The Note-Coin Boundary

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In currency management the note-coin boundary and the calculation of where this should fall is critical to public acceptance and usage of banknotes and coins, to optimising inventory management and to minimising costs of production and circulation. There are several different definitions and models for this calculation, as evidenced by the wide variation in the number of denominations and volumes of banknotes in circulation in countries around the world. In this article, Peter Koeze of De Nederlandsche Bank explains the model he developed for calculating the note-coin boundary.

When Stockholms Banco issued the first European banknotes on 16 July 1661, it set the note-coin boundary for the first time. Banks in other countries followed suit with banknotes of their own, thereby setting their own local note-coin boundaries.

Originally, banknotes replaced coins on a one-to-multiple basis to facilitate payment of large sums and so, on the face of it, their issue was a service to the general public. Less evident to the public, however, was the fact that banknotes also provided the issuing bank with a source of income, as the costs of note printing were less than the value of the coins they replaced. The bank could then earn interest on the amount of money saved. The lowest denomination of the banknotes had to be chosen judiciously though. If it were chosen at too high a value, few people could or would use the notes and the total value of all notes outstanding would stay small, failing to generate an appreciable income for the bank. If it were chosen at too low a value, the number of notes in circulation would soar, but so too would the costs for their production and handling. Clearly, it paid to seek out the optimum.

The situation is little changed today. It is still necessary to strike a balance between the interests of the general public and those of the issuing bank. The problem of where to lay the note-coin boundary hence is open to two approaches, taking the perspective of the general public or that of the central bank.

Payne and Morgan published a paper in 1981 in which they took the public’s perspective [1]. They provided evidence that the denominational structures across 35 countries fitted one ideal sequence consisting of six denominations.

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coins and six notes, although each place in the sequence was not necessarily occupied by a coin or note in every country. A measure which was taken to define the sequence was the average day’s pay represented by the symbol \( D \). If the places or intervals in the sequence were delimited by the values \( D/5000, D/2000, D/1000, D/500, D/200, D/100, D/50, D/20, D/10, D/5, D/2, D, 2D \) and \( 5D \), each interval contained just one coin or note or stayed empty, regardless of the country. The note-coin boundary was found at either \( D/50 \) or \( D/20 \).

It was a pity that the authors did not offer a justification for their approach. Although it seems logical that \( D \) is somehow related to the prices of goods and services, it is not self-evident that the note-coin boundary should be found at \( D/50 \) or \( D/20 \).

Koeze published a paper in 1988, taking the interests of both the general public and the central bank into account \[2\]. He formulated two principles. On the one hand, the boundary should be as low as possible because banknotes are cheaper to produce than coins and the general public displays a strong preference for banknotes. On the other hand, it should not be so low that the average quality of the banknotes of the lower denominations drops below the level deemed acceptable. In such a situation the public has no choice but to handle unfit notes and a stream of justified complaints is likely to result. A central bank should strive to keep the circulation of banknotes, in particular of the lowest denomination, reasonably fit.

Accordingly, Koeze presented a technical criterion for the note-coin boundary based on the life and cycle times of banknotes. Basically, when most banknotes of a denomination become unfit before one cycle through the circulation (between issue and return) has been completed, the central bank loses the opportunity to withdraw and exchange them for new notes. The mean life of banknotes should hence exceed the mean cycle time. When the mean life approaches the mean cycle time, the banknotes should be replaced by coins.

The technical criterion Koeze proposed employed the mean number of times the central bank reissued the banknotes of a certain denomination until withdrawal, represented by the symbol \( N \). In other words, \( N \) is the mean number of cycles traversed by the notes of a certain denomination through the circulation. Its calculation involves four quantities known at the Central Bank, namely the total number \( I \) of fit and newly printed notes issued in a certain year, the total number \( R \) of fit and unfit notes returned in that year, the number \( P \) of newly printed notes issued in that year, and finally the number \( W \) of unfit notes withdrawn during that year. The mean number of cycles then is given by the simple formula \( N = (I + R) / (P + W) \). It rightly follows that if only newly printed notes are issued so that \( I = P \) and \( W = R \), \( N \) equals one cycle. When it is significantly larger than one for a particular denomination, issuance of those banknotes may be continued. However, when \( N \) attains a value between one and two, banknotes of that
denomination ought to be replaced by coins in the near future.

The advance of electronic means of payment may well shift the note-coin boundary, dependent on where they are positioned in the spectrum of payments, at the lower or the high end, but without invalidating the technical criterion.

References


Note

Dr Peter Koeze, Adviser to the Governing Board, retired from De Nederlandsche Bank, the National Central Bank of the Netherlands, in 2004. This is the last paper he wrote before his retirement.

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