Estimating a country's currency circulation within a monetary union

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Motivation

How many of us... carry cash when traveling abroad?

Over the last decade, cash in circulation increased in CPMI countries*
(Bech *et al.*, 2018)

Despite **pressure** for the fading out of cash, demand for USD is growing
(Judson, 2017)

79% of the number of payments in the euro area **are settled in cash**
(Esselink & Hernández, 2017)

Cash is (still) king!

Stock of cash in circulation is an important input for central banks!

* The 24 CPMI jurisdictions are: AU, BE, BR, CA, CN, EA, FR, DE, HK, IN, IT, JP, KR, MX, NL, RU, SA, SG, ZA, SE, CH, TR, GB and US.

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Objective

Address the issue of the compilation of the stock of cash in circulation

- Raise awareness to the complexity introduced by the participation in a monetary union and by the international relevance of the currency

- Discuss possible methods to consider such complexity in the techniques used to estimate currency in circulation

- Promote the debate within the central banking community on this issue

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Methodology

Case-study: Cash in circulation in euro area countries (fixed 2002 composition)

- All information used is publicly accessible

- Cash in circulation is considered net of coins, due to their low quantitative relevance

- Estimation period: 2002 to 2017

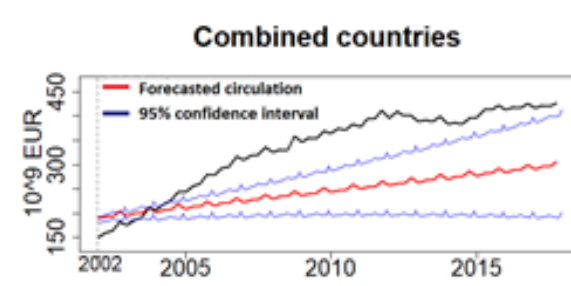- 3 different methods tested:
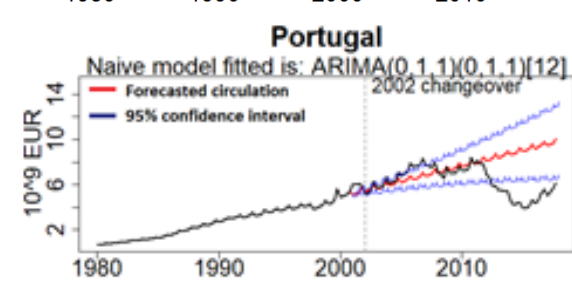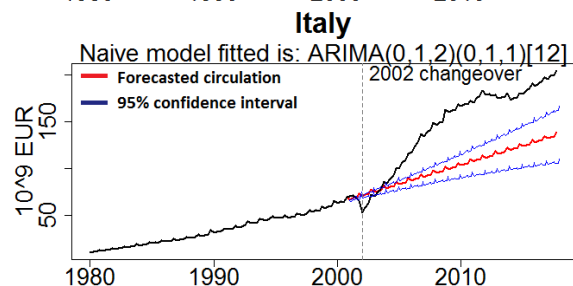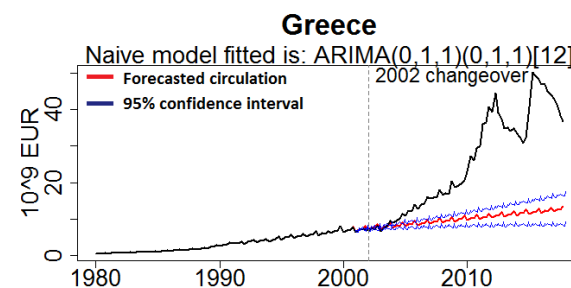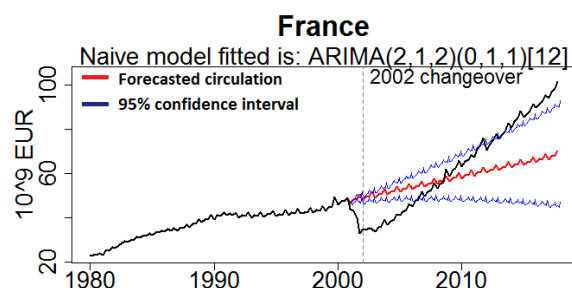
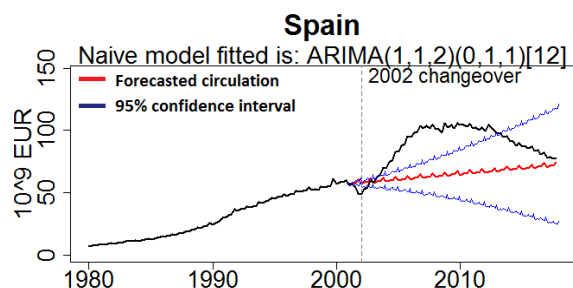| Extrapolation of legacy currencies	Allocating a proportion of the circulation estimated for the euro area	Exploring a structural money demand model

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Method 1 - Extrapolation of legacy currencies

Application of auto.ARIMA to legacy cash in circulation and forecast for euro era

- Imposed relatively long time-series (> 5 years, monthly) and overfit restrictions

- Data available only for 5 countries: France, Italy, Spain, Greece and Portugal
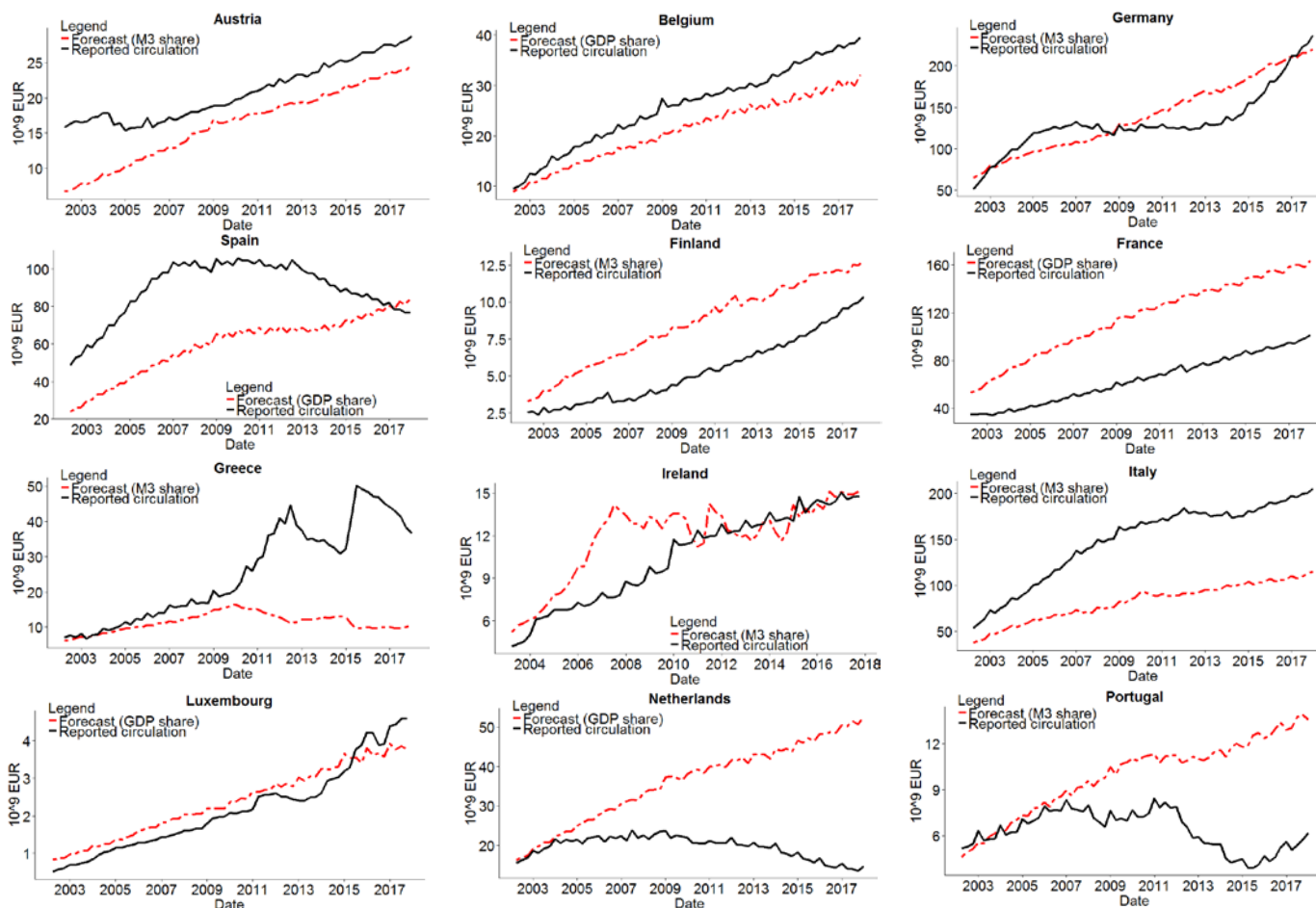
Method 2 - Allocating a proportion of the circulation estimated for the euro area

Based on ECB (2017a)'s estimate for cash in circulation outside the euro area

- Estimate of cash in circulation in euro area is obtained by difference

- 2 allocation keys considered: GDP share & contribution to M3 share

Method 2 - Allocating a proportion of the circulation estimated for the euro area

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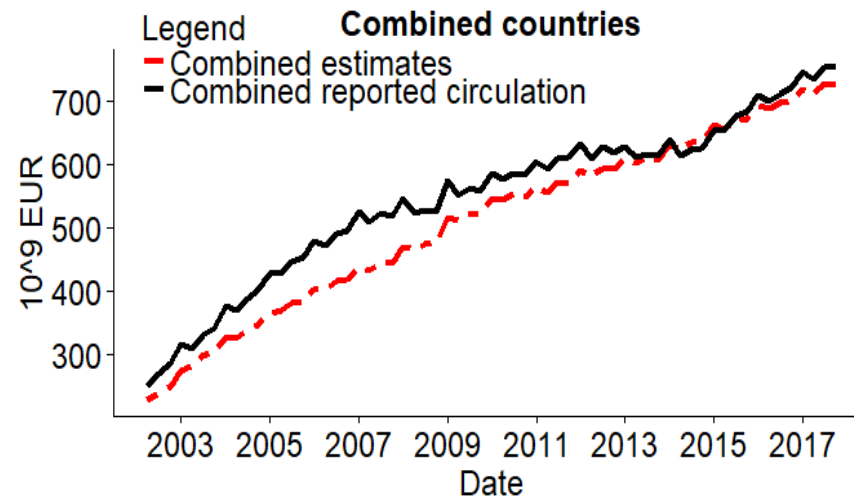
Method 3 - Exploring a structural money demand model

Estimate structural money demand for EU countries outside the euro area and apply structural parameters for euro area countries

- Technique similar to proposal in Bartzsch *et al.* (2011b, section 2.2.4)

- Assume negligible foreign demand for non-euro EU currencies

- Include proxies for price level, transactions level and opportunity cost of holding cash

$$\boxed{\text{Reference countries X}} \quad \hat{c}_t^X = \hat{\beta}_0 + \hat{\beta}_1 P_t^X + \hat{\beta}_2 Y_t^X + \hat{\beta}_3 i_t^X \qquad (1)$$

$$\boxed{\text{Euro area country Z}} \quad \hat{c}_t^Z = \hat{\beta}_0 + \hat{\beta}_1 P_t^Z + \hat{\beta}_2 Y_t^Z + \hat{\beta}_3 i_t^Z \qquad (2)$$

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# Method 3 - Exploring a structural money demand model

Pairs of non-euro & euro countries were determined according to Ward's (1963) and MacQueen's (1967) clustering methods

- Clustering based on dataset with proxies for transaction level, wealth, dimension, importance of tourism, hoarding motive, importance of cashless payments

- Non-euro countries in each cluster with best econometric performance were selected as reference

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Method 3 - Exploring a structural money demand model

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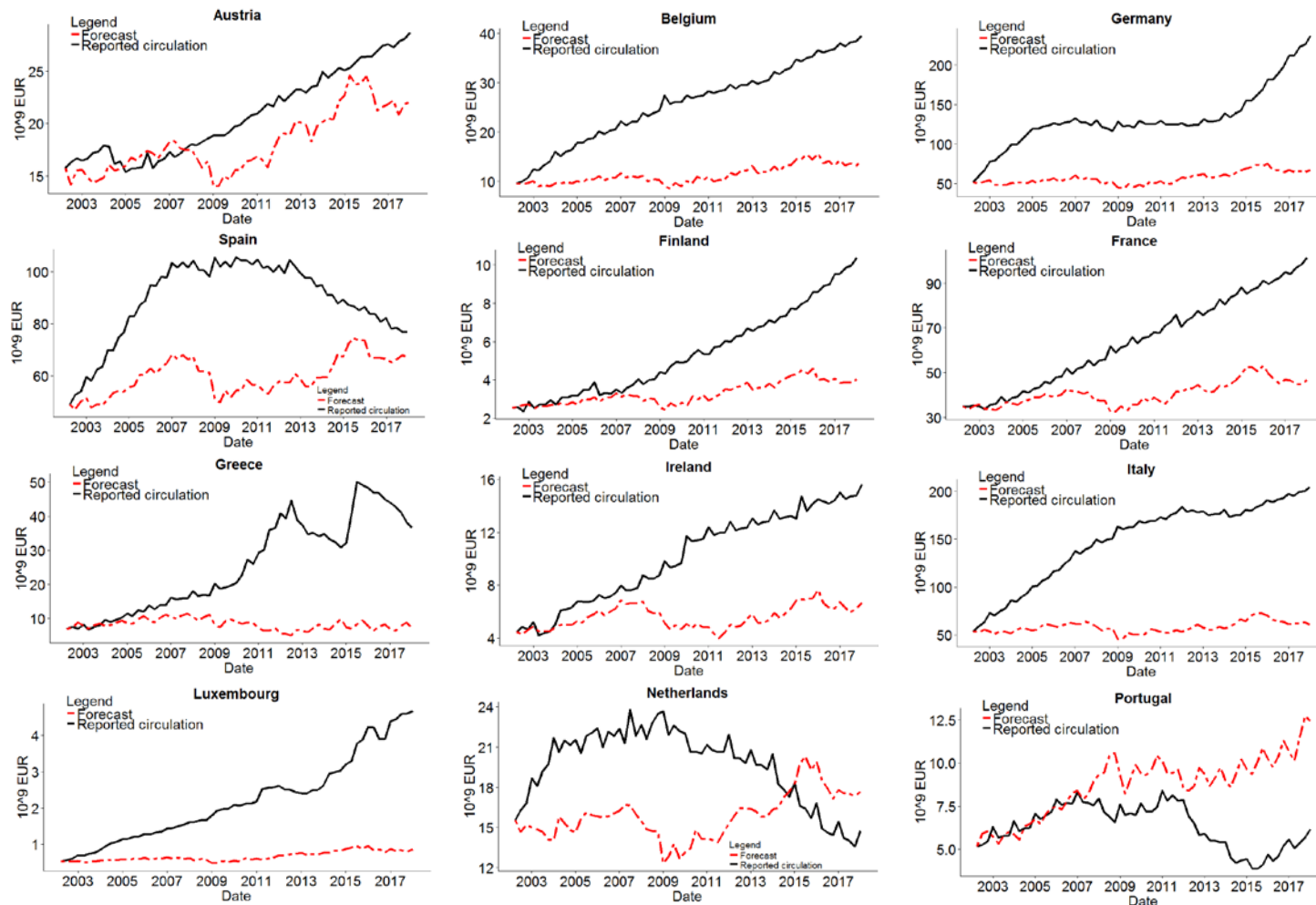
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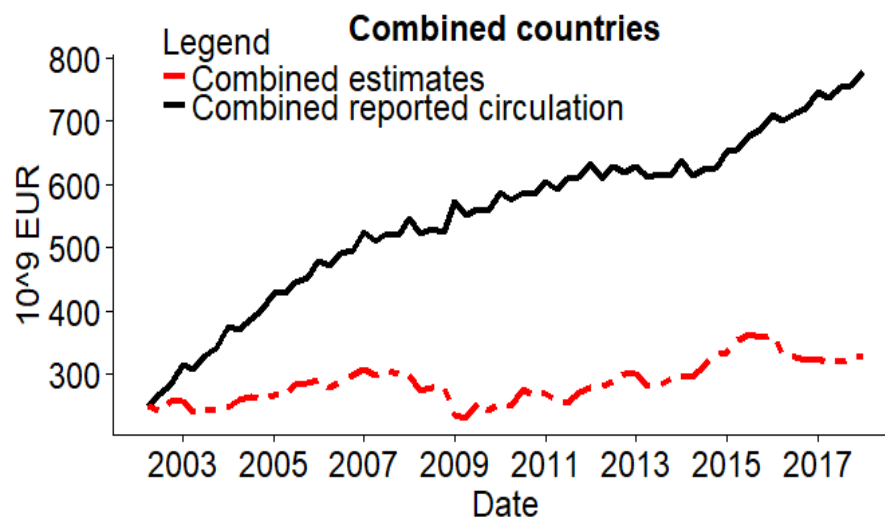
Conclusions

	Method	Merits	Limitations
1	Extrapolation of legacy currencies	Technically easy to implement	Assumes legacy time series structure holds in monetary union era
2	Allocating a proportion of the circulation estimated for the euro area	Enables the harmonization of the compilation of cash in circulation in the monetary union's countries	Assumes no differences between countries in the preference for cash
3	Exploring a structural money demand model	Proxies nearly all motives to hold cash and tracks their short & long run effects	Depends on structural resemblance between paired countries

- Cash still holds an instrumental role in the way we pay and 'save'

- Strong international role of currency & participation in a monetary union complexify the compilation of cash in circulation

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There are no optimal answers to this issue...
further research & discussion are very much welcome!

Thank you!

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