A simple way to capture currency abroad

Nikolaus Bartzsch [a] , Gerhard Rösl [b] & Franz Seitz [c]

[a] Cash Department, Deutsche Bundesbank, Wilhelm-Epstein-Str. 14, D-60431, Frankfurt am Main, Germany

[b] Department of Business Studies, University of Applied Sciences Regensburg, Seybothstrasse 2, D-93053, Regensburg, Germany

[c] Department of Business Studies, University of Applied Sciences Weiden and WSB Poznan, Hetzenrichter Weg 15, D-92637, Weiden, Germany

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Nikolaus Bartzsch[a], Gerhard Rösl[b] and Franz Seitz[c],*

[a]*Cash Department, Deutsche Bundesbank, Wilhelm-Epstein-Str. 14, D-60431 Frankfurt am Main, Germany*
[b]*Department of Business Studies, University of Applied Sciences Regensburg, Seybothstrasse 2, D-93053 Regensburg, Germany*
[c]*Department of Business Studies, University of Applied Sciences Weiden and WSB Poznan, Hetzenrichter Weg 15, D-92637 Weiden, Germany*

In this article, we analyse the volume of euro banknotes issued by Germany that circulate abroad. Inferences are drawn from a coin model. Our approach suggests that foreign demand has increased since 2002. At the end of 2009 nearly 50%, the equivalent of €170 billion, is held outside the euro area.

Keywords: banknotes; euro; foreign demand; coin

JEL Classification: E41; E42; E58

I. Introduction

Generally speaking, all euro-area national central banks issue euro banknotes. Following the introduction of euro cash at the start of 2002, the volume of banknotes issued by the Deutsche Bundesbank increased from an initial €73 billion to €367 billion in 2010. This growth was much faster than could have been expected on the basis of earlier growth rates for D-Mark currency. Moreover, for each of the seven euro denominations, the Bundesbank's share in the net issuance is higher than its share in the capital of the European Central Bank (ECB) of about 27%. The latter is calculated according to the euro countries' population and GDP shares.

These developments cannot be explained by an increased holding of transaction balances in cash as German private consumption since 2002 was weak and there was a steady decline in the percentage of cash payments in German retail sales (EHI Retail Institute, 2010). The huge surge is therefore likely to be due to domestic hoarding and especially to foreign demand for euro banknotes. This foreign demand may originate from other euro area countries or from non-euro area countries. In what follows, we try to capture demand from abroad with the help of a coin model.[1]

There are only very few studies on foreign demand for euro cash. Fischer *et al.* (2004) estimate that between 8% and 13% of the total volume of outstanding euro legacy currencies in 2000 was circulating abroad. As yet, however, there are no detailed papers that examine the (total) foreign demand for euro cash either for the euro area as a whole or for individual euro area countries. Deutsche Bundesbank (2009, pp. 49–51) uses the total known volume of euro banknotes shipped by banks from Germany to noneuro area countries and an additional blanket amount for probable positive net exports of euro banknotes via other channels (e.g. tourism or money sent home by foreign workers) to estimate that foreign demand outside the

*Corresponding author. E-mail: f.seitz@haw-aw.de
[1] See on an overview of different estimation approaches Feige (1997). An application to Germany can be found in Bartzsch *et al.* (2011a, b). Analyses of cash movements within a currency area are relatively rare. For a country-specific perspective within the euro area, see Schneeberger and Süß (2007) and Bartzsch *et al.* (2011a, b). For the situation in the United States, see Judson and Porter (2004).

euro area at the end of 2008 had accounted for between 25% and 35% of the total demand for Bundesbank-issued euro banknotes. The ECB (2011, p. 31) states that 'taking into account a range of different estimates suggests that around 20–25% of euro currency was circulating outside the euro area at the end of 2010'. However, it does not specify these 'different estimates' in more detail. And according to a survey by the Austrian central bank, households in central, eastern and south-eastern Europe held approximately €12 billion in euro cash in 2008 (Scheiber and Stix, 2009). This article on the foreign demand for euro banknotes issued by Germany since the euro cash changeover until the end of 2009 thus fills a gap in the research.

II. The General Model

The basic problem can be formulated as follows (Feige, 1997, p. 184):

The shares β_1 and β_2 of two subpopulations C_1 and C_2, which together produce the total population C, are to be estimated. Let X_1 and X_2 denote the observed and recorded characteristics of subpopulations C_1 and C_2. The average feature X is then a weighted average of both characteristics, with the weights being the unknown shares β_1 and β_2:

$$X = \beta_1 X_1 + \beta_2 X_2 \qquad (1)$$

As $\beta_1 = 1 - \beta_2$, the shares can be estimated by means of the observed and measured properties:

$$\beta_1 = \frac{X - X_2}{X_1 - X_2}$$
$$\beta_2 = \frac{X_1 - X}{X_1 - X_2} \qquad (2)$$

A sensible solution to this problem exists if the characteristics of the two parts X_1 and X_2 differ ($X_1 \neq X_2$) and the calculated shares are between 0 and 1. Therefore, to implement this approach for our purpose of the calculation of German banknotes held abroad, the characteristics of the banknotes in circulation outside Germany (X^a) must differ sufficiently from those of the banknotes outstanding in Germany (X^d) so that the foreign share can be identified. In our case, the distinguishing feature is detected from an analysis of German coin issuance. At the same time, information is required about how the demand

for banknotes would have developed if there had been no foreign demand.

III. Analysis of German Coin Issuance

In what follows, we try to filter out information from the volume of euro coins to determine how many euro banknotes circulate outside Germany (Porter and Judson, 1995, Section 3.3; Feige, 1997, p. 189 f). Specifically, the ratio of coins to banknotes is used for this purpose. It is easy to calculate this ratio for the entire German issuance (c/n). However, the corresponding domestic and foreign shares and, thus, also the noneuro area countries' share, are unknown. We approximate the domestic share $(c/n)^d$ by using a reference country. The idea behind selecting a reference country is to find a country that is similar to Germany in its use of banknotes, except for foreign demand from noneuro area countries. After careful consideration, we decided on France as our reference country.[2] There are several reasons in favour of this:

– France is a euro area country. Thus, it has the same denominational structure.
– The standard of living in France is similar to that in Germany.
– The *overall* cashless payments behaviour of nonbanks relative to cash transactions in the two countries is not too dissimilar (Bank for International Settlements, 2009).
– The size of the shadow economy, in which most transactions are settled in cash, is similar in both countries (Feld and Schneider, 2010; Thießen, 2010).
– There should not be a major difference in hoarding behaviour in the two countries (see, for instance, the estimates in Boeschoten, 1992, Chapter 4).
– Since the start of EMU, there has been a high degree of synchronization of the business cycles and also, in particular, of private consumption expenditure between Germany and France (Gayer, 2007; Aguiar-Conraria and Soares, 2011).

Moreover, there are indications that in the case of small denominations not only Germany but also France within the euro area is a net exporter of banknotes to other euro area countries. To this extent, France and Germany could be treated similarly with regard to migration within the euro area as an initial approximation.

If we now assume that none of the banknotes issued by France (F) go to noneuro area countries (this is

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[2] In the case of the US dollar, usually Canada is taken as the reference country (e.g. Porter and Judson, 1996).

indicated, e.g., by the fact that the official shipments are carried out almost entirely by German banks), we have found in France a reference country that is rather similar to Germany in its use of euro banknotes, with the exception of demand from noneuro area countries. Accordingly, using this approach, we identify the share of German euro banknotes in these countries.

The coin to banknote ratio for noneuro area countries, $(c/n)^a$, is likely to be 0 as euro coins are not in circulation outside the euro area or only to a negligible extent. Equation 1 thus reads as

$$\frac{c}{n} = \beta^d \left(\frac{c}{n}\right)^d + \left(1 - \beta^d\right)\left(\frac{c}{n}\right)^a \qquad (3)$$

As it is assumed that $(c/n)^d \approx (c/n)^F$ and $(c/n)^a \approx 0$, the following relationship holds for β^d

$$\beta^d = \frac{c/n}{(c/n)^F} \qquad (4)$$

and $\beta^a = (1 - \beta^d)$. Here, β^d is the share of banknotes in circulation in Germany *and* in other euro area countries. Figure 1 shows the results derived with this approach. The volume of banknotes abroad increased since 2002. At the end of 2009, euro banknotes outside the euro area amounted to just under €170 billion. This is significantly higher than the cumulated official net shipments (about €100 billion) and is in line with estimates from other direct and indirect sources (Bartzsch *et al.*, 2011a, b). As Deutsche Bundesbank (2003, p. 208 f) notes, theoretically speaking, there is little to suggest a net outflow of euro coins from Germany to other euro area countries, since it may be assumed that, as far as coins for
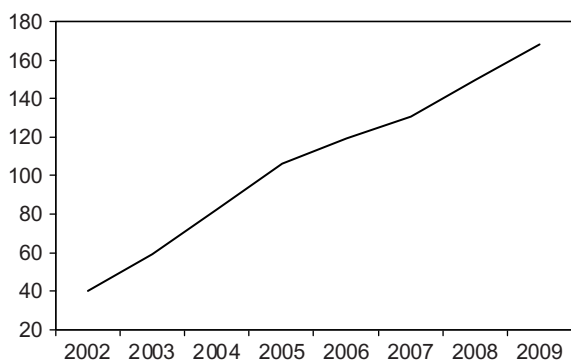
transaction purposes are concerned, German tourists take a similar amount of coins with them when travelling both from and to their home country.[3] However, as Bartzsch *et al.* (2011b) find, 'German' banknotes also circulate in other euro area countries and to a significantly greater extent than 'French' banknotes. Therefore, the total volume of banknotes in circulation outside Germany (extra euro area *and* intra euro area) must be higher than the calculated €170 billion.

IV. Summary and Conclusion

This article has endeavoured to use a coin model to determine foreign demand for euro banknotes issued in Germany. It has been found that, in 2009, around 50% of the cumulated net issuance was held outside the euro area (approx. €170 billion).

As demonstrated by Seitz and Setzer (2009), the statistical-econometric quality can be raised and the economic interpretation of cash demand functions for Germany can be made easier if arguments for foreign demand are incorporated. Given the results and the figures derived in this article, this comes as no surprise. Aksoy and Piskorski (2005, 2006) have determined for the United States that the indicator properties of narrow monetary aggregates with regard to cyclical and price developments can be improved considerably by taking foreign demand into account. Whether this is also the case for Germany or the euro area as a whole should be the subject of future research.

Fig. 1. German banknotes in noneuro area countries (€ billion)
Source: Authors' own calculations.

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[3] On calculating domestic migration of coins within the euro area, see Seitz *et al.* (2009).

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