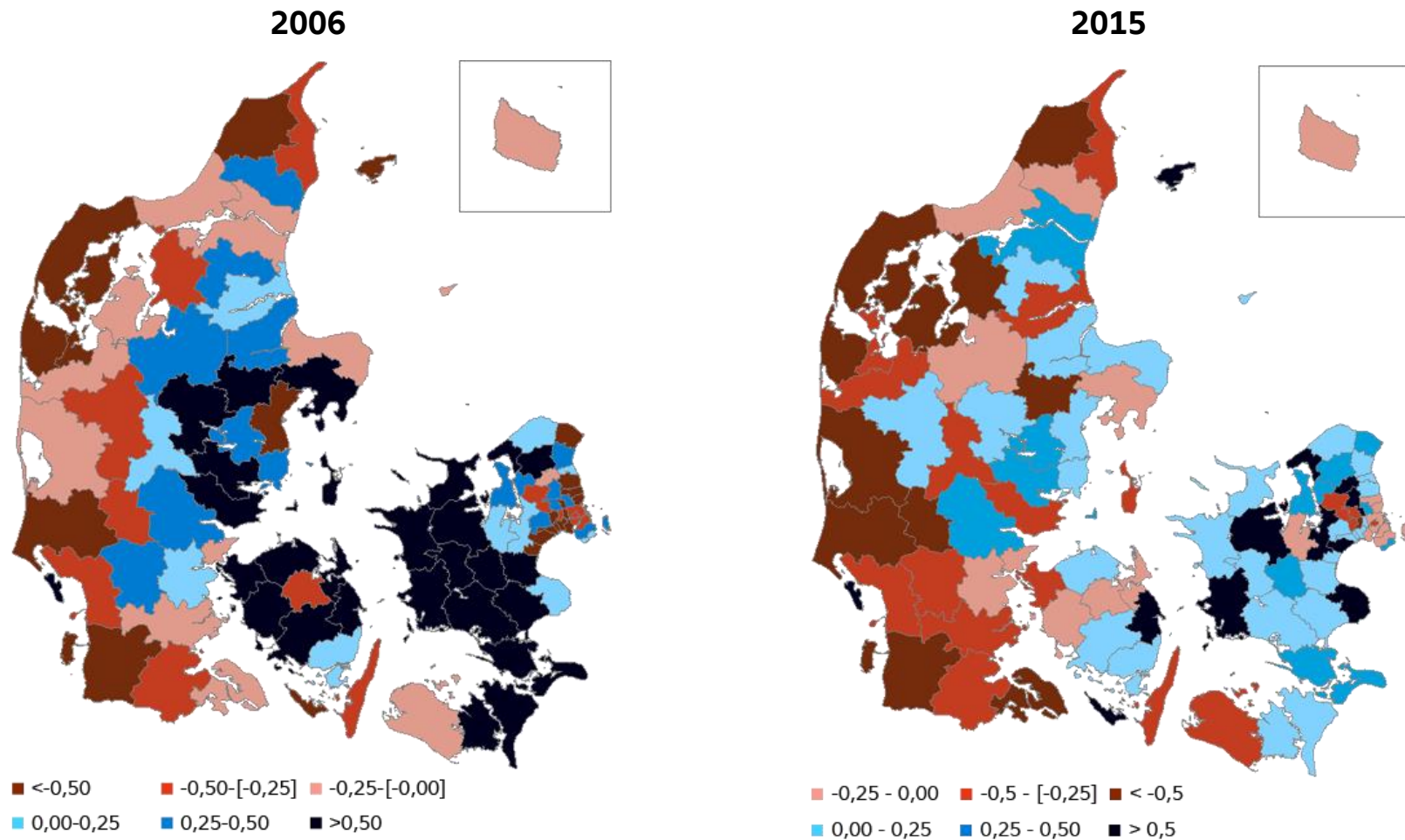
Per cent, year-on-year



## Price per square meter, 1st quarter 2016



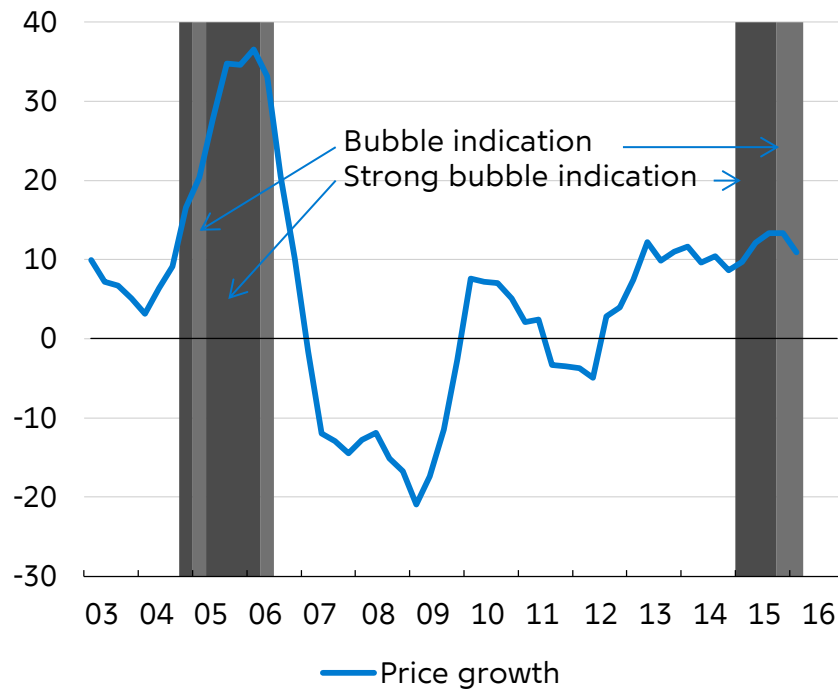
# Net migration within Denmark



# Test of self-reinforcing beliefs, Copenhagen flats

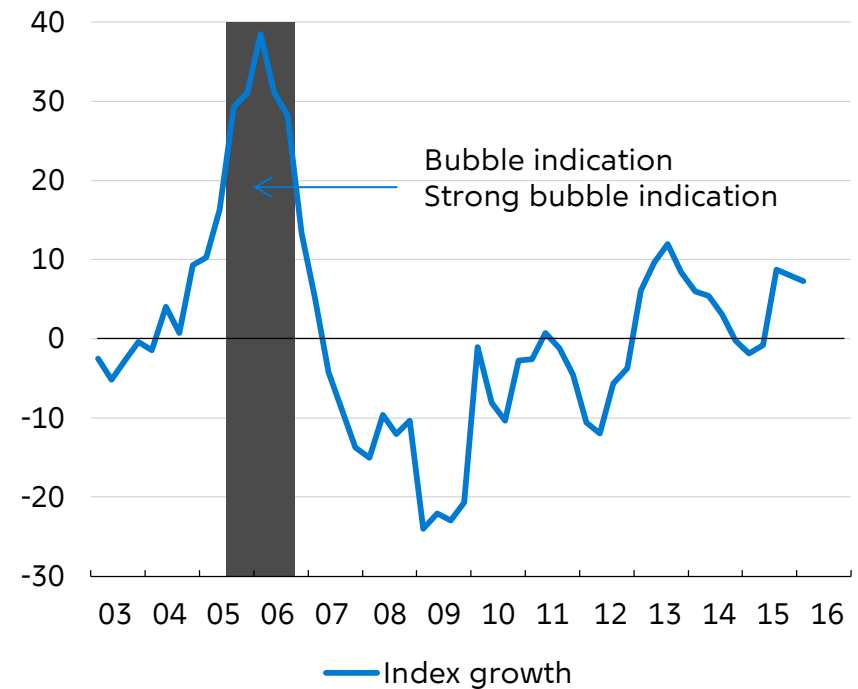
## Test on prices

Per cent, year-on-year



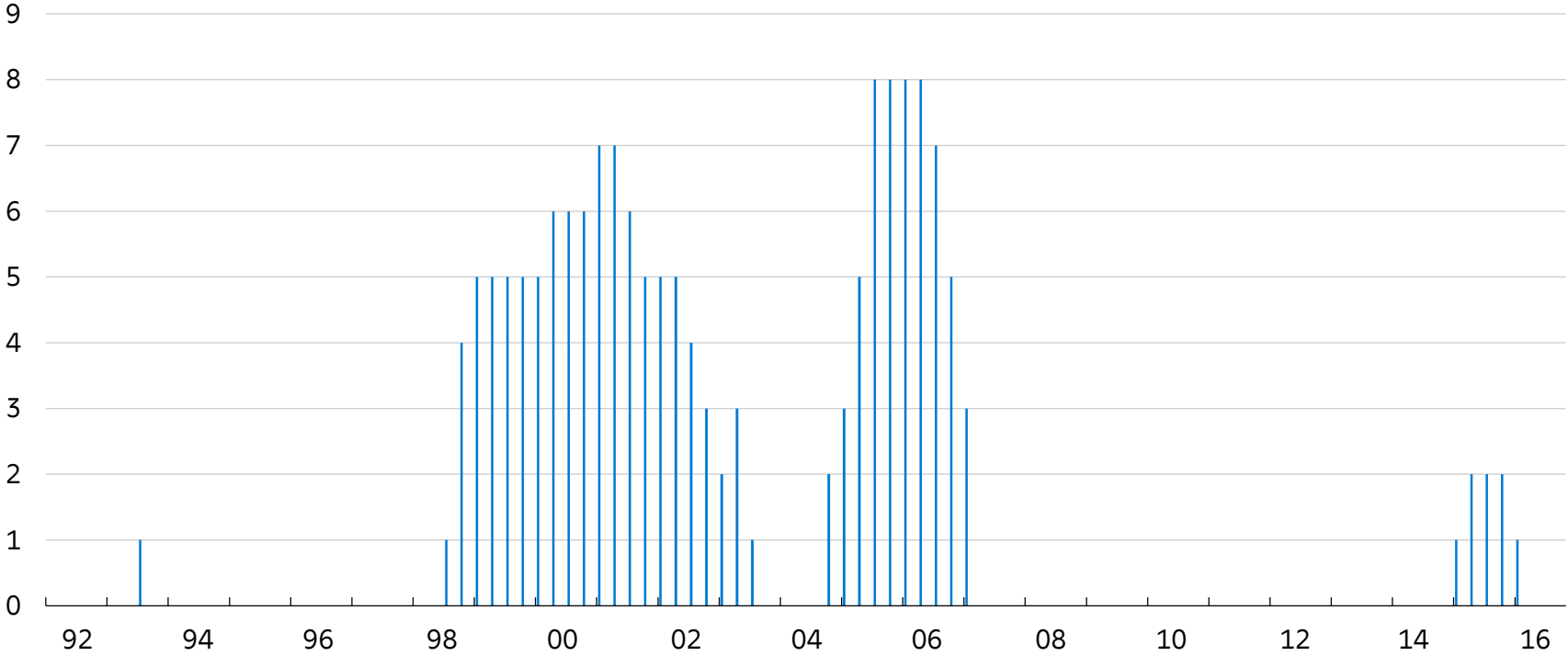
## Test on index

Per cent, year-on-year



# Aggregation of bubble indicators, CPH

Number



■ Bubble indications



# Comparison of bubble indicators

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## Findings:

- Large differences in conclusions across tests.
- Synchronicity in the years prior to the financial crisis.
- Some synchronicity in the mid-80's and 90's.
- All indicators are sensitive to the choice of threshold.
- There is currently not signs of a house price bubble at the national level, but the developments in Copenhagen calls for increased vigilance.

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**THANK YOU!**

