

# Early experience of the management of euro banknote printing and issuance

*This article looks at the early experience in the areas of production and issuance of euro banknotes, as well as at anti-counterfeiting measures. It specifically focuses on continuous improvement challenges in these areas and on providing a level playing-field for cash services within the Eurosystem. Post-launch activities have concentrated on improvements in the production and quality management functions. The implemented decentralised production scenario with pooling provides economies of scale and helps – together with the quality management system – to ensure a supply of consistent quality banknotes. A level playing-field has been introduced by adopting common standards for the provision of cash services. The implementation of a stock management system in conjunction with common minimum sorting standards ensures an efficient use of the euro banknotes within the Eurosystem. At the same time, the counterfeiting threat calls for constant monitoring and the implementation of measures to minimise the potential impact of counterfeit banknotes. Given that a great deal of experience still remains to be gained with the single currency in all the above-mentioned areas, the Eurosystem will constantly monitor developments and seek to make improvements.*

## I Introduction

The preparations for the euro banknotes, from their design through to their launch, spanned almost a decade. This pre-launch phase largely involved a series of co-ordinated projects. Since the euro banknotes and coins were put into circulation on 1 January 2002, however, this project-based approach has evolved towards a situation of “business as usual”. One important aspect of this

evolution has been the ongoing management of the printing and issuance of euro banknotes. Business as usual, of course, requires continuous improvement in terms of production, technical progress, quality management, currency supply, stock management and counterfeit information. The following sections will consider each of these aspects in more detail.

## 2 Euro banknote production

### Allocation of banknote production

The banknote production requirements for the launch were met using a decentralised production scenario, i.e. each national central bank (NCB) procured, in principle, its requirements in all denominations. However, bilateral and even multilateral pooling arrangements were possible and agreed upon by some NCBs. In April 2001, the Governing Council of the European Central Bank (ECB) decided that, as from 2002, euro banknote production would take place in accordance with a decentralised production scenario with pooling. Under this arrangement, each NCB would be responsible for procuring normally no more than two denominations. The decentralised pooling system enables the Eurosystem to benefit from economies of scale and helps it to ensure a supply of consistent-quality banknotes by reducing the

number of production sites for each denomination.

The responsibility for production of the different euro banknote denominations is assigned by the ECB, taking into account to the greatest possible extent the production preferences of the NCBs. Furthermore, the ECB takes into account the denominations for which an NCB was responsible in the previous year in order to benefit as much as possible from the experience gained by the printing works in the previous production of a certain denomination.

The assignment of responsibility for the Eurosystem production requirements for 2002 was based on each NCB's share in the total Eurosystem banknote requirements. For this allocation of the banknote production, national forecasts were used. This use of

national forecasts was justified because the needs were still heavily influenced by national circumstances, which were not expected to change drastically and immediately after the introduction of the euro banknotes. However, as time progresses, it is not possible to measure the impact of national factors on the circulation of banknotes owing to the influence of banknote migration resulting from tourism and other activities. Therefore, it has been decided to assign responsibility for banknote production to the NCBs in accordance with a specific key which is not based on estimated national needs.

The assignment to the NCBs of the responsibility for total Eurosystem banknote production is based on two key factors:

- each NCB's share in the ECB's capital key: this factor reflects the size of the respective country's economy and population, both of which influence developments in banknote requirements; and
- each NCB's share in the launch stock needs: this factor represents the best estimate of the specific national features of banknote demand.

Over time, the weights of these two factors will move gradually towards the ECB's capital key.

### Banknote production volumes in 2003

In September 2002, the Governing Council decided on the total volume of euro banknotes to be produced in 2003 and the allocation of this production volume to the NCBs. In total, some 3.1 billion euro banknotes are being produced in 2003, after 4.8 billion in 2002 (see the table below). These banknotes are planned to cover any growth in the circulation and the replacement of banknotes no longer fit for circulation, and to ensure that NCBs have sufficient logistical stocks to accommodate all requests for banknotes, even in periods of seasonal peak demand.

In addition, the Governing Council decided on the production of banknotes and the further arrangements for the establishment of the Eurosystem Strategic Stock (ESS). This stock is intended for exceptional circumstances to cover an unexpected increase in the demand for euro banknotes or a sudden interruption in the supply of euro banknotes. The ESS consists of 30% of the total value of euro banknotes in circulation (held in the three high-value denominations) and 20% of the number of lower-value euro banknotes in circulation (held in these denominations). There are currently around 1.74 billion banknotes in the ESS.

**Table**  
**Production of euro banknotes in 2003<sup>1)</sup>**

Denomination	Quantity (millions of banknotes)	Value (€ millions)	NCBs commissioning production
€5	110.0	550	FR
€10	999.1	9,991	DE, GR, IE, AT
€20	1,071.1	21,422	DE, ES, FR, NL, PT
€50	657.0	32,850	BE, ES, IT, NL
€100	122.0	12,200	IT, FI
€200	133.0	26,600	DE, LU
<b>TOTAL</b>	<b>3,092.2</b>	<b>103,613</b>	

1) It should be noted that the stocks of €500 banknotes are sufficient, so there is no need to produce this denomination in 2003.

### **Continuous improvement philosophy**

Prior to the launch of the euro, each participating country had produced its own national series of banknotes with its own quality standards to meet its own specific delivery requirements. The euro launch was the first time in Europe that a large number of printing works had been given the task of producing a single series of banknotes to common specifications and standards. Management procedures and quality standards varied widely across the printing works involved. Furthermore, the need to implement a common quality standard and to keep to a tight production schedule made the task even more challenging. One and a half years on from the launch, it can be said that the preparatory work was very effective.

The post-launch activities have focused on building upon this success and improving the overall production and quality management functions within the Eurosystem. This has been achieved through reviews of the whole system, particularly in the areas of technical standards and quality management, in co-operation with all the parties involved, including the NCBs and printing works. Improved communications and closer working relationships between the manufacturing sites and their key suppliers contributed to the effectiveness of these reviews. One significant operational improvement achieved by decentralised pooling has been a reduction in the number of printing works producing a particular denomination. This has reduced further the risk of varying quality standards for any given denomination. Attention has now shifted to the suppliers of the key raw materials to the printing works, with the goal of optimising the supply chain. The future challenge is to continuously improve systems by implementing the necessary measures to enhance efficiency and effectiveness within the Eurosystem banknote printing community.

The high output of the manufacturing sites before the launch of the euro, together with the reduced demand for banknotes resulting

from a more efficient circulation of the euro, have led to overcapacity in banknote printing in the euro area. The Eurosystem is reflecting upon this issue, the objective being to ensure efficient and secure production of banknotes to the highest standards, for both the current and future euro series.

In some countries, there have been complaints about the quality of the paper of the low-denomination euro banknotes. The Eurosystem is currently looking into this matter. However, a final assessment cannot be made before a full life cycle for each banknote denomination is complete. In general terms, the quality of the euro banknotes is higher than that of the legacy currency banknotes, as the euro banknotes are produced according to tight production tolerances while incorporating state-of-the-art security features. The banknote paper is similar to that used to produce several of the legacy currency banknotes. However, when making comparisons, it is always necessary to assess the banknote specifications in their entirety as the integration of certain security features may adversely affect the banknotes' resistance to wear and tear.

### **Health and safety and environmental issues**

Well before the launch, the Eurosystem had commissioned analyses of the euro banknotes, assessing them against the most stringent European health and safety regulations. These tests were carried out on all seven denominations, all producers and all the production materials of suppliers. They confirmed that euro banknotes would not cause any health problems if used normally and would meet all legal requirements.

After the launch, the media reported on the presence of Tributyltin (TBT) in euro banknotes and the possible impact on health. TBT is used as a stabiliser in a large number of everyday products, including food packaging, textiles, wood preservatives and disinfectants. The ECB commissioned further

in-depth studies into TBT and concluded that there were indeed very small concentrations of TBT in specific raw materials used in euro banknote production, but that they were by no means significant enough to harm the general public. An individual would in fact need to consume more than 2,500 euro banknotes per day over a significant period of time to exceed the recommended tolerable daily intake. Irrespective of this, the ECB has taken action to eliminate TBT from the euro banknotes as part of its precautionary approach towards public health matters.

In late 2002, there were reports in the media about the possible presence of genetically modified cotton (GMC) in euro banknote paper. The ECB has started investigating both the possible presence of GMC fibres in euro banknotes and its potential impact on public health and the environment, in co-operation with suppliers and specialised institutions.

### 3 Euro banknote issuance

#### A level playing-field for NCB cash services

According to Article 105 (2) of the Treaty establishing the European Community, the European System of Central Banks (ESCB) has a responsibility to promote the smooth operation of payment systems in general. However, the position with regard to the various payment instruments is neutral, i.e. the Eurosystem neither promotes any particular payment instrument, nor prevents or hampers its use. The introduction of the euro banknotes and coins has posed considerable challenges to euro area NCBs, which have quite different national traditions and practices in the field of cash logistics and services. Against this background, the Governing Council has underlined on various occasions the importance of a level playing-field for cash services. It has consequently adopted certain measures contributing to a fair, competitive environment for the provision of cash services:

When selecting cotton for banknote paper, the same standards are applied as in the textile industry and there is no evidence that exposure to GMC damages health. The ECB is monitoring the issue closely and will take any action deemed necessary on the basis of its precautionary approach towards public health and environmental issues.

As part of its continuous improvement programme for banknote production, the ECB has initiated further studies on health and safety and environmental issues related to euro banknotes. The ECB remains fully committed to continuously monitoring developments in this field and improving Eurosystem banknote production standards, and is constantly seeking and evaluating opportunities to minimise the health and safety and environmental impact of the production and use of euro banknotes. Experience gained will be applied to both current and future banknote series.

- A common Eurosystem fee policy for the cash transactions of professional clients at NCB counters was implemented as from 1 March 2002, defining both free-of-charge services and fee-based services.
- With regard to cash recycling machines in the euro area, a common Eurosystem approach has been agreed resulting in the establishment of terms of reference for the use of these machines by credit institutions and other euro area parties engaged in the sorting and distribution of banknotes.<sup>1</sup>
- A common approach to opening hours and debiting/crediting rules for cash services at NCB counters has also been defined.

The ECB will continue to analyse and discuss additional measures on an ad hoc basis with

<sup>1</sup> The terms of reference can be found on the ECB's website ([www.ecb.int](http://www.ecb.int)).

third parties, including the European Credit Sector Associations. Also in this context, the Cash User Group (CUG) was set up jointly by the European Commission and the ECB in January 2003. All sectors and industries involved in the handling of euro cash are represented in this group. This includes banks, retailers, cash-in-transit (CIT) companies, the cash-operated machine industry, as well as consumers and small and medium-sized enterprises. The CUG serves as a forum for regular dialogue on all issues related to the use of euro banknotes and coins, thus being an important body to help the European authorities in their efforts to continuously improve the use of Europe's single currency. It provides input for the monitoring of the performance of euro banknotes and coins and contributes to the better definition of the needs and expectations of private and professional users of euro cash.

### **Stock management and the efficient use of euro banknotes**

In order to meet the demand for euro banknotes in any situation, the Eurosystem needs to keep an appropriate level of stocks. Euro banknotes are managed and stored in accordance with the principle of decentralisation. Accordingly, each NCB has to maintain a certain level of banknote stocks for logistical purposes, with a view to ensuring a smooth and efficient supply of euro banknotes under normal circumstances. NCBs should try to smooth irregular banknote flows by managing banknote surpluses and shortages at the regional/branch level by means of banknote transportation within their jurisdiction.

The main objective of the stock management system is to monitor and efficiently co-ordinate the logistical stocks at the

Eurosystem level, also taking into account the use of the ESS (see above). One key element is that the NCBs have calculated appropriate benchmark inventory levels per denomination for their logistical stocks. In view of existing national peculiarities, such as structural differences in NCBs' branch networks or differing seasonal fluctuations in demand, the benchmark levels may vary between NCBs and banknote denominations.

In addition, credit institutions and CIT companies may decide to also offer their cash services in euro area countries other than their own. As with tourism, this could lead to persistent imbalances in cross-border banknote flows, which may ultimately call for the transfer of banknote stocks between NCBs.

Whilst the NCBs are responsible for monitoring and managing the logistical stocks at the national level and for monitoring developments in these stocks in relation to euro banknote demand, the ECB centrally monitors the logistical stocks at the Eurosystem level and co-ordinates the cross-border use of logistical stocks. This is necessary to respond to changes in supply or demand in individual countries, or to banknote migration. To date, several bulk transfers of logistical stocks have been carried out in order to avoid imbalances in stocks among NCBs.

Depending on the accepted quality of the banknote circulation, NCBs could vary the threshold for determining banknote fitness in sorting machines, which would affect banknote destruction levels. However, given that the cost of replacing unfit banknotes is shared by all NCBs in accordance with the mixed production key, the Governing Council has agreed on common minimum NCB sorting standards.

## 4 Anti-counterfeiting measures for euro banknotes

### Organisation of counterfeit handling within the ESCB

When considering the Eurosystem's approach to handling counterfeit euro banknotes, it was decided that a co-ordinated decentralised system would be adopted, in which the advantages of both centralised and decentralised approaches would be maintained.

The ECB has established a Counterfeit Analysis Centre (CAC) to look after the centralised elements of counterfeit banknote handling. The CAC is in charge of the analysis and classification of the better quality and/or international counterfeits, as well as acting as a National Analysis Centre (NAC) for euro counterfeits originating from outside the European Union (EU). For the euro coins, these functions are assumed by the European Technical and Scientific Centre (ETSC), which has been established by the EU Member States.

In parallel, each EU Member State has established an NAC for banknotes and a Coin National Analysis Centre (CNAC) for coins. The NACs and CNACs are institutions set up to manage counterfeits on a national basis.

All these centres contribute to the collection of data on counterfeit euro banknotes and coins which are fed into the Counterfeit Monitoring System (CMS) and they use the information that is centralised there to perform their respective tasks.

Within the ESCB, a specially established group – the Counterfeit Working Group (CWG) – deals with counterfeit matters. It is principally concerned with the statistical and technical reporting on and the analysis of counterfeit euro banknotes, the user management of the CMS and the co-ordination of communication between all relevant parties.

### The Counterfeit Monitoring System

The CMS is a central repository where all the statistical and technical information on euro counterfeits (both banknotes and coins) is stored and put at the disposal of the authorised users.<sup>2</sup> It is a web-based application accessible by all the authorities in the EU involved in the fight against euro banknote and coin counterfeiting. The technical description of each new counterfeit class includes reproduction techniques, the way in which the different security features are imitated and pictures of the counterfeits. In addition, the CMS incorporates a geographical information system that is used in particular by the police to investigate the distribution of counterfeits.

### Statistics

The early resistance of the euro to counterfeiting has been very encouraging. During 2002, fewer than 170,000 counterfeit euro banknotes were removed from circulation. This is less than a quarter of the aggregate quantity of counterfeits of the legacy currencies reported in 2001. The €50 banknote was clearly the favoured target of counterfeiters, accounting for over 80% of the counterfeit banknotes. So far, the euro has not been a significant target outside Europe: over 99% of euro counterfeit banknotes were recorded in the 12 euro area countries.

### Future threats

The principal threats are perceived to be a significant rise in the quantity and/or quality of counterfeits or in their production and circulation outside the euro area. Measures currently under consideration to minimise the

<sup>2</sup> For example, the ESCB and the police.

probability and potential impact of these threats include an extension of the public awareness programme and the conclusion of co-operation agreements with NCBs and law enforcement authorities representing non-EU countries. In

addition, information gathered on counterfeits and their technological standards is fed back into Eurosystem banknote research and development to enhance the resilience of both current and future designs.

## **5 Further challenges ahead**

One and a half years are clearly a very short time in the life of a physical currency. Therefore, it is still indeed necessary to speak of early experience. Given the fact that the euro is a currency for the citizens of 12 countries with very different cash handling traditions and practices, it will be quite some time before a steady-state situation is reached. A great deal of experience thus remains to be gained with the new currency in its unique surroundings. This experience

concerns production quality and quantity, the central banks' issuance and cash service policies, as well as the protection against counterfeiting, including the related research and development work. The Eurosystem will constantly monitor and seek to make improvements in these areas in order to exploit to the greatest possible extent the potential of a currency used by more than 300 million citizens.