

ESRC Centre for Population Change

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Methods for forecasting migration: Evaluation and policy implications

*Joint work with George Disney, Arkadiusz Wiśniowski,
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Background

- Project “Evaluation of existing migration forecasting methods and models”
- Commissioned by the Migration Advisory Committee, Home Office – *publication pending*
- **Aims:**
 - (1) to evaluate the existing approaches to forecasting UK international migration;
 - (2) to assess the uncertainty of different forecasting methods

All the views and interpretations presented in this talk are those of the authors, and do not reflect the views of the Home Office or the Migration Advisory Committee. Please note that the presented findings have not yet been published.

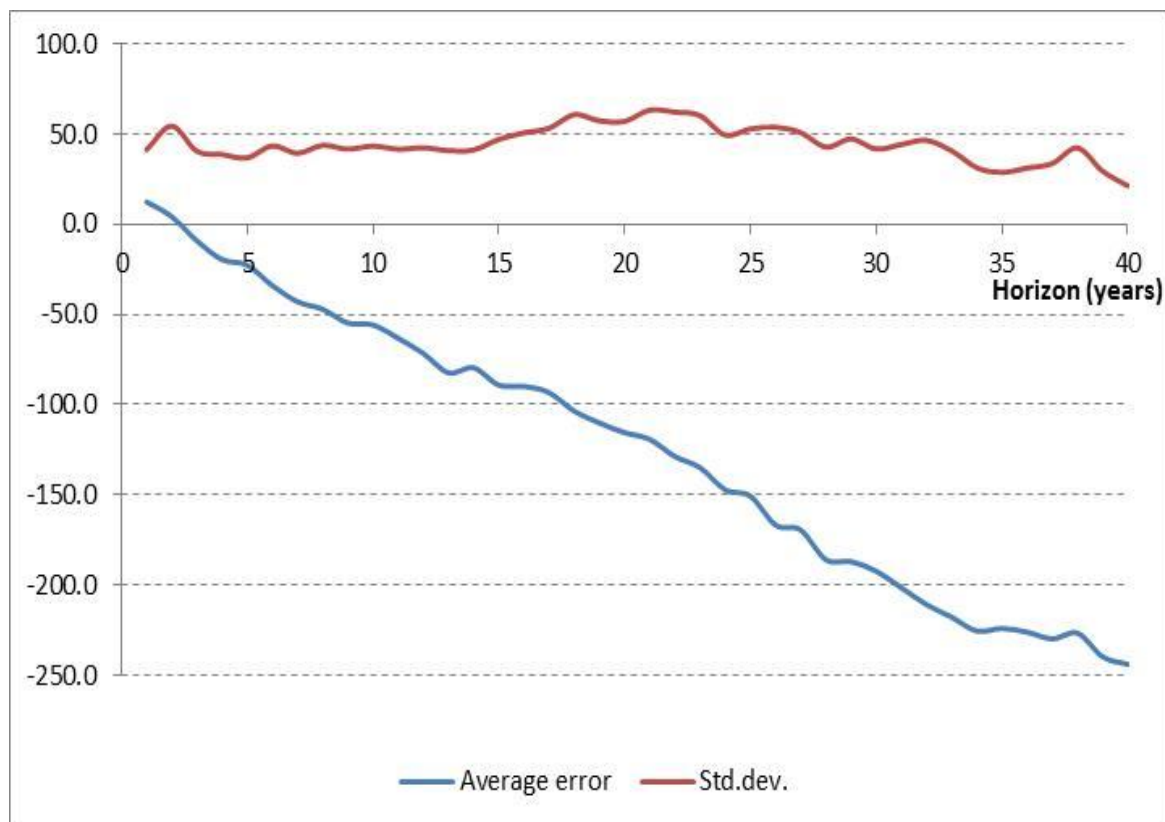


Methodological State of the Art

- Migration is **volatile and barely predictable**; too precise forecasts are doomed to fail
- Uncertainty compounded by data problems
- Various forecasting methods used in the past: extrapolation of the past data or past forecast errors, expert opinion, including explanatory economic data and demographic data, etc.
- **No method universally superior**

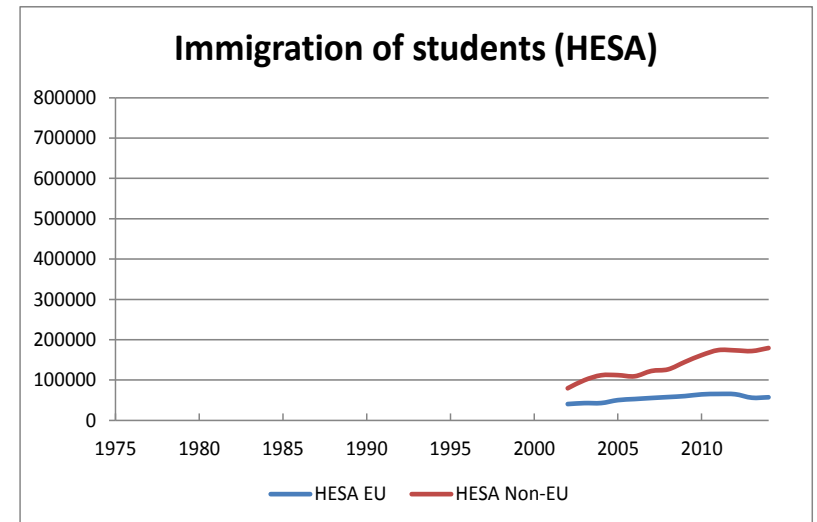
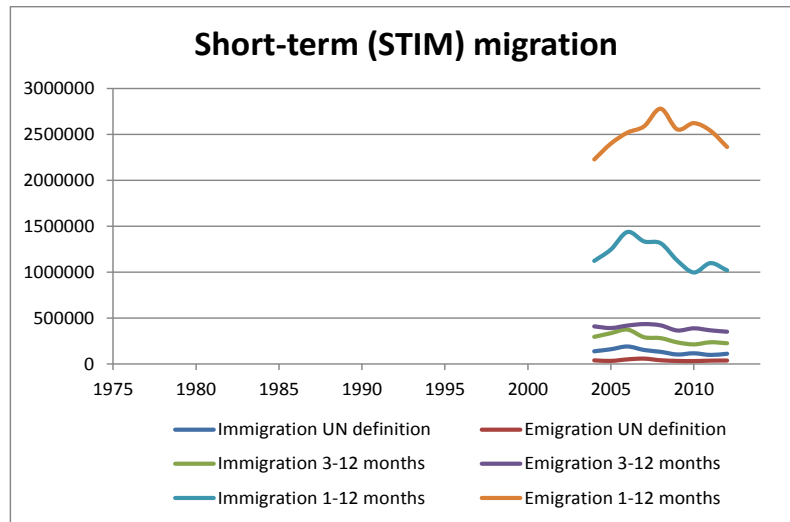
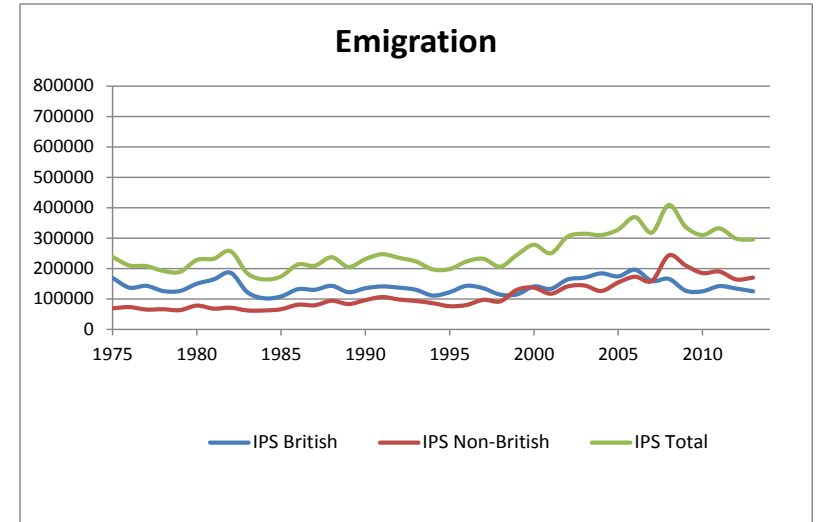
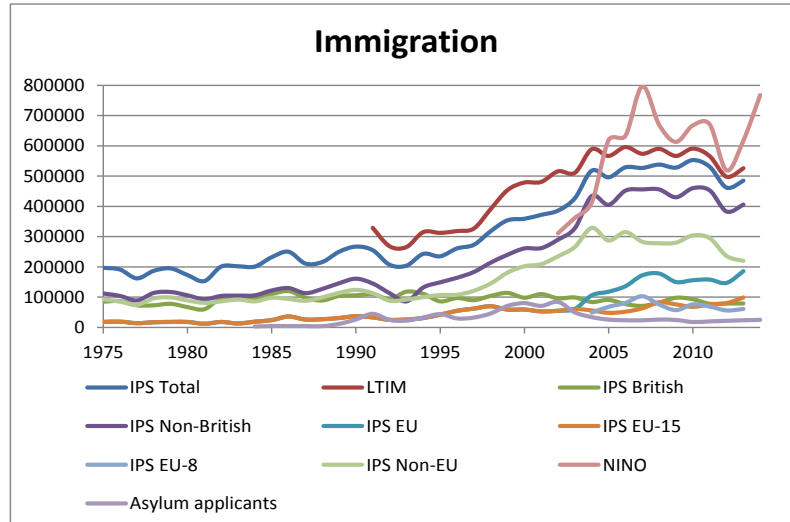
Extrapolation of Past Errors

Average error and its standard deviation by projection horizon, NPP 1970-based to 2012-based



Source: Government Actuary's Department / ONS

Data



Source: ONS; HESA; Home Office (various years)



Assessment Framework

- Insight into forecast uncertainty offers decision makers additional information beyond single (deterministic) variants
- Empirical assessment by comparing the results of various models for different migration flows against the past trends
- Two crucial challenges:
 - Synthesis of this information
 - Communication to the users

Assessment Framework

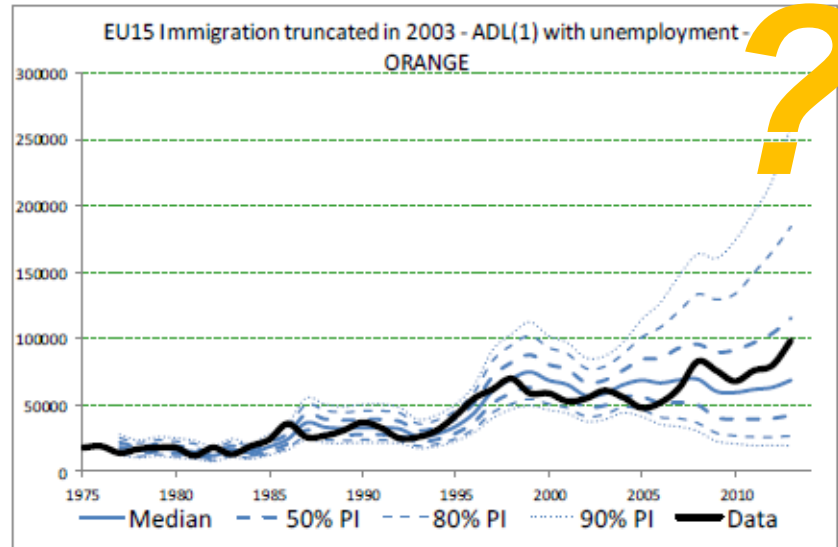
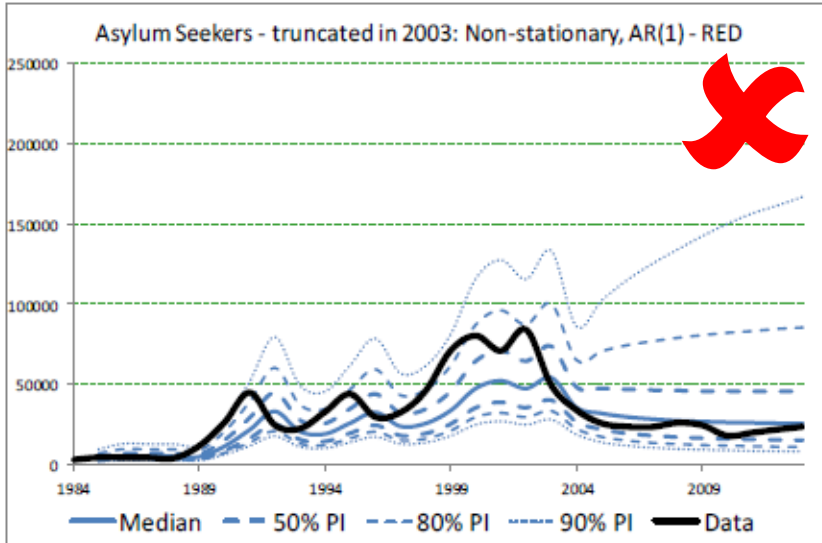
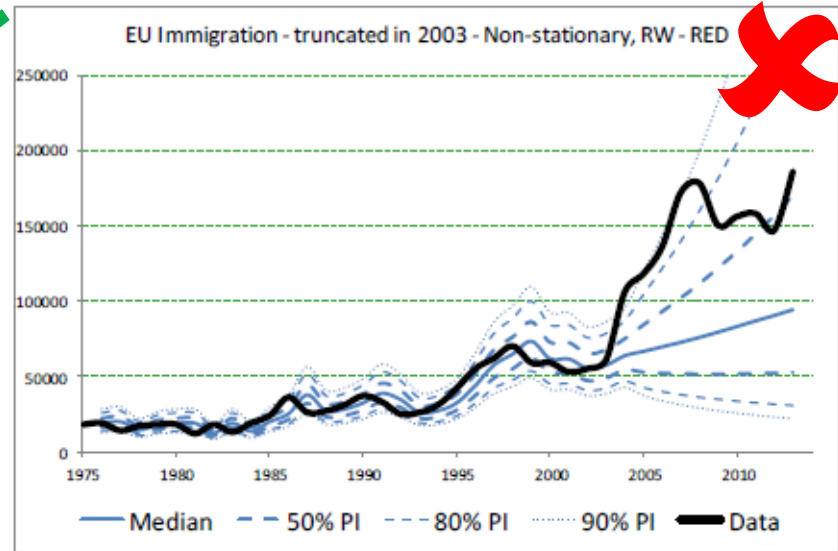
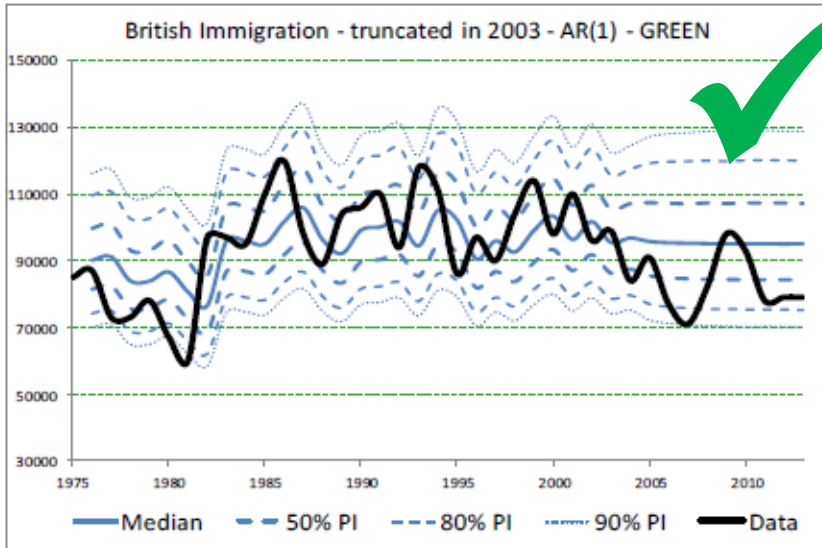
Class	Data sources	Methods vs. models	Empirical results
	<ul style="list-style-type: none">• Good match to a given definition• Small random errors• Small biases	<ul style="list-style-type: none">• Method readily applicable to available data	<ul style="list-style-type: none">• Low errors ex post• Generally well-calibrated
	<ul style="list-style-type: none">• Reasonable match to a given definition• Medium errors• Medium biases	<ul style="list-style-type: none">• Some issues (e.g. small samples), but surmountable given additional input	<ul style="list-style-type: none">• Medium errors ex post• Some problems with calibration
	<ul style="list-style-type: none">• Poor match to a given definition• Large errors• Large biases	<ul style="list-style-type: none">• Method not applicable to available data	<ul style="list-style-type: none">• High errors ex post• Uncertainty not calibrated



Methods and Models

- Several methods looked at, chiefly time series and extrapolation of past errors
- A range of data sources with different features: **(non)stationarity, series length**
- Analysis of errors and calibration
 - Mean Percentage Error (bias)
 - Empirical coverage of 50% and 80% intervals
 - Exercise on series truncated in 2003 and 2008

Selected results





Selected results

- **No single model is conclusively superior**
- Results are not surprising: better forecasts for the more stable data series (e.g. flows of the UK nationals), less susceptible to unpredictable shocks or policy changes
- Models assuming stationarity should not be used for non-stationary data series (and vice versa)

Migration – Risk Management Matrix

Uncertainty (risk) Impact	Impact		
	Low	Medium	High
Low		Long-term migration of UK nationals	Short-term non-EU migration*
Medium		Long-term migration: old EU nationals (Western Europe) Long-term migration of non-EU nationals*	Long-term migration: new EU nationals (Central and Eastern Europe) Short-term EU migration Student migration*
High		Visas issued, by type*	Refugees and asylum seekers*

* Existing policy controls



Key Messages – General

- Imperative to emphasise the uncertainty involved in all migration forecasts, by the means of probabilities for various ranges of possible outcomes.
- Transparently acknowledge that migration cannot be forecasted without substantial error, whilst also providing an account for the possible size of these errors
- The probability of a single forecast being correct is extremely low, it is vital that the uncertainty around migration forecasts is made explicit to decision-makers and the general public
- Migration can be affected by a wide range of events, including ‘shocks’, all of which need to be taken into account as, although they are quite unlikely, their potential impact on migratory flows could be large



Key Messages – Methodology

- **Multiple layers:** data, models, combinations of the two, and their empirical performance
- Communication challenge addressed by applying a traffic-lights system
- **First adding uncertainty, then reducing it**
- The framework cannot be applied to single deterministic scenarios: not possible to assess calibration



Recommendations

A three-step approach has been proposed:

1. Assess the nature of the migration flow being forecast (stationary, volatile...)
2. Evaluate the available data (quality, accuracy, possible biases)
3. Design a bespoke forecasting model, reflecting both the character of the given migration flow and the data



General Remarks

- Paradigm change in forecasting: from determinism to acknowledging uncertainty
- Focus not on methods, but on possible impacts and consequences of decisions
- Various sources of uncertainty need to be acknowledged and combined in the analysis

See a letter on “Probabilistic population forecasts for informed decision making”, forthcoming in *Journal of Official Statistics* (Bijak et al. 2015)



Open Challenges

- Convince the users and producers of forecasts about the **added value** of uncertainty analysis
- **Bespoke approaches:** forecasts tailored to specific needs of different users and audiences
- Tailoring predictions and eliciting the relevant information requires **interaction with users**
- More **methodological research:** calibrating tails of distributions, developing methods for forecasts for specific decisions



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