House Price Expectations and Housing Choice

Alexander Ludwig (Goethe University), Jochen Mankart (Deutsche Bundesbank), Jorge Quintana (Goethe University), Nathanael Vellekoop (University of Toronto), Mirko Wiederholt (Sciences Po, Paris)

DEUTSCHE BUNDESBANK
EUROSYSTEM

Motivation and Research Question

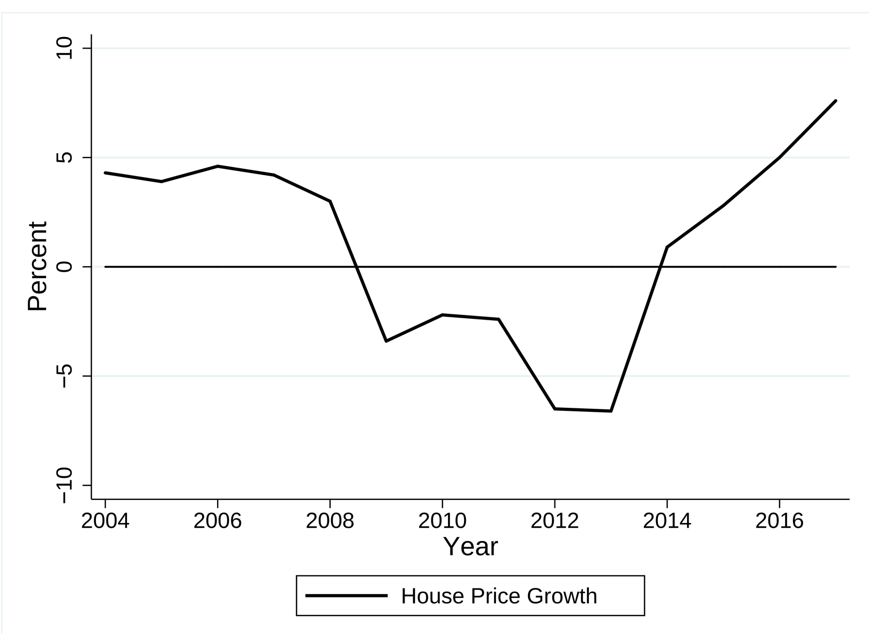
- Large swings in house prices in many advanced economies.
- Potential explanations for these dynamics
  - supply-side: savings glut, fall in lending standards
  - demand side: (ir-)rational expectations about future house prices
- Our question: what is the role of expectations in a house-price boom and bust cycle?
- Our contribution:
  - empirical: panel data set on expectations and choices
  - structural: model consistent with panel data

Empirics

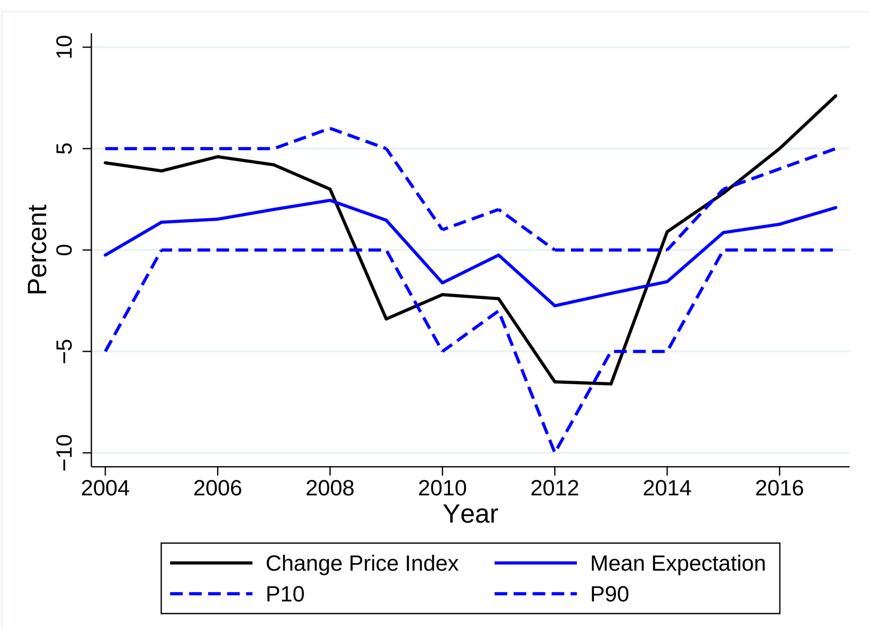
Data

- The survey data is from the DNB Household Survey, conducted annually since 1993. The survey is representative for the Dutch population (≈ 4500 households). Households participate for several years. Housing question only since 2003.
- Survey (and administrative) data on income, assets and liabilities.
- Expectation questions
  1. Own house price
  2. Aggregate house price

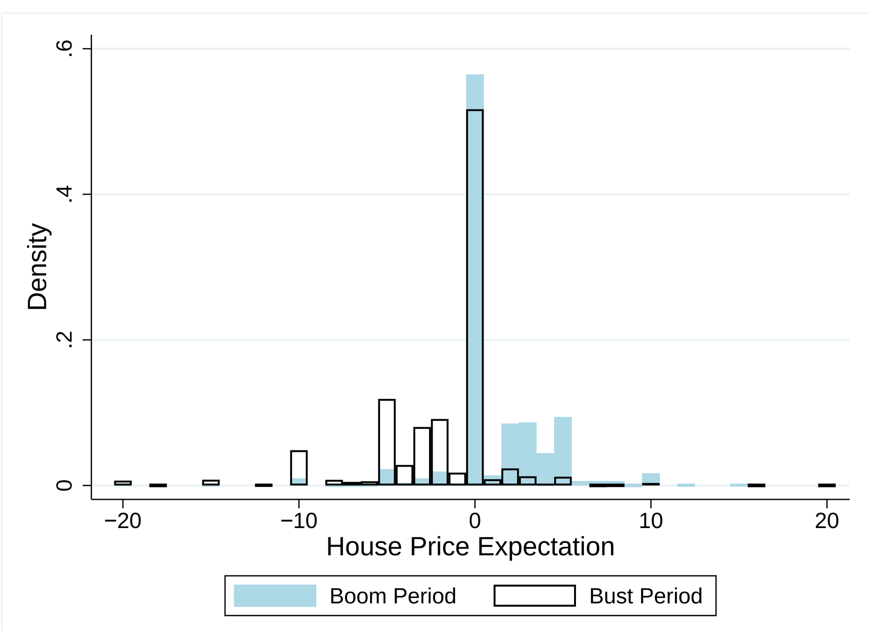
House Price Growth in the Netherlands



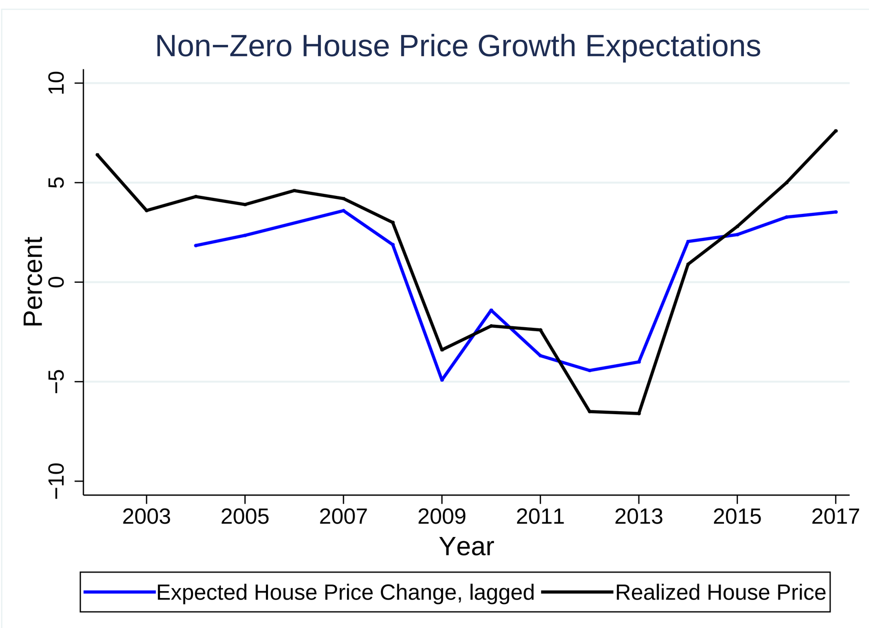
House Price Growth and Expectations



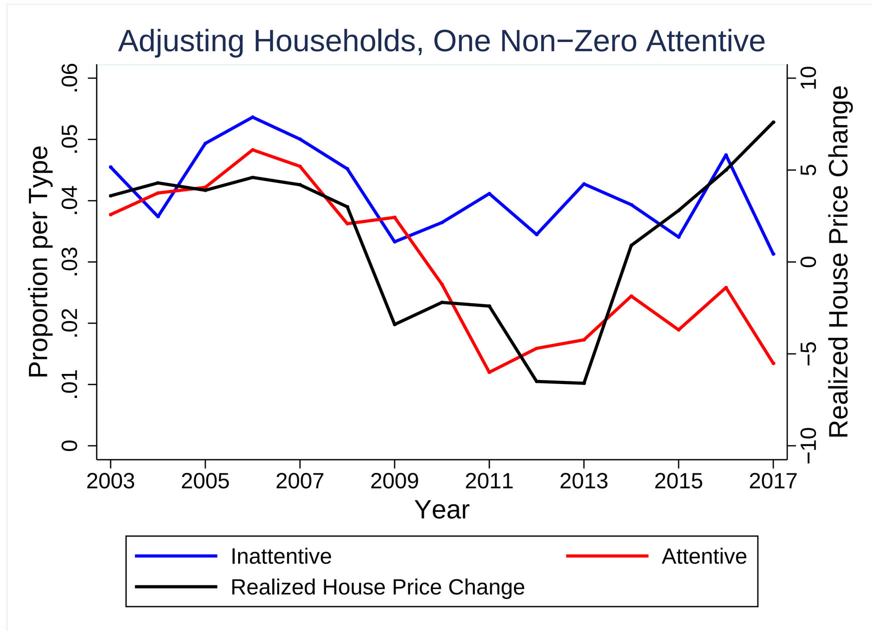
Distribution of Expectations: 2 types



Attentive Households: track market



Behavior of attentive vs inattentive households



- Inattentive almost flat probability to buy
- Attentive respond strongly to house prices.

Model

Model set-up

- Life-cycle model

$$E_t^i\left[\sum_{j=1}^{J}\beta^j U\left(C_{it+j}, S\left(\bar{H}_{it+j}\right)\right)+\beta^{J+1}B\left(\tilde{W}_{it+J+1}\right)\right]$$

$\beta \in (0,1)$ discount factor, $B\left(\tilde{W}_{it+J+1}\right)$ utility from bequest.

- Discrete housing
  - Owner-Occupied: $H_{it} \in \mathcal{H}$ where $\mathcal{H} = \left\{h^0, ..., h^{N_h}\right\}$
  - Rental: $\tilde{H}_{it} \in \tilde{\mathcal{H}}$ where $\tilde{\mathcal{H}} = \left\{\tilde{h}^0, ..., \tilde{h}^{N_{\tilde{h}}}\right\}$
- Mortgages
  - LTV limit $-A_{it} \leq \lambda_m P_t H_{it}$
  - Minimum repayment per period $A_{it} \geq \left[1 + r_M - \phi\left(r_M, j\right)\right] A_{it-1}$
- Budget constraint

$$C_{it} + A_{it} + P_t H_{it} + \mathbb{1}_{\{H_{it}\neq H_{it-1}\}}\theta\left(1-\delta\right)P_t H_{it-1} + \mathbb{1}_{\{\tilde{H}_{it}>0\}}\tilde{P}_t\tilde{H}_{it} = Y_{it} + \left(1 + r_b + \mathbb{1}_{\{A_{it-1}<0\}}\zeta\right)A_{it-1} + \left(1-\delta\right)P_t H_{it-1}$$

- Labor income

$$Y_{it} = g\left(j_{it}\right)\chi_{it}\varepsilon_{it}$$
$$\chi_{it} = \chi_{it-1}^{\rho}\nu_{it}$$

Recursive formulation:

$$V_t\left(X_t\right) = \max\left\{V_t^{adj}\left(X_t\right), V_t^{noadj}\left(X_t\right), V_t^{rent}\left(X_t\right)\right\}$$

Utility specification

$$U\left(C_t, S\left(H_t, \tilde{H}_t\right)\right) = \frac{\left[C_t^{1-\sigma}S\left(H_t, \tilde{H}_t\right)^{\sigma}\right]^{1-\gamma} - 1}{1-\gamma}$$

where $S\left(\cdot\right)$ is linear in its first two arguments and given by:

$$S\left(H_t, \tilde{H}_t\right) = \omega H_t + \tilde{H}_t \qquad \text{where} \qquad \omega \geq 1$$

The specification for utility due to bequests follows De Nardi (2004),

$$B\left(\tilde{W}\right) = \vartheta_1\frac{\left(\tilde{W}+\vartheta_2\right)^{1-\gamma} - 1}{1-\gamma}$$

Calibration

Fixed Parameters

Parameter	Interpretation	Value in Data
	Demographics	
j	Period length in years	1
J	Length of life	80
J^{ret}	Retirement age	65
J^{born}	Age of newborns	25
	Income Process	
$\{g(j_t)\}$	Deterministic age profile polynomial order	4
rr	Replacement rate	0.80
ρ	Autocorrelation of persistent component	0.9669
σ_{χ}^2	Variance of persistent shock	0.0146
σ_{ε}^2	Variance of transitory shock	0.2908
	Financial Instruments	
r_b	Risk-free rate	0.03
ζ	Mortgage loan markup	0.01
λ_m	Maximum LTV ratio on mortgage loans	0.90

6 parameters calibrated internally: Discount factor β; 3 bequest-related parameters ω, ϑ_1, ϑ_2; housing bins $\mathcal{H}$, $\tilde{\mathcal{H}}$

Targeted Moment	Data	Model
Average financial assets	-0.454	-0.248
Home-ownership rate	0.748	0.773
Median $NW_{j=75}$ / Median $NW_{j=50}$	1.444	1.330
Percent of bequest HHs in bottom half of NW dist.	0.112	0.080
Housing/Net Worth 10th percentile	0.700	0.797
Housing/Net Worth mean	0.916	0.948
Housing/Net Worth 90th percentile	1.000	1.000
Rent / Income 10th percentile	0.178	0.054
Rent / Income 50th percentile	0.316	0.133
Rent / Income 90th percentile	0.554	0.277

Model rent-to-price ratio 0.12, instead of 0.07 (data).

Temporary Equilibrium - intuitive

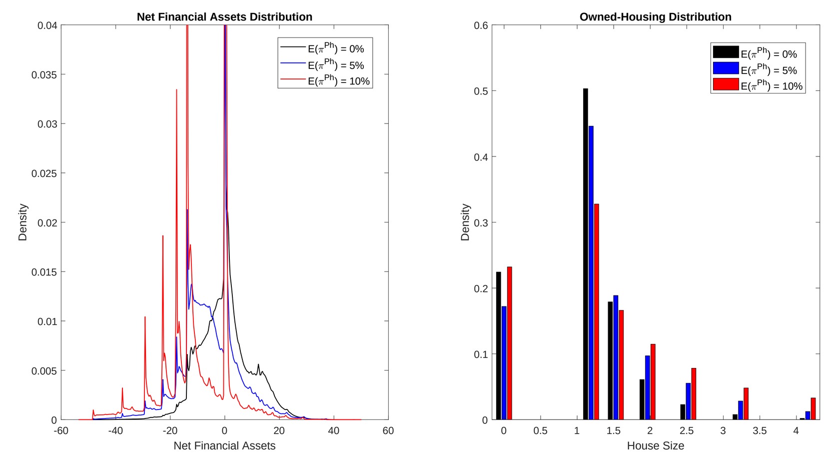
- Recall that we observe the sequence $\{\Phi_t\}$.

$$\underbrace{P_t\bar{H}_t}_{\text{Data}} = P_t\int\underbrace{h_t}_{\text{Model}}\underbrace{\left(P_t, \tilde{P}_t, A_{it-1}, H_{it-1}, Y_{it}, j_{it}, r_t, E_t^i(\Pi_{t+1}^H)\right)}_{\text{Data}}\,d\Phi_t$$

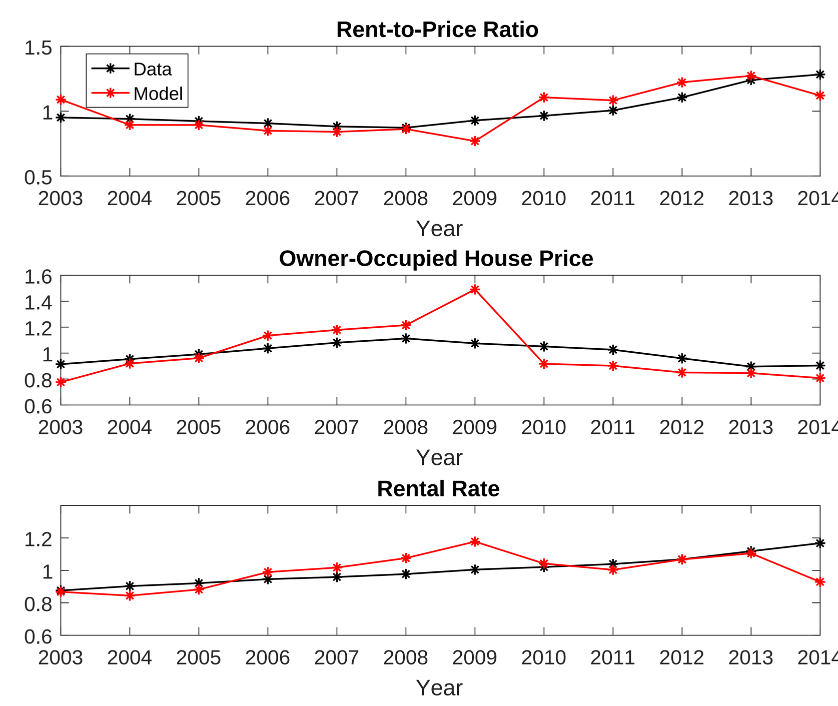
- Use model to derive the sequence $\{P_t\}^{TE}$
- Compare with $\{P_t\}^{data}$

Results

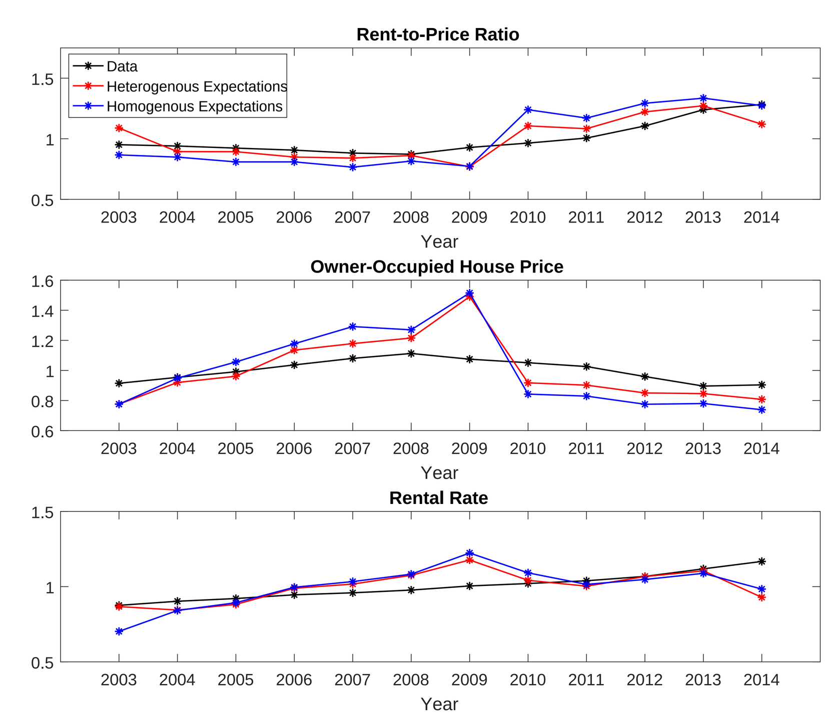
Model mechanism: expected capital gains



Equilibrium prices: model vs data



Heterogenous vs. homogenous expectations



Conclusions and next steps

- Evidence for *attentive* and *inattentive* households wrt house prices.
- Attentive households track the market.
- Expectations matter for choices.
- Model outcomes track data qualitatively but still too volatile.
- Heterogeneity matters (homogenous expectations version does worse).
- More formal (regression-based) comparison of model and data at household level.

The views expressed in this presentations are those of the authors and do not necessarily reflect those of the Deutsche Bundesbank or the Eurosystem.