Household inflation expectations- exploiting the cross-sectional dimension

Alina Barnett Haroon Mumtaz Matthias Paustian Silvia Pezzini

Bank of England

Conference on Consumer Inflation Expectations
Federal Reserve Bank of New York
18 November 2010

Motivation: main questions

- Can sticky information models capture some of the dynamics of UK inflation expectations better than the full information models?

- Is the proportion of agents updating information sets each period constant or time varying- which specification fits UK surveys better?

- Can we find any evidence of the sticky information model in the micro data?

Motivation: literature review

Rational expectations

- agents share information sets and form expectations conditional on that information
- everybody has the same expectations

Expectations formation is heterogeneous across agents

- agents have different information sets (Mankiw and Reis (2002), Mankiw et al. (2003), Carroll (2003))
- agents use different models to form expectations (Gramlich (1983), Branch and Evans (2005), Branch (2007), Molnar and Reppa (2010))
- agents have different processing capabilities- learning models (Orphanides and Williams (2003))

Road map

1. Methodology

2. Data description

3. Results- macro analysis
    - Similar exercise to Mankiw, Reis and Wolfers (2003) on UK data (Part 1)
    - Fit the full distribution of the model forecasts to that of the Barclays Basix survey (Part 2)

4. Results- micro analysis

5. Conclusion

Methodology

There are two dimensions to our exercise:

- The time when the information set was updated- information types
- The way the new information is incorporated - forecasting process

Recursive forecasting process:

1) equal weight on all information available (constant coefficient)
2) variable weight on new information (TVP with stochastic volatility)
3) most weight on new data (constant gain least square)

Data

Information set

- Inflation (RPIX)
- Real time GDP growth
- Bank Rate

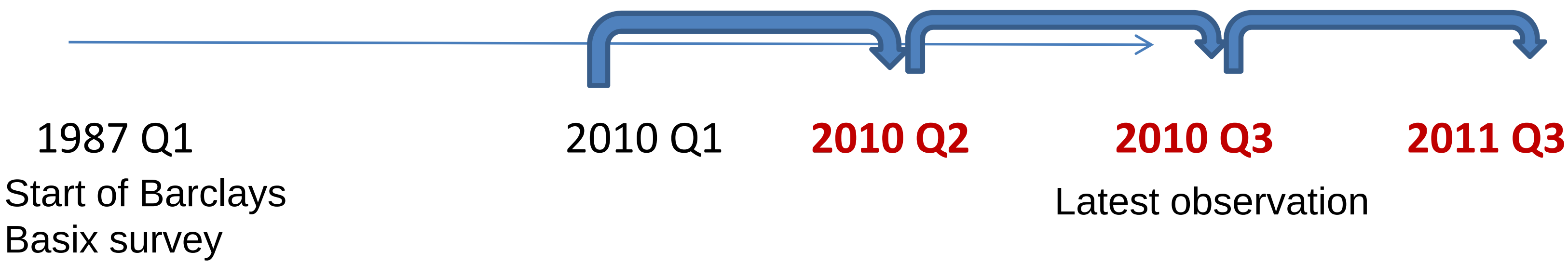
Sample: 1967 Q1 to 2010 Q2

Start forecast: 1987 Q1 for Basix and 2000 Q1 for NOP

Surveys of inflation expectations

- **Barclays Basix**
  - asks about inflation rate
  - 1987Q1 to 2010Q3
  - 1 and 2 years ahead expectations; from 2008, also 5 years ahead expectations
- **Bank NOP**
  - asks about prices in general
  - 2000Q1 to 2010Q3
  - 1 year ahead expectations & perceptions; from 2008, also 2 and 5 years ahead expectations

1) Constant coefficient BVAR



$$Y_t = \beta_t * Y_{t-1} + \varepsilon_t$$

Type 1 $\quad Y_{t+1|t} = \beta_t * Y_t$ $\quad$ Most informed

Type 2 $\quad Y_{t+1|t-1} = \beta^2_{t-1} * Y_{t-1}$

Type 3 $\quad Y_{t+1|t-3} = \beta^3_{t-3} * Y_{t-3}$

.
.
.

Type 20 $\quad Y_{t+1|t-20} = \beta^{20}_{t-20} * Y_{t-20}$ $\quad$ Least informed

Results: Mankiw, Reis and Wolfers (2003) on UK data

Part 1

- Assume that the same fraction θ of households updates its information set every period
  - estimate θ s.t. weighted mean of BVAR estimates is closest to survey mean
  - analyse dispersion

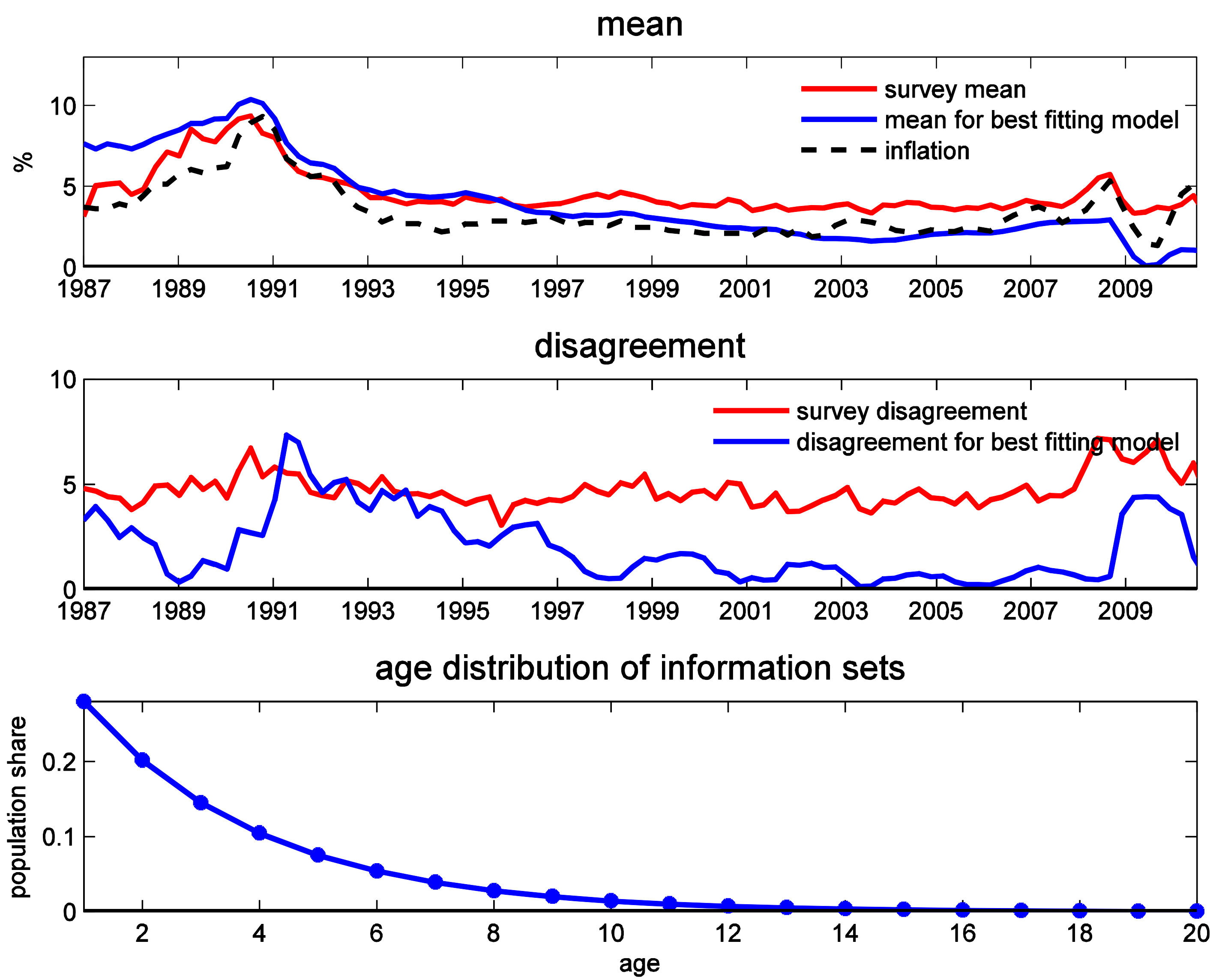
add parameter uncertainty

- estimate θ s.t. weighted mean of BVAR estimates is closest to survey mean
- analyse dispersion

- Compare with full information model with parameter uncertainty

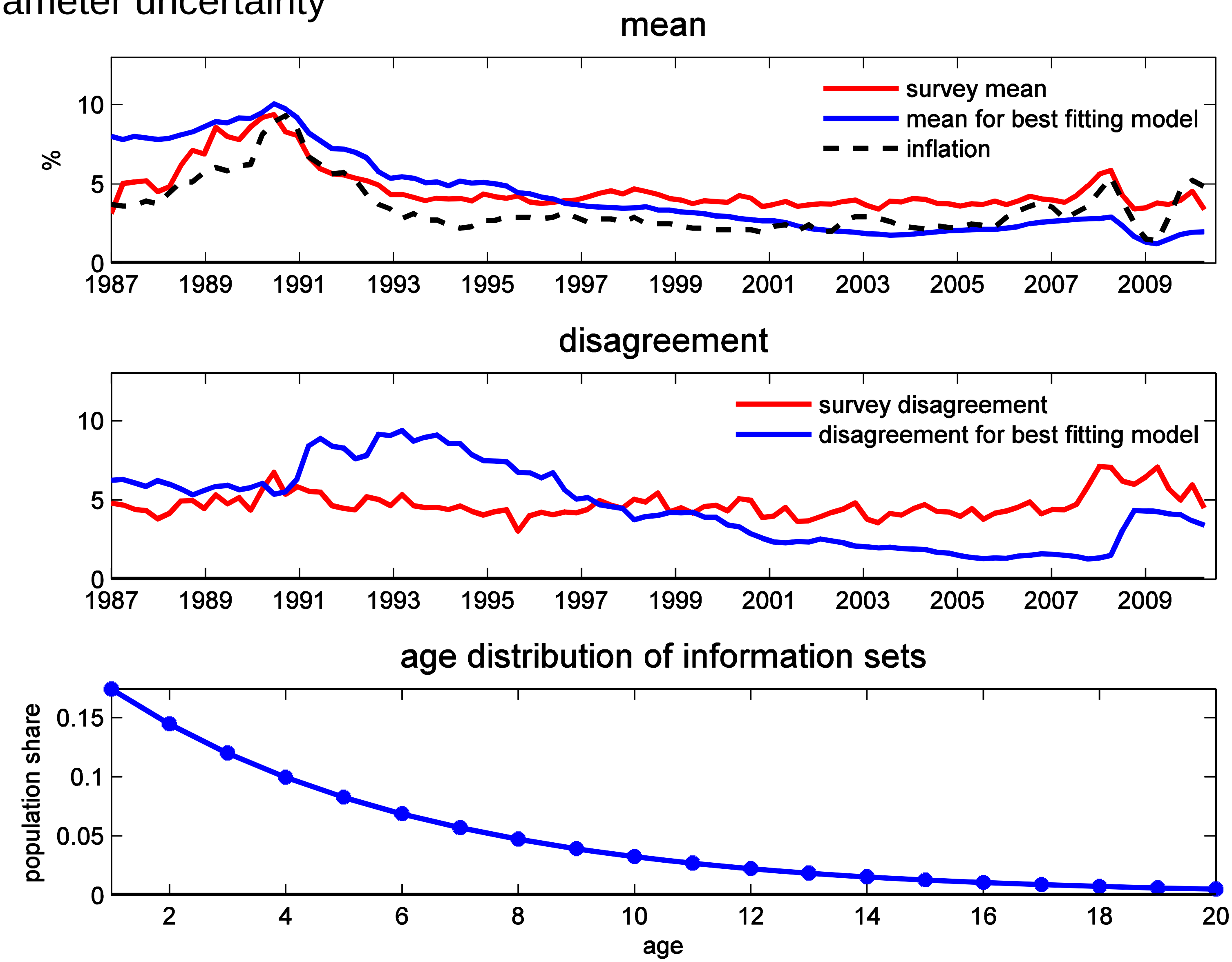
Results: Mankiw, Reis and Wolfers (2003) on UK data

Population shares are geometrically distributed…



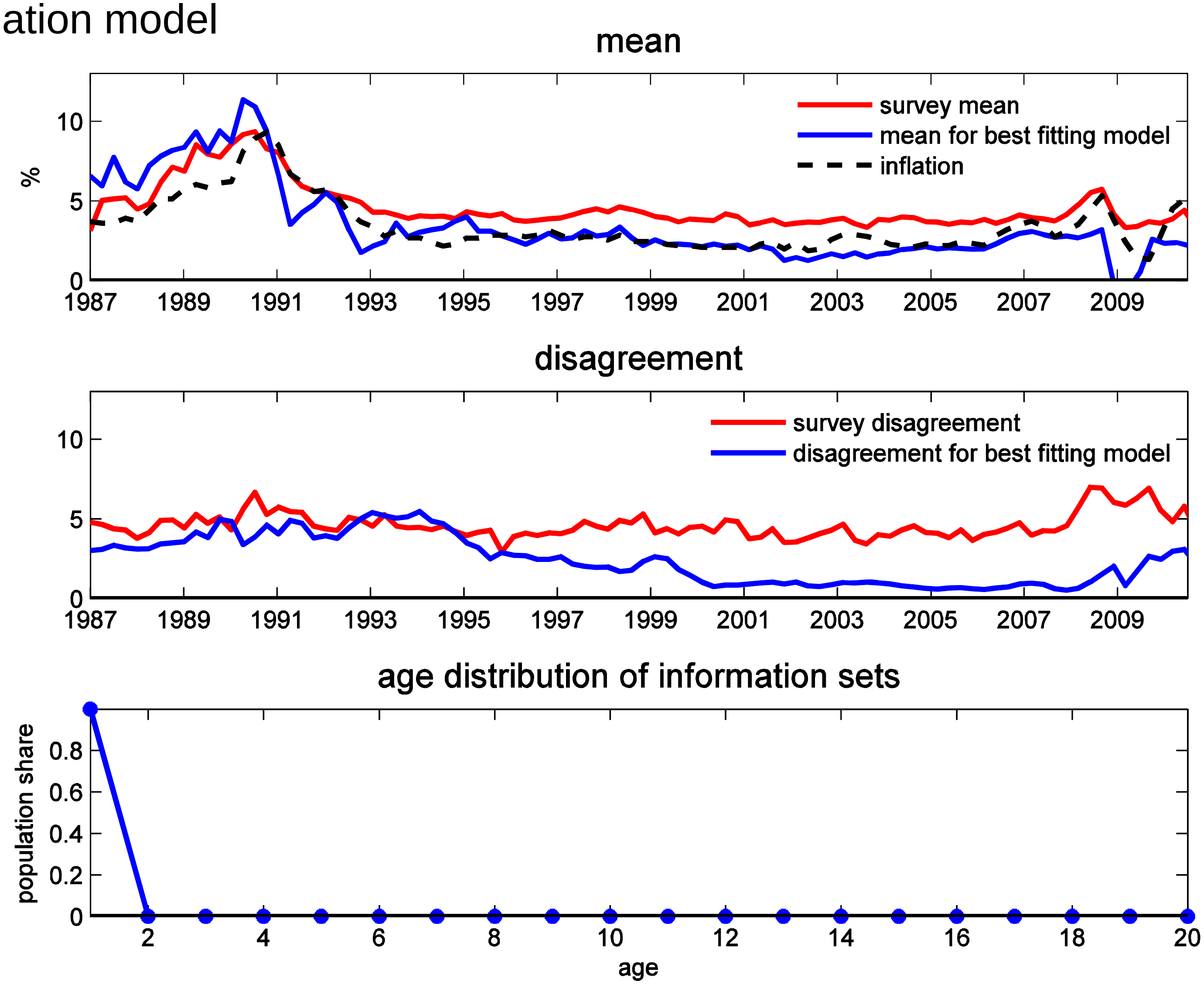
Results: Mankiw, Reis and Wolfers (2003) on UK data

…add parameter uncertainty



Results: Mankiw, Reis and Wolfers (2003) on UK data

…full information model



Results: fitting the full distribution

Part 2

1) Estimate the Barclays Basix survey's density and that of the model based forecasts using a normal Kernel

2) Use the Kullback- Leibler (Klic) distance measure to assess how 'close' the model based densities are to that of the survey

$$Klic(p, p^{*}) = \int \log[\frac{p^{*}(x)}{p(x)}] p^{*}(x) dx$$

Forecast density of the model

Density of survey

Results: models generating density forecasts

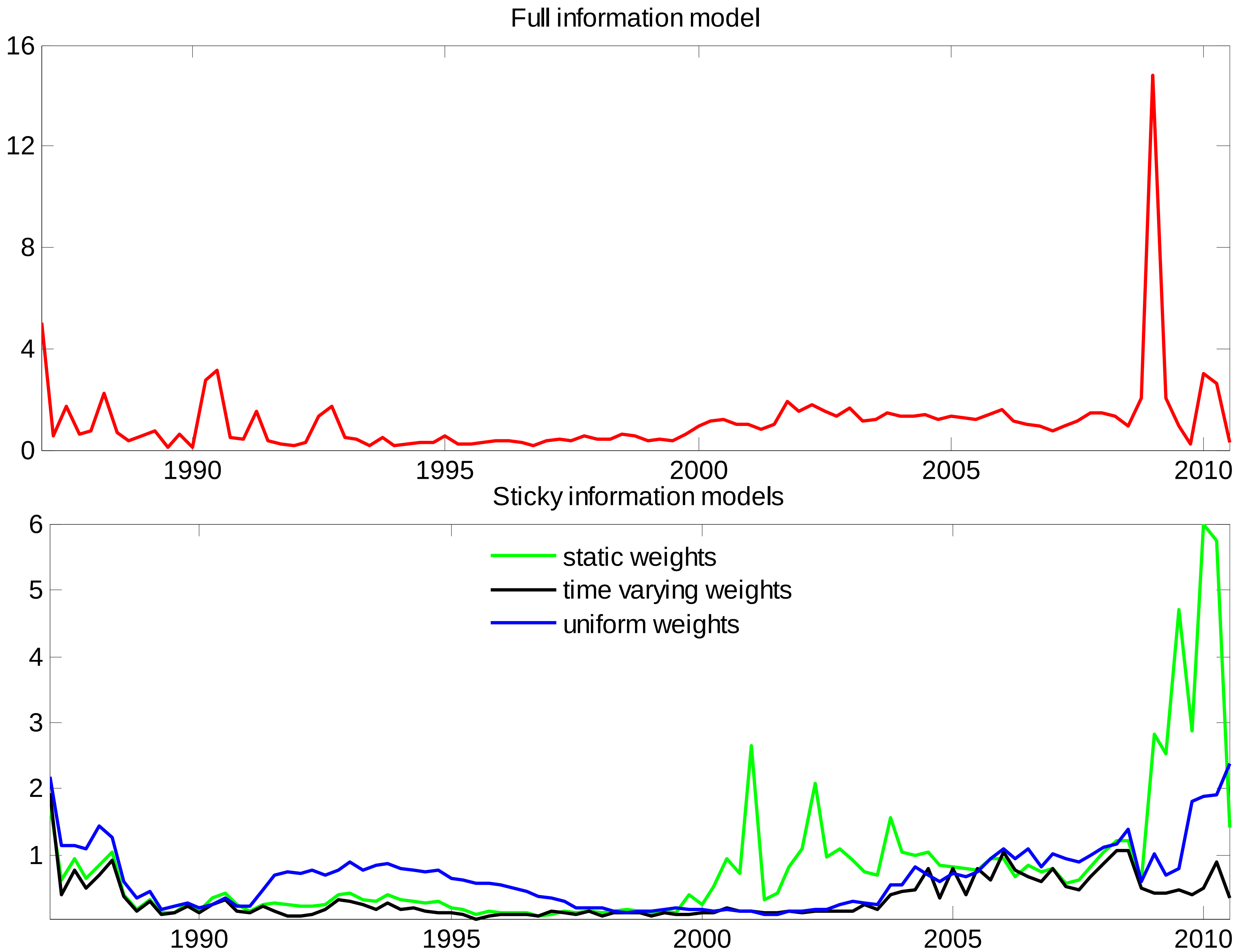
Models:

- Full information model

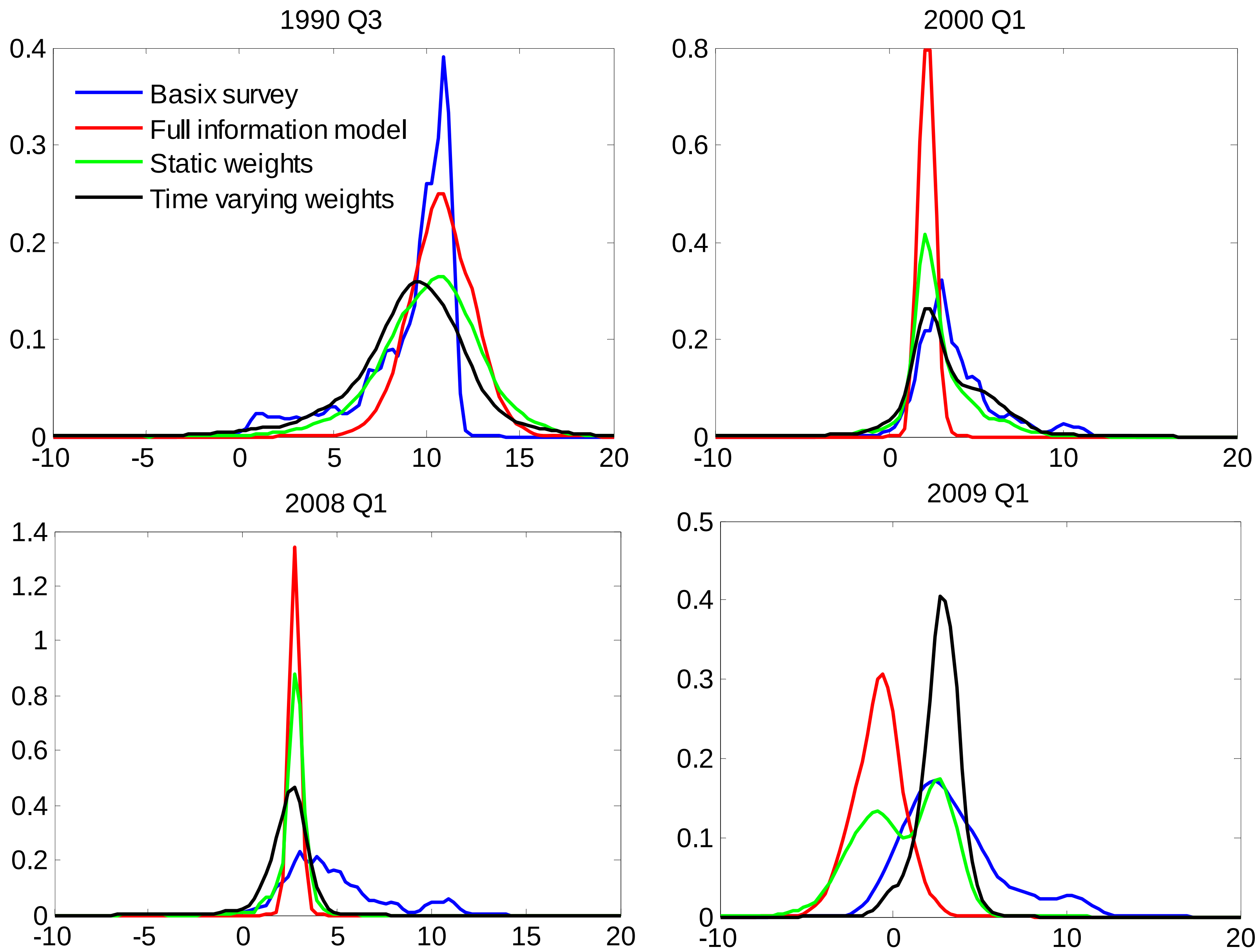
- Sticky information model:
  - static **weights**- min Klic over entire sample
  - time varying **weights**- min Klic for every quarter in the sample

$Beta(\alpha, \beta)$ = beta distribution parameterised by two shape parameters

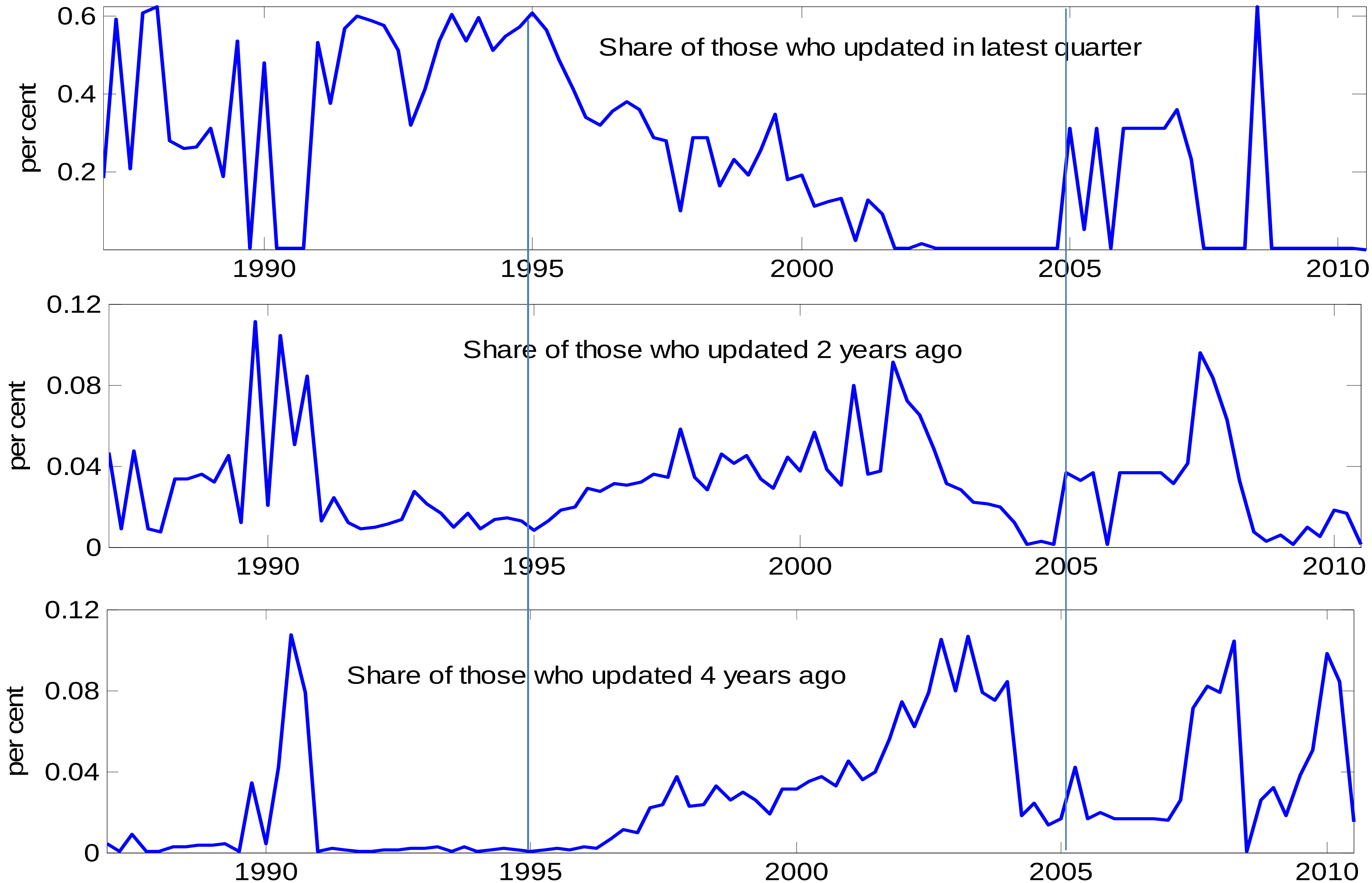
Results: Klic- distance measure between model based and survey density



Results: estimated PDFs



Results: estimated weights in the time varying sticky information model



Results- micro analysis

Aim: match characteristics of NOP respondents to BVAR forecasts

- frequent updaters: those who last updated within the last year
- infrequent updaters: those who last updated between 6 and 15 quarters ago
- rare updaters: those who last updated between 16 and 20 quarters earlier
- don't knows: those who do not form expectations

Method: run a probit regression for these 4 'types' on individual characteristics

Results- micro analysis

- 13% do not formulate expectations- likely to be women, not have a degree, not to own a house or have a mortgage
- 87% form expectations- likely to be male, have a degree, own a house and/or have a mortgage
- 47% have a match in the model based forecasts- use those that have only one match (cc. 17%)
  - **Frequent updaters**
    - 8% more likely to be educated than rare updaters
    - More likely to have a mortgage, not to own or rent
  - **Infrequent updaters**
    - Likely to have a mortgage as well as own their own house
    - Lower probability of a degree than frequent updaters

Results- micro analysis

Depvar / Pers char	Frequent updaters	Infrequent updaters	Rare updaters	Don’t know
Edu: degree	**0.085*****	0.023***	-0.017	**-0.029*****
Edu: secondary	**0.044*****	0.014	-0.002	**-0.019*****
Own house outright	0.018	0.025**	**0.033****	**-0.023*****
Has mortgage	**0.027****	0.024**	0.021*	**-0.025*****
Rents	-0.062***	0.012	**0.039*****	0.003
Obs	12,832	12,832	12,832	45,655

***: 1%, **: 5%, *:10% significance level

Conclusion

- Full information model fits less well than sticky information models
- Sticky information model with t.v. weights fits the Basix survey best- although more free parameters!
- Around high inflation in 1990s, we estimate households to have updated their information on average just under once a year
- During the great stability, this increased to every other year.
- Micro-analysis suggests frequent updaters are more likely to be highly educated than the rest

To do next...

- Add several models of expectations formations for comparison such as: TVP and a constant gain parameter model
- Re-do the analysis for these
- Analyse perceptions and 2 years ahead expectations in more detail
- Entire exercise using different price indexes such as CPI and RPI
- Explore how to incorporate the news on inflation as a factor in affecting the frequency of data updates.
- Add other sources of prediction heterogeneity- different consumption baskets for example