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Opinion

- 2 Editorial
- 3 Interview with Louis O'Byrne
The Irish point of view about central bank cash management
Head of the Currency Centre of the Central Bank & Financial Services Authority of Ireland
- 6 How to manage cash policy in 15 countries?
The development of cash management policies in Europe
Antti Heinonen. *European Central Bank*
- 8 The Eurosystem's legal competence regarding banknote issuance
An analysis of Eurosystem regulatory powers in the field of banknotes
Pedro Machado. *Banco de Portugal*
- 10 Improving banknote and coin statistics: a condition for efficient cash management
A powerful instrument for cash management improvement
J. Darío Negueruela. *Banco de España*

Banknotes and Coins

- 12 Costa Rican banknotes
Ricardo Rodríguez. *Banco Central de Costa Rica*
- 14 The Issue and Custody Department of the Banco Central de la República Dominicana
Cristian A. Cuesta. *Banco Central de la República Dominicana*

Cash Activities and Technology

- 16 The Note Quality Reward Scheme
The Australian system to improve the quality of banknotes in circulation
Michael Andersen. *Reserve Bank of Australia*
- 19 The world-class cash operation
Current challenges and prospects for the cash processing industry
Ed Brindley. *De la Rue International Ltd.*

CIGE

- 21 V International Course on Cash Management

Miscellaneous

- 22 International events
- 23 Central banking news
- 25 Publications devoted to cash
- 26 Banknote security features

Editorial

■ J. Darío Negueruela *Banco de España*

Spring has arrived, and with it, as promised, comes this third issue of **BILLETARIA**. We wish to thank all our readers and colleagues who have given us their help and who have encouraged us to continue with this review, aimed at professionals in cash management in central banks worldwide, whatever their location, size or currency.

This latest issue replicates the format and appearance of the second issue. We have made no significant changes, and we have continued with a number of items that we hope will come to define the review: an interview with a representative figure in the industry; a combination of short and more in-depth articles and of technical illustrations and more informal and more colourful images; a different world map on the back page of every issue; analysis of a specific series of banknotes and of a cash and issue department; and a guest contribution from a manufacturer or supplier. As well as an open invitation to all central banks interested in making their own contribution.

Publication of the interview with Louis O'Byrne coincides with his departure from the Central Bank and Financial Services Authority of Ireland where he has worked for the last forty years. Louis is taking a well-deserved break, and we wish him every success in the future. In the interview he offers a series of personal opinions which we are sure will be of great interest to all our readers. On most matters Mr. O'Byrne is, as always, right on the mark, even though one may not always necessarily agree with him on all the details.

In this issue the Opinion section contains three contributions from Europe; in the next issue we would hope to extend the geographical reach. First up is Antti Heinonen, who is about to leave the Directorate Banknotes of the European Central Bank where he has done an extremely important job at a historic point in time, with the laying of the foundations of the Eurosystem in the field of cash management. Mr. Heinonen presents a brief, didactic and spot-on overview of the singular nature of an area of issue that embraces 15 different countries, a subject on which few can speak with greater authority. He is followed by Pedro Machado, who once again demonstrates his sharp legal style and gives us a concise and clear master class in a singular and on occasions little-known subject, namely the legal basis of the Eurosystem's issuance capacity. And lastly a contribution by the undersigned, aiming to attract attention to the urgent need for work to be done on the creation of a minimum cash management statistical database. Until this gap is filled, it will be difficult for us to speak of new management styles or efficient modern management in our field.

The Banknotes and Coins section is dedicated to the banknotes issued by the Banco Central de Costa Rica, with special emphasis on the characteristics of the 10,000 Colon note, and to the Issue and Custody Department of the Banco Central de la República Dominicana which presents an overview of its structure and activities.



The Cash Activities and Technology section consists of two contributions: the first from the Reserve Bank of Australia, presenting a novel and original system that rewards credit institutions for activities and initiatives designed to enhance the quality of banknotes in circulation, an idea that will no doubt delight our readership; and the second from the firm De La Rue, on the present challenges and future prospects facing the cash processing industry.

In the section devoted to the CIGE we report on the characteristics and content of the V International Course on Cash Management which is being organized by the Banco de Portugal and will be held in Lisbon at the end of May.

The now traditional Miscellaneous section contains information on international events, news and publications in the field of cash management. We reiterate our call to all our colleagues for contributions for this section, all of which will be very gratefully received.

The broad range of potential contributors heightens the difficulties faced in presenting such a wide range of contributions with no specific or central theme. Therefore, the Editorial Committee is considering the possibility of establishing a central theme (but not an exclusive or monographic theme) for each issue of **BILLETARIA**. Accordingly the fourth issue, to be published in October 2008 with a similar format and structure, will concentrate, in particular, on aspects relating to communication between central banks and society in general on matters connected with banknotes and coins. And the first issue of **BILLETARIA** in 2009 will concentrate, in particular, on aspects relating to polymer or non-paper banknote substrates. We believe the opportunity that this represents for those interested in making a contribution on the subject in question offsets the possible risks that giving advance warning of our content may imply, and we are certain that this will be appreciated by the international community.

Our thanks go to all our contributors and readers. **BILLETARIA** is a forum for debate, a meeting place whose doors are always open. We welcome all comments, contributions and suggestions, via the **BILLETARIA** e-mail address that appears on the back page of the review. We look forward to hearing from you.

Collaborators

Louis O'Byrne	Head of the Currency Centre. Central Bank & Financial Services Authority of Ireland.
J. Darío Negueruela	Director of the Cash and Issue Department. Banco de España.
Antti Heinonen	Director Banknotes of the European Central Bank.
Pedro Machado	Legal Counsel. Banco de Portugal.
Ricardo Rodríguez	Director of the Treasury Department. Banco Central de Costa Rica.
Cristian A. Cuesta	Director of the Issue and Custody Department. Banco Central de la República Dominicana.
Michael Andersen	Head of Note Issue. Reserve Bank of Australia.
Ed Brindley	Head of Pre-Sales and Product Management. De La Rue International Ltd.
María Eulalia Andonegui	CIGE Coordinator. Banco de España.
Antonio Tarantino	Photographer.

Interview with Louis O'Byrne,

Head of the Currency Centre of the Central Bank & Financial Services Authority of Ireland

■ J. Darío Negueruela *Banco de España*

Louis O'Byrne is one of the most eminent figures in Europe in the field of cash management. We met in 2001 in the CASHCO, the ad-hoc Committee established to prepare and monitor the cash changeover in the 12 Member States which adopted the euro as the single currency in 2002. This event was a real milestone and it was considered as such by the majority of us; sharing those experiences is difficult to forget. I was probably the novice participant at the meetings and Louis one of the most outstanding representatives. From that moment onwards, our friendship has been informed by mutual respect, cordial co-operation and my personal admiration for one of the great living masters of the trade. Nowadays he applies his many qualities to other activities: his family, his friends both in Ireland and abroad, his hobbies and his "second jobs". I refer to those activities at which he is very gifted and which inspire admiration in his friends.

My view is that cost is not the first consideration when considering banknotes. The key element in relation to banknotes is confidence. Unless banknote users have full confidence in that piece of paper that is a banknote, they will not use it. Therefore, the first objective must be to make the banknote as secure as possible. From the cost/benefit point of view, there is much more to be lost to central banks if people refuse to accept or use banknotes, because they fear they are counterfeits, than the cost of spending a little more on making the notes as secure as they can be. My views, therefore, are on the side of the Swiss approach rather than on the side of central banks who chose low cost over high quality product.

Louis started working for the Central Bank of Ireland in the 1960's and has remained loyal to the institution ever since, working in two important areas: the Foreign Department and cash activity. He has been a member of the Banknote Committee of the Eurosystem since 2000 where his opinions and contributions are always considered with special respect. His experience and common sense are always pivotal in the discussions of sensitive, novel or difficult issues. For all these reasons, and on account of our friendship, it is for me a great pleasure to converse with Louis O'Byrne and to give **BILLETARIA** readers the benefit of his opinions.

Q. You have now been working for the Central Bank & Financial Services Authority of Ireland (CBFSAI) for more than 30 years. Could you briefly explain your professional experience there?

A. I joined the Central Bank of Ireland during "the best of decades", the 1960s. Almost all my career has been in two areas – Foreign Exchange/Exchange Control and Currency. I was Head of Currency Issue from 1982 to 1988. Then I went back to the Foreign Exchange/Exchange Control area. Since the beginning of 1993, I have been Head of the Currency Centre which includes Currency Issue, Currency Processing, the Banknote Printing Works and the Mint.

Q. The Currency Centre of the CBFSAI is one of the few cases in the world in which one department of a central bank is responsible for the activities: production of banknotes, coins mintage and sorting of used banknotes. According to your experience, in which of these

Mr. Louis O'Byrne was born in County Wicklow (Ireland). He graduated in economics and joined the Central Bank of Ireland in June 1963. He worked for various departments, including Banking, Foreign, Government Loans, Management Services, Exchange Control and Currency Issue. He joined the Currency Issue Department in 1982 as Head of Currency Issue where he worked for several years. From 1989 to 1992 he managed the departments responsible for the foreign exchange reserves and exchange control. He returned to the Currency Issue Department in 1993 as the Head of the Currency Centre in Sandyford. He continues to hold this post and he is also Assistant Director General.

Mr. O'Byrne has been very active in the international arena. In the 1980's he was a member of the Statistics and Banknote Handling Committee at the Banknote Printing Committee (BPC) and in 1993 he became a member of both the BPC Policy Committee and the Policy Committee Advisory Group. In 1993, he also joined the Banknote Working Group, the predecessor of the Banknote Committee of the European System of Central Banks. He is currently the Central Bank & Financial Services Authority of Ireland's representative on this Committee



activities is the Currency Centre more efficient?

A. The model we use is, in my view, the most efficient model for a country of our size. The key activities are currency issue, currency withdrawal and used banknote processing. These require substantial overheads in the form of premises, security, engineering administration etc. By establishing a printing works and mint on the same premises, the same security, engineering etc. can cover these activities also at very little extra cost. What are very expensive overheads can, accordingly, be shared over a much wider activity base with a substantial gain in efficiency.

Q. The Currency Centre is located in Sandyford, about 15 Km from Dublin. What are the advantages and disadvantages,

if any, of locating a currency centre at a distance from the main premises of the central bank, outside a city?

A. The Currency Centre is located about 15 kilometres from the Bank's Head Office in the city centre. There is no doubt that two locations are much more complex for an organisation to manage than one. Nevertheless, there are substantial advantages to having an industrial location outside the city in terms of lower site cost and nearness to the motorway which goes around the city and connects with the main transport arteries to the rest of the country.

Q. What is your opinion about the cost of cash?

A. There are several aspects to the cost of cash. To the end user, the



J. Darío Negueruela (left) and Louis O'Byrne (right)

Personally speaking, I do not like the concept of parallel issuance. If a central bank announces that an upgraded banknote is necessary to stay ahead of the counterfeiter, then the older series should, in principle, be withdrawn immediately. Otherwise a very mixed message is sent to the public and confusion or lower confidence can result. The problem is that immediate withdrawal of the old series can be very expensive and logistically difficult. The decision revolves around where you decide the best balance of advantage lies between these two competing factors. I would tend to err on the side of speedy withdrawal of the old series.

citizen, cash seems virtually cost free. To the commercial banks, it has costs that they would like to avoid. But I do not see many of them refusing to provide a cash service to their customers. Cash is still important for their business relationships. From the point of view of society, I have little doubt but that cash is still the most efficient means of payment for small purchases.

Q. Central banks rely on a variety of strategies to enhance efficiency in the production and supply of cash to the economy. What is for you the meaning of

efficiency applied to the cash management?

A. Each business segment in the cash cycle constantly seeks to make itself more efficient. This can be done by improving the efficiency of ones own operation or by passing costs on to other segments. To me efficiency is represented by the best overall cash service to the community at the lowest cost. In the modern business environment this is probably best achieved by just this kind of competition among the various participants in the market.

Q. The selection of a substrate for a banknote has become more and more topical in the definition of a new series of banknotes, in particular for low denominations. The substrate is an important component of the banknote that contributes to improve its quality in circulation. In your opinion, what are the key factors for the selection between paper / polymer substrate for a banknote?

A. My strong preference is to keep the same substrate for all denominations. One of the key factors for alerting users to a counterfeit is that it feels different. I think that we dilute that advantage at our peril. At this moment the distinctive banknote feel is really only available using a paper-based substrate. In time it is likely that a multi-layer polymer substrate will win out. It has, in theory, much more potential for incorporating security features as well as longevity advantages. But I think that there is a huge amount of

research and development work needed before a product is available that really beats paper.

Q. Concerning the issuance of high denomination banknotes, what is your analysis of pros and cons of this decision? What advice would you give to colleagues of other central banks about this issue?

A. There is a common human tendency to impute moral status to inanimate objects. I often hear high denomination banknotes condemned because they are used for criminal purposes. From my observation over the years, however, the last things that criminals want are high denomination banknotes. They want denominations that are regularly used and accepted without question. As central banks, one of our functions is to provide a banknote service to the community. If there is a demand for high denomination, as part of the overall mix, then we should provide for it.

Q. With regard to the outsourcing of the cash activities of a central bank, what should be the limits, if any?

A. It is difficult to decide where the line should be drawn between what the central bank does and what the market does. In general, it is desirable to leave as much as possible to the commercial sector. But, if the central bank withdraws too much from the business, it loses control of its product. Then the banknote circulation quality deteriorates as commercial operators find it too expensive to extract the unfit banknotes. I am still not sure where the line should be drawn.

Q. In general for cash activities, are you in favour of a system based on regulations or on leaving to the market the auto regulation?

A. Again, my preference is to leave as much as possible to the market. As with any complex human activity, detailed regulations for cash handling will not be very successful. It is better to have few, straightforward and well-implemented regulations rather than to have many, complicated ones that are ignored.

The optimal level of stocks of banknotes to meet the demand is a topical issue in which many central banks are currently working. Our experience over the years is that six months issue is about the best stock level. Being part of the Eurosystem now means that, if we need emergency supplies, we have fourteen partners ready to help. In our circumstances, the key factor is to keep in close touch with the commercial banks on their ATM plans. If there is a sudden move by a major commercial bank, for example, to put €50s into their ATMs instead of €20s, it can change the pattern of demand dramatically. With regard to the fight against the counterfeiting, the key is continuous education of the first line of defence, the person at the cash till, and to achieve this without creating the impression that there are large quantities of counterfeits around.

Q. I remember the statement made by you some years ago: "banknotes and coins are two different animals". What is your view about the role of a central bank in coin activities? Could you provide some advice on how to manage the coin tasks carried out by a central bank?

A. They are indeed two very different animals. For one thing, people often seem to take more interest in the coins as objects than in banknotes. They seem to take coin matters personally. This does not mean that their views are very consistent. They will wait at the cash till for their one-cent change. They will then discard it when they get home. They will complain about low-value 'rubbish' coins and then scream loudly about inflationary effects if anyone suggests abolishing them.

Q. According to the Irish experience, what do you think about the structure of denominations (8 coin denominations and 7 banknote denominations) and the boundary between the high coin denomination (€2) and low banknote denomination (€5)?

A. In principle, I think that there should be seven coin denominations and six banknote denominations. But in practice it can be difficult to get practical reality to align with theory over the short term. The 1, 2, 5 sequence is the one I prefer. The smallest denomination would be the 5 cents. The 1cent and 2 cents coins are not treated with respect, even by children, and, therefore, do not contribute to the concept of value in the currency. The €5 denomination seems to have now crossed the threshold where it is a change-giving denomination more than a tendering denomination. This is part of the reason why the circulation quality is so poor. However, there are security difficulties with a coin of this value. This is where substantial research effort is still required for the euro and for many other currencies that are in a similar situation.

Q. The relationship between a central bank, commercial banks and Cash in Transit companies (CIT) is a key factor in cash management. What is your experience of this relationship with commercial banks and CIT?



A. We have solved this relationship problem in a rather unique way. We expect the commercial banks to employ the CIT companies to collect the cash from, and lodge the cash back with, the CBFSAI. We do not have any direct relationship with the CIT companies. However, because of their pivotal position in the system, we do keep in contact with them.

Q. In the battle on the future use of payment instruments: banknote / plastic cards for cash and other electronic devices like mobile phones, is there any future for banknotes?

A. When I was a very young central banker, in the late 1960s, my boss said to me one day "If you are thinking of a long-term career in this business, you should read this". He gave me an article from The Banker magazine. The title was 'The Cashless Society'. We are still waiting. It is a bit like The Paperless Office really. But, as the ancient Greeks used to say, "There is one statement that is always true 'This too will pass'".

Q. Concerning the review on cash management BILLETARIA, what is your opinion about it? Would you suggest any change?

A. BILLETARIA is an excellent initiative. It is great to see a magazine for central banks, by central banks. My one request is that you keep the two versions – Spanish and English.

I have held the view for many years that the threat to cash comes from within rather than from outside. In other words, cheques, credit cards, debit cards, etc have not been the main threats. The market for payments was growing so rapidly that there was room for many different payment mechanisms. And it is very important that the public should have a choice of different methods of payment. The principal damage was likely to come from within. Cash depends totally on confidence. If the public loses confidence in cash as a reliable payment medium, for example through widespread counterfeiting attacks, they will move to safer mechanisms. To date, cash is regarded by the public, if anything, as safer than other payment mechanisms. On a more general level, if I were to pick out one external future threat to cash, it would probably be electronic payment using mobile telephone technology.

My Spanish is, I am ashamed to say, limited to ordering a beer.

Thank you very much Louis for your time and your words. Do not worry, I will pay for the beer. It has been a great pleasure to have this conversation. We will continue talking about "money business" for many years. Hasta siempre.

How to manage cash policy in 15 countries?

■ Antti Heinonen *European Central Bank*

The euro banknotes and coins were launched on 1 January 2002 in 12 countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain). Subsequently three further countries (Slovenia, Cyprus and Malta) have adopted the euro as their currency, and now the euro is the common currency for 15 European Union Member States. This brief article addresses the issue of how to manage cash policy in 15 different countries.

Development of cash management policies in the euro area

There has been continuous development of the euro cash management philosophy since the preparations for the launch of the single currency were initiated. One may distinguish three different phases in this development process. The first phase was from 1992 (when the Working Group on Printing and Issuing a European Banknote was established) up to circa 1999, during which the major focus was on the design and security features of the common currency and also on the preparatory work for a smooth cash changeover. This involved designing and originating banknotes and establishing the production and issuance scenarios. At that time the predominant thinking was that there would be common banknotes and coins produced

and issued but the national cash management policies and practices would broadly continue. This was, because the national central banks (NCBs) still had to operate under the prevailing national constraints, resulting from their role in the cash cycle, their existing branch network, and their long-term commercial agreements.

The second phase started around 1999-2000 when the focus of the preparatory work started to move more towards the issues that would become reality after the cash changeover. At that time efficiency and level playing field arguments became more important. As an example, in April 2001 the Governing Council of the ECB decided that from 2002, instead of being totally decentralised, euro banknote production would take place in accordance with a decentralised production scenario with pooling. Under this arrangement, each NCB is responsible for procuring normally only up to 3 denominations, which enables the Eurosystem to benefit from the economies of scale and it helps to ensure a supply of consistent-quality banknotes. Furthermore, after extensive preparation the Governing Council adopted in September 2004 a Guideline setting out how euro banknotes would be procured in the future. According to this Single Eurosystem tender procedure (SETP), NCBs which do not have in-house printing works (PWs) and do not use public PWs will use a common tender to procure the banknote production allocated to them. However, NCBs with in-house PWs or using public PWs may decide not to participate in the SETP. The SETP will apply from the beginning of January 2012 at the latest, but may apply earlier dependent on the fulfilment of certain criteria.

Efficiency gains were also made with the development of a common euro banknote stock man-

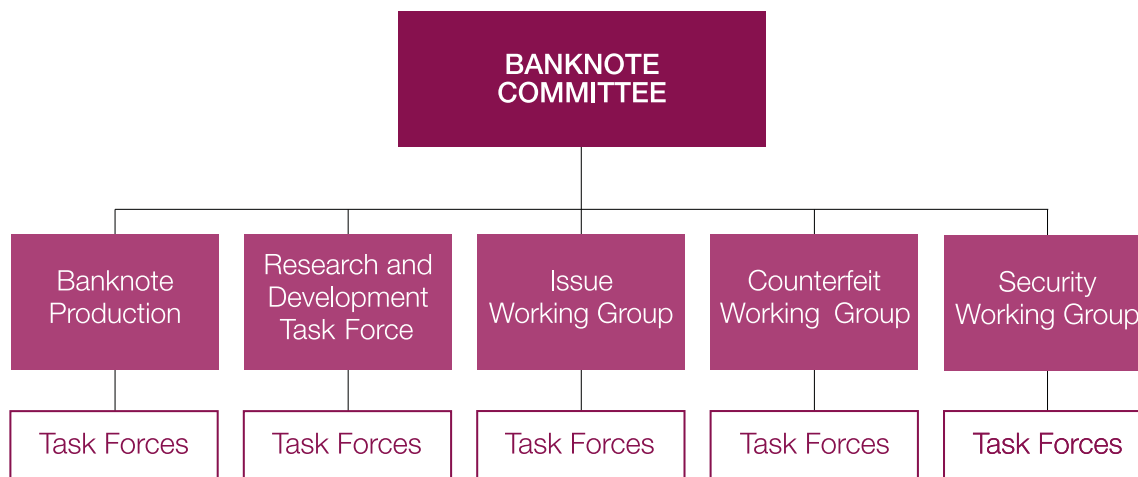


The ECB's Eurotower in Frankfurt am Main

agement system. The primary objectives of the stock management policy are to monitor and efficiently co-ordinate the logistical stocks at the Eurosystem level and to operate with a common Eurosystem Strategic Stock (ESS). The ESS is intended for exceptional circumstances to cover an unexpected increase in the demand for euro banknotes or a sudden supply interruption. Each NCB maintains a level of logistical banknote stocks to ensure a smooth and efficient supply of euro banknotes under normal circumstances. The ECB centrally monitors these logistical stocks at the Eurosystem level and co-ordinates their cross-border use. The ECB also coordinates the use of the ESS.

It also became evident before the cash changeover that certain NCB cash services should be harmonised, both because of maintaining a level playing field and in order not to give the wrong incentives to the market. Therefore, after the end of the dual circulation period on 1 March 2002, the free-of-charge services (i.e. the basic services that all NCBs shall provide, taking into account their unique role in providing the payments system with new and fit banknotes and coins) were harmonised. Also a common approach to opening hours and debiting/crediting rules for cash services at NCB counters was defined.

Developments which are based on efficiency and level playing field



arguments have naturally continued and will continue in the future, but in addition, new aspects have also come into play. This could be characterised as the third phase of the development of the euro cash management philosophy, in which more efficiency has been sought from the whole cash cycle giving all stakeholders the possibility to reap the benefits of the common currency. In addition, efficiency and effectiveness gains have been sought from the Eurosystem division of labour by creating the understanding that it is not necessary for every NCB to do everything and the system could benefit from specialisation and pooling.

Examples of measures to increase the efficiency of the cash cycle are the ECB framework for the detection of counterfeits and fitness sorting by credit institutions and other professional cash handlers, which was adopted by the Governing Council in December 2004. According to this framework, banknotes which are recycled to the general public via ATMs must be checked by means of a banknote handling machine type that has been successfully tested by an NCB. These tested models are published on the ECB website and are valid for the whole euro area. Furthermore, remote access to NCBs' cash services has been implemented recently. This means that credit institutions located in the euro area will have access to the cash services provided by an NCB in another euro area Member State, provided that these foreign credit institutions meet the same conditions for withdrawals and lodgements as the national credit institutions. Other examples which are still under

preparation are the development of common packaging standards for the free-of-charge lodgements and withdrawals of banknotes from NCBs, and a common Eurosystem approach to electronic data communications with professional clients. The Eurosystem has also decided on the introduction of orientation-independent banknote lodgements and withdrawals as a common free-of-charge service as from 2011, given that the technological developments for both banknote processing machines and ATMs allow banknotes to be read and processed in all four orientations.

There are also several examples of specialisation and pooling of tasks by the Eurosystem. Five NCBs have recently had a combined tender for the production of the euro banknotes allocated to them, four NCBs have agreed to maintain and develop a harmonised customer interface, a few NCBs have specialised in the testing of the banknote handling machines according to the banknote recycling framework mentioned above, and similarly, a few NCBs have specialised in the conduct of the annual tests of the quality of euro banknotes in circulation by processing banknote samples from each euro area country. In addition, some NCBs are responsible for the development and maintenance work of Eurosystem systems related to currency information and counterfeit monitoring and one NCB takes care of maintaining the website regarding the successfully tested banknote recycling machines. Specialisation also extends to the stock management area and the pilot programme regarding extended custodial inventory (ECI) system in Asia,

where one NCB is the logistical counterpart for the ECI banks on behalf of the Eurosystem.

However, the Eurosystem is not following the dogma of a "one-size-fits-all" cash management system. Irrespective of the common currency, there are differences in the economic and geographical environments where the NCBs and the stakeholders in the cash cycle operate. Furthermore, there are limits to the extent of change that can be introduced within a short period of time, and since the changes may necessitate investments by NCBs and commercial parties, the process of convergence will require long term consideration and flexibility.

Preparation for implementing common policies in the euro area

An important aspect of the cash management policy is how the preparatory work for the decision-making bodies is organised. The preparatory work is largely carried out within the Banknote Committee (BANCO) and its sub-structure of working groups and task forces, and is normally based on documents prepared by ECB staff. BANCO comprises maximum two members from each NCB and the ECB representing issuance and production expertise. Similarly working groups usually consist of

one member from each NCB. Task forces are generally established for a specific task and they may include 5-7 NCB and ECB experts, who have a special knowledge of the issue in question. Annually between 10 and 20 ad hoc task forces could be established and normally after having met a few times they submit their proposal via the relevant working groups to BANCO for final assessment and further advice to the decision-making bodies. This multilayered organisation can be time consuming but it guarantees that common policy proposals are well justified and the practical implications from the point of view of Eurosystem members are well considered.

Summary and conclusions

Regardless that it is only six years since the launch of the euro banknotes and coins, much has changed in the cash management policies of the countries that have adopted the euro. As the examples cited above demonstrate, the management of cash policy in an area comprising 15 countries is not as challenging as one may assume. When developing cash policies it is of utmost importance to carefully consider the pros and cons of a potential new common policy, jointly agree the objectives and then take the time to implement with care.



The Eurosystem's legal competence regarding banknote issuance

■ Pedro Machado *Banco de Portugal*

At Community level, the European Central Bank (the 'ECB') together with the national central banks of the Member States that have adopted the euro (the 'Eurosystem NCBs') bear solely the competence to issue euro banknotes. Under Article 106(1)¹ of the Treaty establishing the European Community (the 'Treaty') and Article 16 of the Statute of the European System of Central Banks and of the European Central Bank (the 'Statute'), the Governing Council of the ECB has the exclusive right to authorise the issue of banknotes in the Community; under these provisions, the ECB and the Eurosystem NCBs may issue such banknotes which are the only banknotes to have the status of legal tender within the Member States that have adopted the euro.



Article 10 of Council Regulation (EC) No 974/98 of 3 May 1998 on the introduction of the euro¹ states that 'with effect from the respective cash changeover dates, the ECB and the central banks of the participating Member States shall put into circulation banknotes denominated in euro in the participating Member States'. In a nutshell, Community law has foreseen a system of a plurality of issuers of banknotes composed of the ECB and the Eurosystem NCBs.

The issue of euro banknotes is not a legal concept whose meaning may be clearly perceived from any of the Community law provisions above. Legal commentators seem nevertheless to converge on the view that a banknote represents a form of monetary claim². In essence, issuing banknotes corresponds to the legal act by means of which the issuer incurs in a liability in respect of the holder of the

issued banknotes up to their face value. Such a liability is to be created against the issuer receiving a corresponding asset equal to the face value of the issued banknotes. In short, it is submitted that the concept of issue of banknotes refers to the creation for legal and accounting purposes of a liability by giving value to pieces of paper that (a) act as a store of value, (b) represent the official unit account and (c) serve as a means of discharging debts³.

The competence of the Eurosystem to issue euro banknotes includes a fortiori the act of putting them into circulation, this latter being however different from the legal act of issuing euro banknotes. Indeed, putting banknotes into circulation indicates that a banknote has physically left the premises of a central bank with the purpose of becoming a means of payment⁴, the reversing act being the withdrawal from circulation by

having the banknotes returned to a central bank. This said, it is noted that an issuer may not necessarily put into circulation or withdraw from circulation banknotes, as it will be demonstrated further below with the example of the ECB.

Further to putting into and withdrawing from circulation, it is argued that the Eurosystem's competence to issue euro banknotes entails an array of aspects which precede and go beyond the legal act of issue proprio sensu. As legal commentators have persuasively argued, 'any act which has a bearing on the circulation of banknotes is, by its nature, to be subject to prior approval of the ECB. To hold otherwise would undermine the exclusive authority of the Governing Council in respect of banknote issue by allowing separate, and possible diverging national decisions in respect of banknote circulation in the Community'⁵. As a general principle, it may be said that

1. OJ L 139, 11.5.1998, p. 1. Regulation as last amended by Regulation (EC) No 2169/2005 (OJ L 346, 29.12.2005 p. 1)

2. C. Proctor (2005) *Mann on the Legal Aspects of Money*, 6th ed., Oxford, p. 705.

3. H. Weenink (2003) "The Legal Nature of Euro Banknotes", *Journal of International Banking Law and Regulation*, Vol. 18, Issue 11, p. 434.

4. B. Krauskopf (2005) "How Euro Banknotes Acquire the Properties of Money" in *Legal Aspects of the European System of Central Banks - Liber Amicorum Paolo Zamboni Garavelli*, ECB, p. 245.

5. R. Smits (1997) *The European Central Bank - Institutional Aspects*, p. 206.

the perimeter of the Eurosystem's competence comprises the regulation of all aspects of the euro banknote cycle which is deemed reasonably necessary for the performance of the specific task of issuing euro banknotes. An overview on the features and limits of the Eurosystem's regulatory competence in this domain will be given in what follows.

Eurosystem's regulatory competence in the field of issue of euro banknotes

The European Court of Justice has already had the opportunity to stress, in the *Non-Community Workers* case⁶, that the provisions of the Treaty which confer a specific task to Community Institutions confer all powers to these latter which are reasonably necessary to carry out that task. In view of this case law, it must be considered that the Governing Council of the ECB has the power to set up a regulatory framework that is deemed reasonably necessary for the performance of the Eurosystem task of issuing euro banknotes, including inter alia the organisational set-up as well as those ancillary activities which are required for fulfilling such a task. Indeed, pursuant to Article 106(1) of the Treaty and Article 16 of the Statute, the Governing Council of the ECB was given a wide margin of discretion to decide on and organise the issue of euro banknotes against the backdrop of a system of plurality of issuers of banknotes. It is furthermore noted that Article 12.1 of the ESCB Statute empowers the Governing Council to adopt the guidelines and take the decisions necessary to ensure the performance of the tasks entrusted to the Eurosystem under the Treaty and the Statute. Thus, the competence under Article 12.1 includes the power to decide on the organisational set-up for carrying out the Eurosystem tasks, comprising the issue of euro banknotes. In pursuance of these powers, the Governing Council of the ECB has already adopted a considerable number of legal instruments.

In deciding on the issue of euro banknotes, the Governing Council of the ECB established that both the ECB and the Eurosystem NCBs issue euro banknotes in the legal sense (see Article 2 of Decision ECB/ 2001/15 of 6 December 2001 on the issue of euro banknotes⁷, as amended). In the very same Decision, the responsibility for putting into and withdrawing from circulation euro banknotes was solely assigned to the Eurosystem NCBs, hence without any involvement by the ECB (see Article 3(1) of Decision ECB/ 2001/15). Furthermore, the Governing Council of the ECB has laid down rules on the denominations of and technical specifications for euro banknotes, production, quality standards for sorting used euro banknotes, security rules on production, transport and storage, management of stocks and reproduction, exchange and withdrawal of euro banknotes, just to highlight the main areas where the Eurosystem's regulatory powers in the field of issue of euro banknotes have been exercised.

As for the organisation, it is noted that the Governing Council has already made use of its competence for the organisational set-up of the procurement of euro banknotes. Guideline ECB/2004/18 of 16 September 2004 on the procurement of euro banknotes⁸ defines the framework for the joint procurement of euro banknotes by the Eurosystem, which is foreseen to be applied on a full-fledged basis at the latest from 1 January 2012 onwards. The underlying reasoning was that the Governing Council's exclusive right to authorise the issue of euro banknotes includes also the competence to define the legal framework for a single procurement system of euro banknotes.

The exercise of regulatory powers by the Eurosystem in the field of euro banknotes may however be subject to different degrees of harmonisation and standardisation. For instance, the establishment of internal quality standards for sorting

used euro banknotes may be done, as it is currently the case, on a minimum harmonisation basis only, thus enabling Eurosystem NCBs, or at least some of them to be more restrictive. On the contrary, there are areas which per se require a maximum degree of harmonisation or standardisation, as it is notably the case with the denominations of and the common technical specifications for euro banknotes. In these latter cases, it is the authenticity of the euro banknotes that is at stake, hence without any possibility of deviation being permitted.

The exercise of the Eurosystem's regulatory powers in the field of euro banknote issue should, on the other hand, not be taken as boundless, since the Community only acts, as established in Article 5 of the Treaty, within the limits of the powers conferred upon it by the Treaty and of the objectives assigned to it therein. When exercising its regulatory powers on euro banknote issue, the Eurosystem is also subject to certain limits and requirements as to the action it chooses. Firstly, it is argued that such exercise has to serve the purposes of protecting the integrity of euro banknotes, that is the quality and authenticity thereof, and/or ensuring their physical uniformity. Secondly, the legal action to be undertaken must be necessary for achieving these objectives. A general reference to the competence for issuing euro banknotes without justifying and demonstrating the need for adopting a certain legal instrument would be unlawful. The necessity requirement also poses limits to the imposition of standards and rules on third parties other than Eurosystem NCBs. Finally, the Eurosystem may not interfere with the competences

assigned by the Treaty to other Community institutions in the field of euro banknotes (e.g. protection against counterfeiting), with other Community policies (e.g. waste management) or with the Member States sphere of competences (e.g. national criminal laws).

Conclusion

In conclusion, the existence of a Eurosystem exclusive competence in the field of euro banknote issue entitles the Governing Council of the ECB to regulate in a legally binding manner a wide array of aspects related thereto provided the exercise of such regulatory powers is reasonably necessary for fulfilling in an adequate and efficient manner the task of issuing euro banknotes and is kept within the boundaries of the powers conferred upon the Eurosystem by the Treaty.

The Eurosystem tends to rest on a decentralised setting, notably in the domain of euro banknotes. This means that the Eurosystem NCBs not only issue and put euro banknotes into circulation as they are assigned implementation tasks in respect of the legal framework in the field of euro banknote issue. In this context, it is noted that the role of the Eurosystem NCBs is pivotal for the effectiveness and uniform applicability of the rules thereof. In particular, Eurosystem NCBs are granted responsibility throughout the entire banknote cycle, which covers a wide spectrum of areas ranging from euro banknote production (which they may carry out through in-house or external printing works provided they have been accredited by the ECB) to banknote processing, including fitness and authenticity checks and destruction.



6. Joint cases 281, 283-285, 287/85, Germany v Commission [1987] ECR 3203, paragraph 28

7. OJ L 337, 20.12.2001, p. 52.

8. OJ L 320, 21.10.2004, p. 21.

Improving banknote and coin statistics: a condition for efficient cash management

■ J. Darío Negueruela *Banco de España*

In recent years the number of international forums, seminars, conferences and meetings devoted to matters relating to the world of banknotes, in particular, and to cash management in general has increased significantly. This is positive on many counts: it is helping to create a new climate of communication between the parties involved in an activity that was traditionally wary of exchanging information and experiences, and it generates interesting discussions and debates on different questions, although others may be of more relative interest and limited use. This article proposes a new topic for debate: the need for central banks to work on the creation and development of a basic statistical system for cash management, as an essential tool for making progress in efficient cash management models.

The article consists of four sections. The next section aims to place this discussion in context, with a brief overview of some of the topics that have been the subject of recent debate in the international arena. The third section proposes a number of basic points that should be considered in connection with this new management model, and the need to create new central bank statistics. Lastly, the fourth section places the new model within the cash management community and asks all the parties involved in the cash management cycle to review their respective positions.

Discussion topics

In the last few years there has been a significant increase in the number of conferences, seminars and meetings of various kinds devoted to cash management matters. Some of these events, organized, promoted and funded by private firms, have a marked commercial interest and consist of two parts: a) valuable professional presentations; and b) exchange of information and presentation of specimens and catalogues of new products and services of interest to the manufacturers and/or clients. At these meetings, the central banks and specialist printing works play the part of clients, interested in learning about the latest technological innovations relating to a unique product: the banknote. Direct contact with a range of suppliers (in some cases competitors) is generally illuminating and useful. These meetings also provide an opportunity for the chief cashiers of the central banks to establish contacts with their counterparts in other central banks

which it would be difficult for them to visit by virtue of the distances involved, enabling them to establish a different kind of relationship with their peers.

These meetings have generated discussion on a wide range of important professional matters: technical aspects related to the design, structure and production of banknotes (substrates, printing techniques, security features, coatings, etc.); aspects related to the day-to-day operations of central banks (the security of their premises, logistics and distribution of cash, packaging systems, systems for counting, processing and destroying banknotes, quality control systems, the fight against counterfeits, etc.); and aspects related to the policies of the central banks in their role of bank of issue, responsible for upholding public confidence in the national currency.

Other matters are also discussed at these meetings, for example: the significance and limitations of outsourcing in central bank activity; comparisons between efficiency levels in the public and private sector; the cost of cash; the battle between "plastic money" and "paper money", or between cash and electronic money, etc.

As indicated at the beginning of this article, the majority of the discussion topics and debates themselves are of great interest. But others are less so, and this is because one of the characteristic features of cash management in the majority of countries is the lack of a sound and consolidated statistical system, resulting in a lack of detailed knowledge of the

cash management activity and market. This is an extremely important point and one that differentiates cash management from all other central bank activities. There are, no doubt, historical reasons for this, but the fact of the matter is that the data available to cash management officers are very limited, in terms of both volume and quality, and are barely sufficient to support a top-quality decision-taking system. There are indeed data available on the cash management activities conducted by central banks, but that is another matter. Accordingly some discussions, despite generating great political and philosophical interest, founder as the result of a lack of figures and basic data to back up the debate. For example, the recent discussions on the cost of cash (or to be more precise on the "high cost of cash"); these discussions may be intellectually stimulating, but they have proved, in terms of methodology, to be inadequate and sterile. At this point in time, the lack of basic statistical data is preventing us from making progress in the more technical aspects, transforming the discussions into purely political debate at best, when not ideological or purely business oriented. Clearly this does not detract from the interest of the argument, but it places it on a different plane and one that is possibly less useful for those responsible for cash management at the central banks.

Information: the basis for a new management model

The lack of basic cash management statistical data is a crucial

problem faced by the majority of central bank chief cashiers. Naturally, all central banks have detailed information on their stocks of banknotes, their operations, the condition of their banknotes, the numbers of banknotes produced and destroyed, their operating costs, etc. The lack of information to which we refer relates fundamentally to aspects of the life of banknotes outside the central bank, the role of the banking industry in the distribution of cash, the use of cash in different commercial activities, the availability and use of different denominations in different geographical areas, the cash cycle in different economic sectors, ATM operations, etc.

In recent years there has been a clear trend for introduction of new and modern management systems into central banks' cash departments; this is in direct contrast to the data shortcomings that make it impossible to design basic management documents. Management by objectives, team building, new time-and-motion systems, project modelling, process re-engineering, new methods of staff motivation and incorporation of activities, improvements in service levels and quality control ... these are just some of the failed aspects of this increasingly demanding new management style which has not quite caught on. And in the meantime, the basic control instruments that all responsible managers seek have become a distant and totally unobtainable objective.

The fact that cash management is undergoing important changes in this first decade of the new century is clear for all to see; there are

a multitude of indicators that could be used to prove this point. Equally clear is the air of change visible in the great majority of central banks which have applied (or at least announced) extraordinary and unprecedented measures, aiming to move with the times. But none of these changes will be really effective if they are not founded on a basic structural project: design and construction of cash management statistics.

This is possibly one of the most important challenges facing those responsible for cash management today, naturally in the knowledge that design of these statistics will require significant investment of both time and resources. The international forums referred to earlier provide opportunities for meetings, relationships and contacts that could prove extremely useful for progress to be made in this area.

A challenge for all the parties involved in the cash cycle

It would be mistaken to think that only central banks need to make efforts to remedy one of the key shortcomings of cash management that is hindering and delaying progress and transformation in this field. Improvements in this respect are vital and will, without doubt, help to bring about a substantial change in the way in which we analyse cash. But little will be achieved if the other parties involved in the cash cycle fail to make a significant contribution to the creation of an operational database and development of new cash management models.

The banking industry should feel closely involved in this project.

Information on cash requirements broken down by branch office, geographical area, time of the year or any other variable should be a minimum objective for purposes of enhanced cash management; in this respect it would seem there is still a long way to go. And this is possibly also the case regarding other professional cash handlers such as cash-in-transit companies, banknote printing works and manufacturers of specialist machinery.

The situation is clearly different according to the characteristics of each country, but the general schema may probably be applicable without too much difficulty in the majority of cases. In times of change, third parties are often

blamed for rising costs, for the difficulties faced in making changes or for a lack of comprehension of the efforts made; changes in cash management prove no exception to this rule. The current interest in discussing the cost of cash, and in accusing the central banks of this "high" cost, is understandable and quite possibly legitimate, but it would probably be more positive and more practical for the parties involved in the cash cycle to stop looking for someone on whom to lay the blame and to make their best efforts to eliminate some of the structural deficiencies that have so far prevented us from implementing a more professional and more efficient cash management system.



Costa Rican banknotes

■ **Ricardo Rodríguez** *Banco Central de Costa Rica*

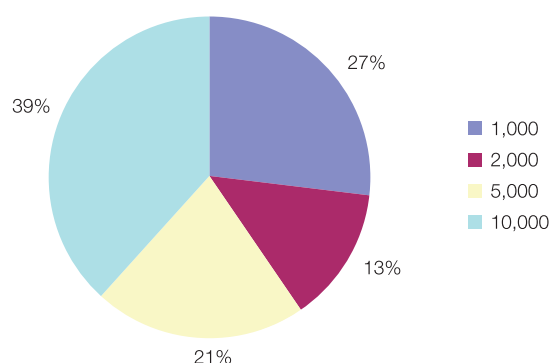
The Banco Central de Costa Rica was founded on 28 January 1950 as an independent body to regulate the country's economic, monetary and credit policy. The Ley Orgánica (organic law) that governs the Banco Central de Costa Rica grants it "the exclusive right to issue banknotes and coins in the national territory. Neither the State nor any other individuals or corporate persons may issue banknotes, coins or other documents or securities that may circulate as money". The law established the colon as the country's monetary unit, represented by a capital C crossed by two parallel vertical lines. It also stated that the banknotes and coins issued and put into circulation by the Banco Central de Costa Rica are the legal tender of the Republic.

Today the Banco Central de Costa Rica outsources banknote production to international companies that are duly recorded in the registry of suppliers held to this effect by the Bank's Purchasing Department. The responsibility for management of banknote purchasing lies with the Cash Department. Statistical models are used to estimate currency requirements; these models consider the requirements of the national finance industry, as well as the need to maintain an adequate level of stocks.

From 1950 to 1990, banknotes were issued in seven denominations: 5, 10, 20, 50, 100, 500 and 1,000 Colones. Subsequently, as a result of economic development, it was decided to replace all these banknote denominations, with the exception of the 1,000 Colon note, with coins with identical face value. Today the banknote series in Costa Rica consists of four denominations: 1,000, 2,000, 5,000 and 10,000 Colones.

At the end of 2007, the banknotes held by the public and financial institutions totalled 94 million, with a value of 509,900 million Colones. The most common banknote was the 10,000 Colon note which, as the chart shows, accounted for 39% of all banknotes in circulation.

Structure of banknotes in circulation



Data as at end-2007

Statistical data 2007	Colones	Euros
Total value of banknotes in circulation (million)	509,900.4	1,492.3
Average value of banknotes in circulation	5,453.5	16.0
Number of banknotes in circulation (million)	93.5	
Banknotes in circulation per capita	21.3	
Value of banknotes in circulation as a proportion of GDP	3.8%	

The 10,000 Colon banknote was introduced into Costa Rica at the end of 1998. It is the highest denomination banknote currently in circulation and the first in the country's history to bear a female effigy: Emma Gamboa Alvarado who is honoured for her work in the field of education. Similarly to all the other denominations currently in circulation, this banknote is 156 x 67 mm in size.

Features of the 10,000 Colon banknote

Design and printing substrate

The front of the banknote depicts Emma Gamboa Alvarado, one of the country's most distinguished female figures. Famous for her important professional role, especially in the University of Costa Rica, and for her struggle against injustice, her leadership and strong will were the driving force behind projects that consolidated the national education system and safeguarded democracy. The banknote also bears the combined image of four of the country's volcanoes that attract the most ecotourism: Irazú, Poás, Arenal and Rincón de la Vieja. On the back of the banknote there are figures of a puma and a jaguar, representing the animal species native to the natural conservation areas of the Cordillera Volcánica Central, Arenal and Guanacaste.

Similarly to the other three denominations currently in circulation, the 10,000 Colon note is produced on security paper whose raw material is 100% cotton, with an approximate thickness of 137 microns and an estimated paper weight of 100 grams per square metre.

Printing techniques

Intaglio. This printing technique is used on both the front and back of the banknote, applying the "bleed off" technique; this implies that the entire surface of the front and back of the note is printed, right to the edge of the note, to ensure continuity of colours and lines. The front of the banknote incorporates three colours and the back two colours.

Offset. Used for the security backgrounds on the front and back printed in rainbow. This printing technique permits incorporation of a see-through register whose complete image can be seen when the note is held up to the light. The front of the note incorporates four colours in offset visible to the naked eye and a fifth colour visible in the infrared spectrum; the back of the note incorporates four colours in offset.

Silkscreen. Used to apply the iridescent vertical band on the front of the banknote.

Letterpress. Used in the two sets of numbers that appear on the front of the banknote in red: one is a vertical set of numbers with figures all of the same size, and the other a horizontal set of numbers which increase in size.

Security features for the public

Front

■ **See-through register.** A geometrical figure engraved in blue appears in the top left-hand corner of the banknote, coinciding perfectly with that on the back of the banknote when it is held up to the light.

- **Multitone watermark.** This represents the effigy of Emma Gamboa Alvarado.
- **Security window-type metallic thread.** A thread 1.5 mm in width on which the words "BCCR 10000" appear repeatedly. Under ultraviolet light it is visible with combined fluorescence in two colours: alternately red and green in each of the windows. The thread conducts electricity and can be read by banknote sorting machines.
- **Intaglio printing.** Designs perceptible to the touch, such as the image of Dr. Emma Gamboa Alvarado, the words "BANCO CENTRAL DE COSTA RICA", "DIEZ MIL COLONES" and the number "10000".
- **Microprinting.** Both sides of the banknote bear a band in microprint on which the words "BANCO CENTRAL DE COSTA RICA" and "DIEZ MIL COLONES" appear repeatedly. The band is legible with a magnifying glass with magnification of 7-12 times.
- **Iridescent band.** An iridescent vertical band along the full height of the banknote consisting of the BCCR logo, in an intense yellow or gold tone which changes to silver when the banknote is tilted.
- **Tactile marks for the visually impaired.** A geometrical figure in high relief that appears on the front of the banknote in the bottom right-hand corner enabling it to be identified by touch.

- **Microprinting.** Microletters in a band on both the front and back of the banknote with the words "BANCO CENTRAL DE COSTA RICA" and "DIEZ MIL COLONES", legible with a magnifying glass with magnification of 7-12 times.

Information on substrate, dimensions and colours

Substrate	100% cotton fibre paper
Substrate weight	100 g/m ²
Dimensions	67 x 156 mm
Dominant colours	Blue and pink on the front; blue and brown on the back

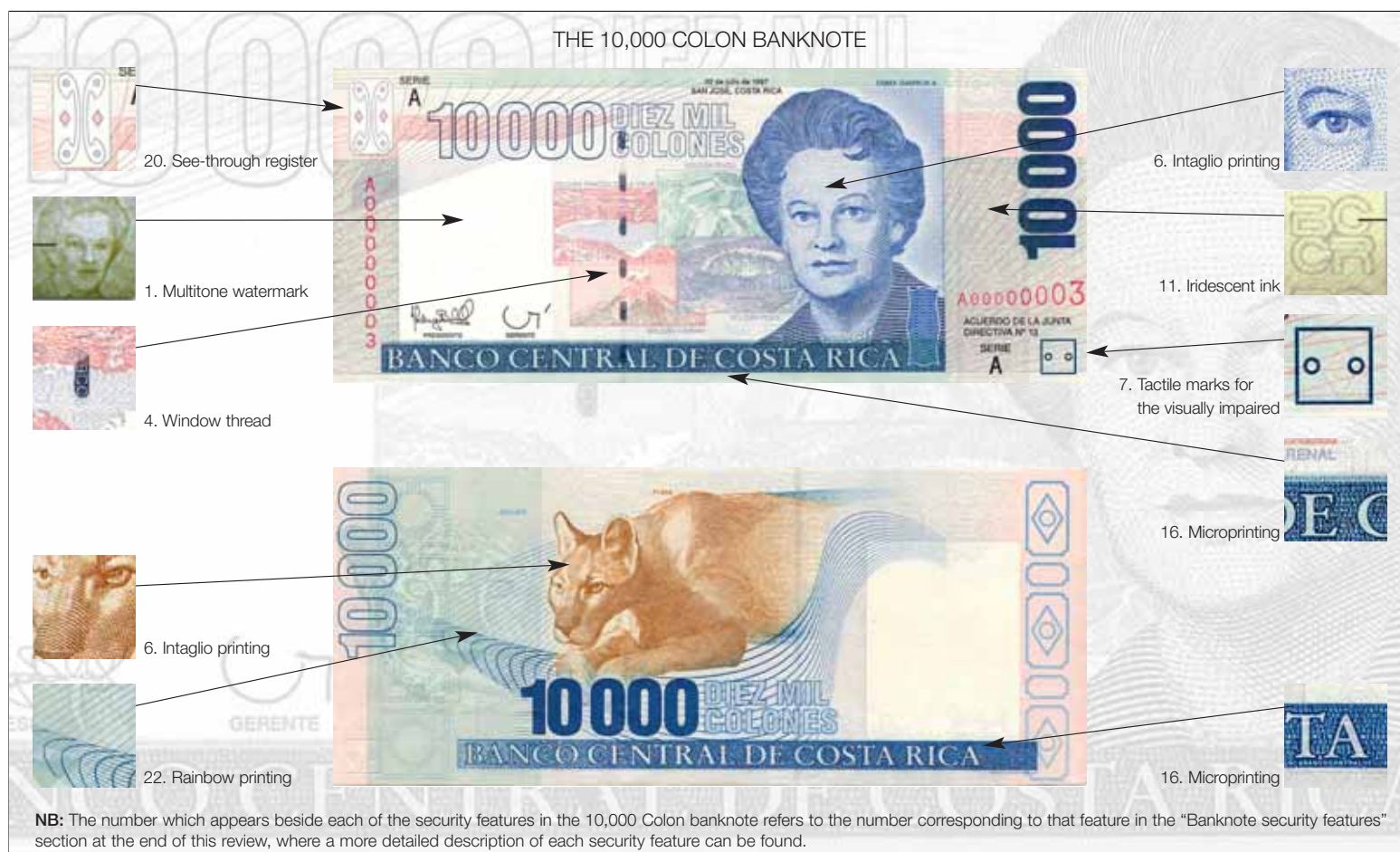
Plans for the future

At a meeting held on 31 October 2007, the Management Board of the Banco Central de Costa Rica resolved to issue a new series of banknotes consisting of six denominations (1,000, 2,000, 5,000, 10,000, 20,000 and 50,000 Colones), different in design, colour and size to the banknotes currently in circulation. The aim of the new issue, inter alia, is to comply with the ruling of the Constitutional Division of the Supreme Court of Justice which states that all banknote denominations in circulation must be easily identifiable by the visually impaired.

Polymer and cotton paper will be considered for production of the new series of banknotes; the decision will be taken according to the technical advantages of each material and the conditions and needs of Costa Rica. The new design, which is currently under way, will be a balance between the civic spirit, recognising persons who have played an important part in the history of Costa Rica, and environmental conservation, represented by the incorporation of images corresponding to the six ecosystems that constitute the country's biodiversity.

Back

- **Intaglio printing.** Designs perceptible to the touch, such as the image of the puma, the words "BANCO CENTRAL DE COSTA RICA", "DIEZ MIL COLONES" and the number "10000".
- **Rainbow printing.** A figure of a jaguar together with designs made from the letters BCCR, printed in offset.



Issue and Custody Department of the Banco Central de la República Dominicana

■ **Cristian A. Cuesta** *Banco Central de la República Dominicana*

The head office of the Banco Central de la República Dominicana is in the country's capital, Santo Domingo de Guzmán, DN. The central bank also has a branch office in the north of the country, in Santiago de los Caballeros. The banknotes and coins needed to meet national cash requirements are distributed to financial institutions from both these offices.

The Banco Central de la República Dominicana does not have its own facilities for producing banknotes and coins. Accordingly, the production process is put out to tender to companies specialising in this field and the banknotes and coins are produced by the successful bidders.

The mission of the **Issue and Custody Department** of the Banco Central de la República Dominicana is to provide the country's financial institutions with the banknotes and coins they need, in a timely manner and in accordance with appropriate conditions of quality and security. The Department also receives cash deposits from the financial institutions; these deposits are processed to determine which banknotes and coins may continue in circulation and which are no longer fit for use and should be withdrawn. These activities are performed at no cost to the financial institutions.

The Issue and Custody Department reports to the Operations Subdirectorato; the Department is divided into two subdepartments which are currently being reorganized.

The **Issue and Custody Subdepartment** is responsible for handling all cash: it sends banknotes and coins to the financial institutions in response to their requests and receives deposits from them. It also acts as the central bank's custodian of cash, documents, valuable items and other objects and it operates counters that provide cash services directly to the general public.

The Subdepartment is divided into three divisions: Banking Services, General Public and Custody.

- The Banking Services Division meets the financial institutions' cash requirements. It receives orders for banknotes and coins and delivers the amounts required on the following business day. It also receives deposits from the financial institutions, in local and foreign currency, and entrusts cash-in-transit companies with foreign currency consignments and exports of Dominican pesos to correspondent banks and cash consignments to the Bank's branch office in Santiago de los Caballeros.
- The General Public Division provides services to the public: these consist primarily of exchanging banknotes and coins that are unfit for circulation, receiving deposits for issue of Bank financial certificates and paying cheques issued by the central bank.
- The Custody Division is responsible for all operations connected with the custody of banknotes and coins in the Department's vaults and the custody of documents, securities, valuable items and other objects. It

Statistical data ¹	2005	2006	2007
Banknotes in circulation			
Amount	49,227,565,630	52,353,895,260	60,705,715,365
Units	185,211,871	184,927,656	174,734,799
Banknotes sent out by the central bank			
Amount	142,720,771,765	156,058,300,725	190,156,386,880
Units	378,937,814	279,397,412	315,715,200
Banknotes deposited with the central bank			
Amount	134,206,926,130	154,216,561,506	184,421,382,732
Units	364,824,824	281,831,899	328,326,451
Banknotes processed by the central bank			
Amount	122,127,537,915	161,674,980,116	184,335,458,952
Units	283,150,535	344,131,919	332,293,358
Destruction rate²	33%	50%	48%

1. Amounts expressed in Dominican pesos and Units in number of banknotes, at each year-end.
2. Number of banknotes destroyed and withdrawn / number of banknotes processed.

packages the cash requested by the Bank's branch office and the financial institutions, it coordinates and prepares the foreign currency consignments sent to correspondent banks abroad and it puts the banknotes to be processed in sorting machines into the corresponding stacks.

The Banknote and Coin Analysis and Quality Control Subdepartment coordinates studies to determine the need for new denominations of banknotes or coins or the need to transform existing banknote denominations into coins, in accordance with demand. It is also responsible for ensuring that the Bank has up-to-date information on the latest techniques for printing of banknotes and minting of coins, on the products and services offered by the sector companies and on the costs of security features. The Subdepartment issues reports on banknote and coin production requirements, it coordinates tenders for the production process and it checks test specimens before banknotes are definitively printed or coins minted.

This Subdepartment is also divided into three divisions: Banknote and Coin Quality Control, Programming and Statistics and Banknote and Coin Processing.

- The Banknote and Coin Quality Control Division establishes the specifications and characteristics of the country's banknotes and coins and periodically reviews the functionality of the security features used. When it is decided to issue new denominations, either for circulation or for coin collectors, the Division works with the Culture Department to coordinate the historical and/or cultural elements to be included in the design. In all banknote or coin production processes, the Division is



Premises of the Banco Central de la República Dominicana in Santo Domingo

responsible for analysing samples of the materials to be used and checking test specimens.

The Division has all the latest information on technological advances in banknote and coin production techniques and on the cost of banknote production worldwide. It analyses counterfeits, to determine which security features should be reinforced in future issues, and it organizes campaigns to educate the general public on security features and on careful handling of the banknotes and coins in circulation.

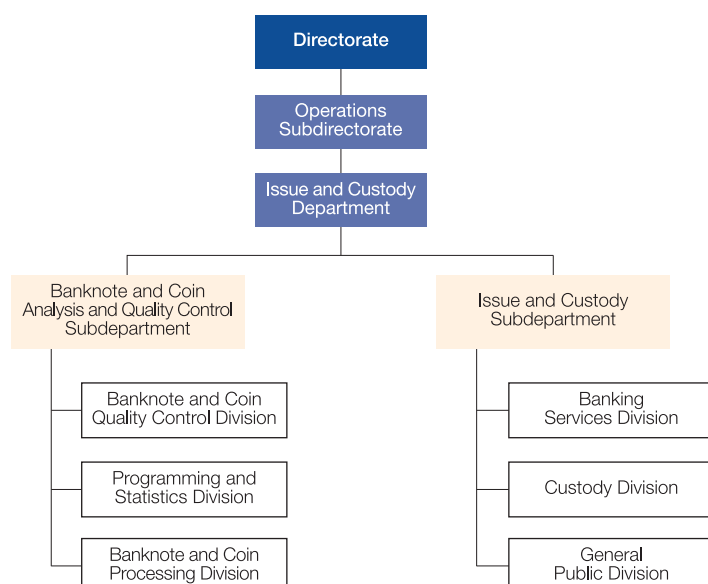
In coordination with the Bank's Internal Security Department, the Division is also responsible for issuing reports determining whether Domini-

can banknotes and coins received from the financial institutions as suspicious are in fact counterfeit or authentic. The central bank sends any allegedly counterfeit euro banknotes it may receive to the Banco de España for it to decide; it sends any allegedly counterfeit US dollar banknotes to a correspondent bank in the United States.

- The Programming and Statistics Division keeps up-to-date records of the stock of banknotes and coins held in the Bank's vaults, of all lodgements and withdrawals of cash, of all cash processing, of all sorting operations into cash that is fit for circulation and that which is unfit, of all cash destroyed and of the amount of cash in circulation. In addition, it handles the data on counterfeits, by denomination, type and year.

This Division is also responsible for preparing reports on banknote and coin production requirements, on the basis of the stocks held in the vaults, estimated demand from the financial institutions based on the previous year's figures and macroeconomic data.

- The Banknote and Coin Processing Division processes banknotes and coins, sorting banknotes into those that are fit / unfit for circulation. It is also responsible for withdrawing and destroying banknotes and coins that are deemed unfit for circulation and it recommends the levels of soiling to be established in the Bank's three banknote sorting machines (De La Rue CPS1800 and CPS200).



Plans for the future

The advantages and disadvantages of using polymer substrates in low denomination banknotes are currently being assessed. In addition, considering the fact that the majority of cash operations are made directly with the financial institutions, the possibility of establishing banknote processing and cash custody centres is being studied, based on the systems already in place in some central banks in Latin America.

The Note Quality Reward Scheme

■ Michael Andersen¹ *Reserve Bank of Australia*

This article describes the Reserve Bank's involvement in the Australian banknote distribution system over the past decade with particular attention to the recently introduced Note Quality Reward Scheme.

The Australian Banknote Distribution System

For much of the time since the mid sixties, the Reserve Bank owned and operated banknote processing and distribution centres in each capital city. Despite providing both retail and wholesale distribution services, it became increasingly apparent that the retail services being provided by the Bank were dominating its activities. Indeed, it was estimated that by the late 1980s the Bank was processing each banknote on average at least five times a year; a level that was judged was considerably greater than was necessary to keep banknotes clean and free of counterfeits.

In August 1990, the Reserve Bank introduced rules designed to encourage armoured car companies to recycle their daily commercial banknote collections independently of the Reserve Bank. Notwithstanding the reduction in turnover resulting from this change, several factors dictated the need for further modifications to the banknote processing and distribution arrangements:

- Between 1992 and 1996, the Reserve Bank replaced Australia's paper banknotes with polymer banknotes. It quickly became apparent that polymer banknotes were able to remain in circulation much longer than paper banknotes and required relatively less fitness sorting.
- Although the number of banknotes returned to the Reserve Bank under the new arrangements had declined, turnover of banknotes through the Reserve Bank continued to be high. The concern was that the Reserve Bank continued to be seen as providing a subsidised banknote sorting service to the industry and that the efficiency gains which should have resulted from the move to the cleaner and more durable polymer banknotes were not being realised.
- In 1996, the Australian Government introduced Competitive Neutrality Guidelines requiring that government businesses not gain a competitive advantage over their private sector competitors due to their public ownership.

To address these issues, new arrangements were introduced in June 1998 whereby armoured car companies would provide retail services directly to commercial banks instead of indirectly through the Reserve Bank. As part of these new arrangements, holdings of Reserve Bank owned banknotes were maintained at a number of armoured car company sites across the country. These Note Pools enabled the armoured

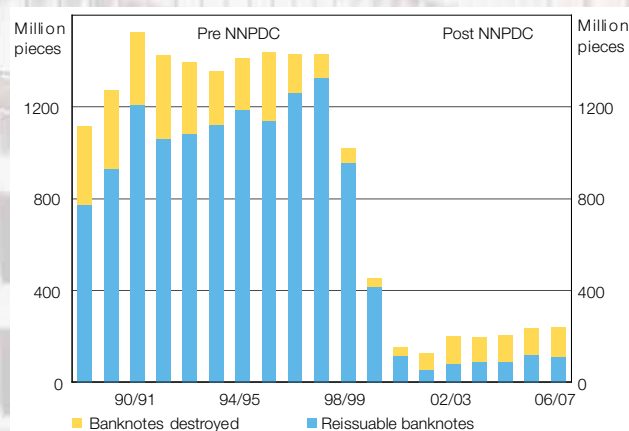
car companies to service the needs of their commercial bank customers and allowed for the distribution of banknotes from a larger number of more convenient distribution points.

These new arrangements only went some of the way to achieve the Reserve Bank's ultimate goals, however, and the Reserve Bank continued to be of the opinion that improved inventory management would result in further efficiency gains. The Reserve Bank also became concerned about the financial risks associated with maintaining such large Note Pools with private companies. As a result, the cash distribution arrangements were modified in November 2001 at which time the commercial banks² took ownership of the note pools by essentially purchasing them from the Reserve Bank and engaged the armoured car companies to manage their cash holdings.

In recognition of the balance sheet and revenue implications of privatising these note pools, the Reserve Bank agreed to compensate the commercial banks for their forgone interest revenue. Specifically, the Reserve Bank introduced an arrangement whereby interest was paid on the surplus working stocks of banknotes and coins (Verified Cash Holdings) subject to predefined limits provided the stocks were held in Approved Cash Centres (ACCs) and on the understanding that these banknotes would be fitness sorted.

Graph 1

Banknote Processing by the Reserve Bank



1. Danny Haynes, Edric Luo and Terence Turton contributed to the writing of this article.

2. The seven commercial banks involved in the agreement include Australia and New Zealand Banking Group, Bank of Western Australia, Commonwealth Bank of Australia, National Australia Bank, St George Bank, Suncorp-Metway, and Westpac.



One implication of the fitness sorting activities now being undertaken by the commercial banks is that the Reserve Bank has been able to centralise its banknote processing and distribution at the National Note Processing and Distribution Centre (NNPDC) in Melbourne. The primary functions of the NNPDC are the receipt and processing of unfit banknotes and the storage and issuance of new and processed (fit) banknotes. Of the 235 million banknotes processed in the past year, 58 per cent were identified as being unfit for reissue and were destroyed (Graph 1).

Note Quality Reward Scheme

Notwithstanding the requirement that banknotes included in verified cash holdings be fitness sorted, it became apparent that Reserve Bank's quality objectives were not being achieved. The crux of the problem was essentially that the Reserve Bank and commercial banks were targeting different quality standards. Specifically, the commercial banks were primarily interested in outsourcing banknotes that they felt would adversely affect their own financial, operational, and reputation risks whereas the Reserve Bank was targeting a higher quality standard (namely, banknotes with no mechanical defects or visible ink wear).

In order to evaluate the range of possible banknote quality models, the Reserve Bank identified four key quality objectives:

- improving the quality of all denominations;
- improving the quality of banknotes in all areas of Australia;
- promoting enduring behavioural and cultural changes in the banknote handling industry; and
- encouraging the evolution of banknote fitness sorting technology.

Three broad model types were examined

The first model was a quota-based model which would have involved the Reserve Bank specifying the number of unfit banknotes that commercial banks would be required to periodically return to the Reserve Bank. While such a model would have resulted in improvements in banknote quality across the country and across all denominations, it was considered that placing a numerical expectation on unfit detection rates would likely result in either too much or too little banknote fitness sorting. It was also assessed that this model would not drive the appropriate behavioural and cultural changes in the industry that the Reserve Bank was seeking, nor would it have been particularly conducive to fostering an innovative technological environment.

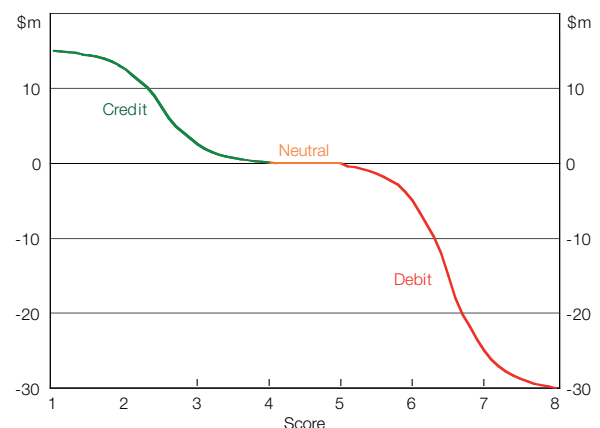
The second model that was considered was an infrastructure-based model which would have involved the Reserve Bank prescribing the type of equipment to be installed and operated at ACCs. As with the previous model, this model would improve banknote quality but the degree to which quality would be improved would have been unknown. Further, it was felt that this model would require the Bank to become heavily involved in examining the technology used in a range of business where it did not necessarily have a comparative advantage and that regulating the industry would not generate the desired degree of cultural change in the industry nor would it be conducive to the development of new technology over a longer period.

The third, incentive-based model, involved the Reserve Bank providing the commercial banks and armoured car companies with a financial motivation to improve the quality of banknotes. Essentially, this model would involve measuring the quality of the Verified Cash Holdings at each ACC and applying a commensurate reward or penalty based on this quality score. In recognition of the fact that the commercial banks require a minimum level of banknote quality, it was agreed that commercial banks would be responsible for funding the cost of achieving the commercial bank (private good) quality standard. The Reserve Bank would provide financial rewards when this standard was exceeded and would apply penalties when it was not achieved. It was believed that this model would generate an optimal level of fitness sorting on the basis that price would essentially determine the number of unfit banknotes returned to the Reserve Bank. Furthermore, the availability of significant monetary incentives in return for improved fitness sorting would encourage the commercial banks and armoured car companies to invest in infrastructure that complemented their broader business strategies.

With a broad acceptance of the incentive-based model, the Reserve Bank and commercial banks entered into a formal agreement – the Note Quality Reward Scheme (NQRS) – in September 2006. The essential details of the NQRS being that banknotes held at each ACC would be periodically sampled by Reserve Bank staff and assigned a Quality Score from one to eight (best to worst) based on the extent of the mechanical defects (missing pieces, holes, tears, and sticky tape) and the levels of ink wear³. Performance credits and debits would then be allocated depending on the Quality Score⁴ – no credit or debit is applied if the quality score is between 4 and 5 (the neutral range which represents the commercial banks' lowest acceptable standard of banknote quality), a quality score that is less than 4 attracts a credit and a quality score greater than 5 attracts a debit. Across all ACCs, the total annual credit and debit payment is subject to a maximum limit of \$15 and \$30 million, respectively (Graph 2).

Graph 2

NQRS Payment Curve



NQRS Performance

Since the NQRS was introduced towards the end of 2006, Note Issue staff have sampled 2.4 million banknotes during the 757 visits to the 59 ACCs throughout Australia. Reflecting the steady improvement of Quality Scores over the year, performance credits totalling \$7.9 million were paid in 2007 (Graph 3).

Notwithstanding the improvement in overall banknote quality, the sample Quality Scores have confirmed a widely held view that the quality of the lower denomination banknotes (ie \$5 and \$10 banknotes) is consistently worse than the quality of the higher denomination banknotes. One explanation for this observation is that denominations are used differently by the public; lower denominations tend to remain in circulation relatively longer and involve higher transactional frequencies. On the supply side,

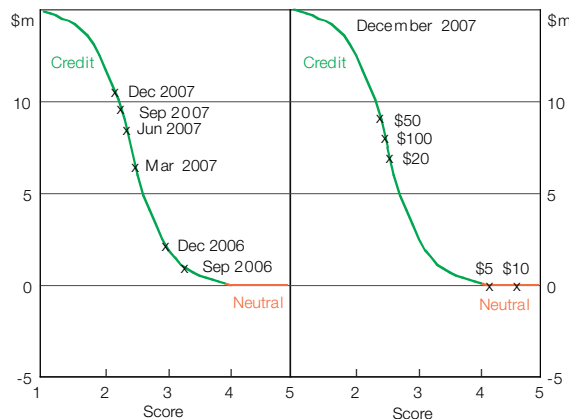
3. Details of the Reserve Bank's Note Sorting Guide can be found at http://www.rba.gov.au/CurrencyNotes/DamagedNotes/note_sorting_guide_0305.pdf

4. For statistical reasons, the performance debit/credit is based on the worst 15 per cent of banknotes sampled.

commercial banks and armoured car companies take less care to outsort unfit banknotes which are not used in ATMs, ie there is a relatively lower private good standard for lower denomination banknotes.

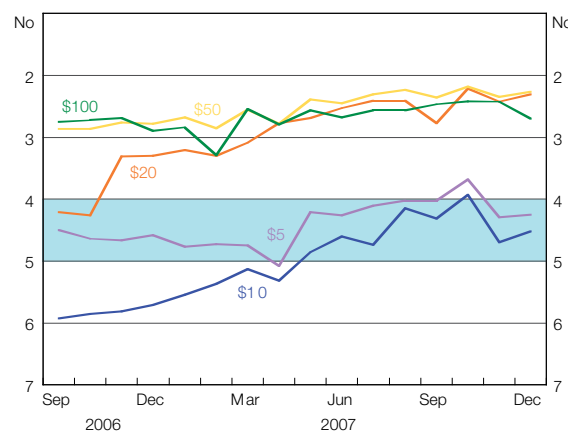
Graph 3

Quality Scores – Total and Denomination



Graph 4

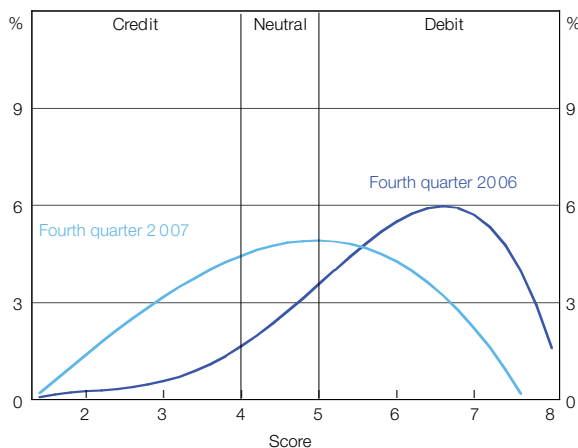
Quality Scores



The quality of low denomination banknotes has, however, improved since the introduction of the NQRS. This is clearly illustrated in the distribution of quality scores for the sampled \$10 banknotes (Graph 5). In the December quarter of 2006, the majority of \$10 banknotes that were sampled were assessed as being of poor quality (ie worse than the 'neutral' private good standard) and only 7 per cent of banknotes were assessed as being of high quality. A year later, the proportion of 'high' quality \$10 banknotes had increased to 28 per cent.

Graph 5

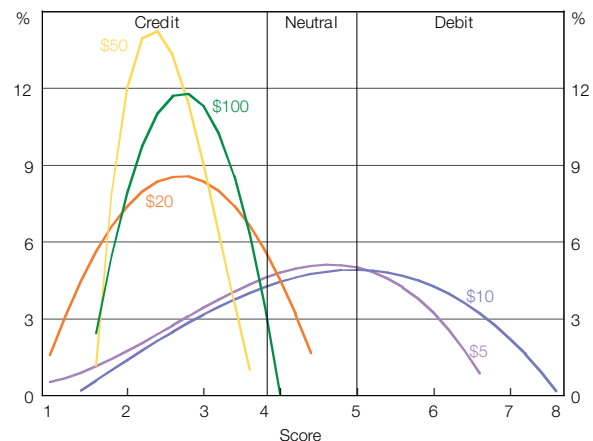
'Smoothed' Distribution of \$10 Quality Scores



Although there has been a significant improvement in the quality of \$10 banknotes over the past year, the extent of the improvement that is still required to put \$5 and \$10 banknotes on an even footing to the higher denominations is considerable. By way of an illustration, 98 per cent of the higher denominations are assessed as having a quality that is better than the neutral standard whereas the comparable figure for the two lower denominations is 35 per cent (Graph 6).

Graph 6

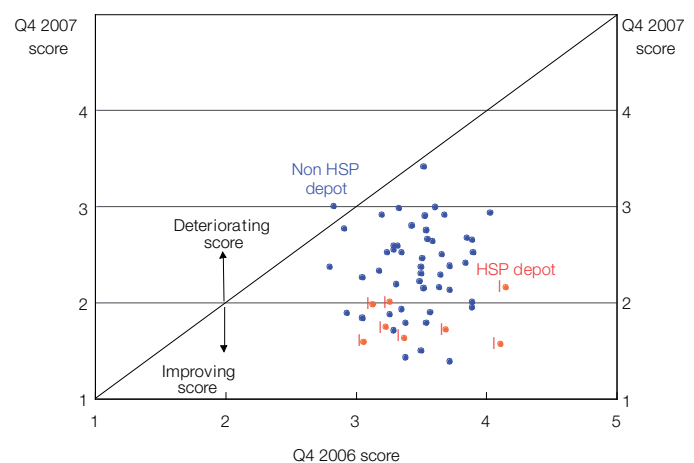
'Smoothed' Distribution of Quality Scores. Fourth quarter 2007



Encouragingly, there is also evidence that the NQRS is producing the desired technological and behavioural changes in the industry. With the exception of one depot, banknote quality has improved in all ACCs over the past year (Graph 7). This improvement largely reflects the introduction of numerous high and medium-speed banknote processors in these depots as well as a concerted effort by the armoured car companies to improve their banknote sorting processes. In particular, the Quality Score improvement has tended to have been greatest in the depots that have made the greatest technology investment with the introduction of high-speed banknote processors (HSPs).

Graph 7

Comparative Quality Scores



Conclusion

Several banknote quality initiatives have been introduced in Australia over the past decade. The most recent of these – the introduction of the Note Quality Reward Scheme – was explicitly designed to improve the quality of banknotes in circulation, to improve banknote fitness sorting behaviour and encourage investment in banknote fitness sorting technologies. Despite having only been introduced in late 2006, there is already considerable evidence to suggest that these objectives are being realised. Substantial investment by the private sector in banknote processing machines has increased their ability to outsort poor quality banknotes which, in turn, has led to a demonstrable improvement in banknote quality across all denominations.

The world-class cash operation

■ Ed Brindley *De La Rue International Ltd.*

When the general public considers cash, little thought is given to the complexities of delivering genuine, fit banknotes to the right place and at the right time. In today's world of increased ATM populations, many people no longer have need to withdraw cash in the bank branch, further reinforcing their tendency to take the availability of cash for granted.

Of course, cash professionals know that behind the scenes lies a sophisticated supply chain dedicated to ensuring that cash is available 24 hours a day 7 days a week. It is only when something fails in the system that headlines are made. Cash provision is a critical service to a modern society, even with the growth of alternative payment mechanisms such as credit cards, debit cards and increasingly mobile phones.

For organisations entrusted with the provision of cash, be they Central Banks, Commercial Banks or Cash Logistics companies, it is critical that they can guarantee high levels of service delivery. Contingency planning is essential to allow for unforeseen disruptions to the supply chain. These may come in many forms such as natural disasters, power cuts or staff shortages, but above all else cash needs to be available. Indeed, recent examples have shown that cash can take on new importance in times of uncertainty. In the aftermath of Hurricane Katrina there was a period where all communication lines were down rendering credit cards inoperable. Cash was the only means of payment.

Current challenges

There are three considerations that drive the cash processing industry today: Security, Productivity and Performance.

Security

Risk is inherent in the cash business, so the question for organisations is how to best mitigate them. This is where partnership with industry experts helps, and where De La Rue has built up expertise over many decades.

De La Rue's pedigree goes back to the early 1960s when the first banknote sorting machines were developed. These were first sold to the Scottish banks, using magnetic barcodes to enable them to distinguish between the different issuers. Shortly afterwards De La Rue also developed a shredder for Central Banks (at the time termed a "garbler") to allow the secure destruction of worn banknotes. More than forty years on De La Rue is still a major provider of cash processing solutions to the industry, providing robust, reliable platforms on which organisations can build their business.

If security and risk mitigation is a major driver for the industry, what else determines the success of a cash processing operation? For the answer

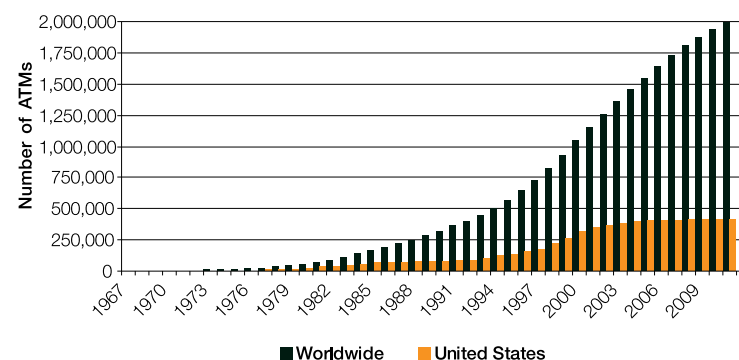
to this, we need to look more closely at the evolution of the cash processing industry since its inception.

Productivity

In the early days the bulk of the processing was done by Central Banks. Banknotes were not as common as they are today, and the main way people accessed their cash was through a wage packet. Lower volumes meant that Central Banks were able to cope with the demand for cash, and there was little demand for 24 hour banking services.

Over the years we have seen a number of changes, making today's cash picture very different. People are now seldom paid in cash – salaries are paid direct into bank accounts. ATMs have proliferated since De La Rue installed the first one in 1967 - within a couple of years the number of ATMs installed worldwide will top the 2 million mark (see figure 1 below). The public demands access to their cash 24 hours a day 7 days a week. In addition, the volumes in cash in circulation have increased dramatically even in the past 10 years, making it increasingly hard for Central Banks to continue to keep up with demand.

Figure 1. Worldwide ATM installations



Source: Retail Banking Research

To relieve some of this pressure, and to drive further efficiencies in the supply chain, it is now common in many countries for the Central Bank to outsource banknote recycling to the commercial sector. The Central Bank itself takes on a governance role, policing the rules that ensure that sorting standards are properly maintained. An example of this is the European Recycling Framework (ERF) to which all commercial operators must comply. In addition, there are strict rules to which equipment manufacturers must adhere. All of De La Rue's banknote sorters are subject to annual checks that licence them for use within the Eurozone.

In many cases the Central Bank now plays a minimal part in the physical recycling of banknotes, but still retains responsibility for destruction of worn notes, it being the final arbiter of banknote authenticity.

There is little doubt that there is an expanding commercial processing market, but that it is extremely competitive. So how do some operators enjoy more success than others?



De La Rue's new high speed sorter, the DLR 7000, shown in multi-denomination 15 pocket configuration

Part of the answer is certainly a focus on productivity. This undoubtedly can make the difference between success and failure. In a competitive environment, the operator that is able to reduce costs whilst maintaining or even enhancing the level of service delivery will be able to win market share.

The leading cash players recognise that they are in the supply chain industry and share many characteristics with other industries, including many household names such as Dell, Amazon and the like. These companies have continuously driven costs down through investment in their systems and processes, enabling them to become extremely lean operations without sacrificing service provision. We believe that there is a tremendous opportunity within the cash industry to learn from these world leaders, applying best practices that would be seen as standard in other industries but to date have been slow to catch on.

We term this concept Enterprise Cash Management, a holistic approach to the management of data within the cash centre. Within this, a critical component is Business Intelligence software. De La Rue's BI module is the first package to be tailored to the specific requirements of the cash industry, enabling cash centre managers to gather data in real time, across multiple machines or even cash centres. Without establishing a baseline it is very hard to know where improvements can be made, so we believe this an essential first step towards the goal of lowering the total cost per banknote.

The benefits can be tremendous – in one example a cash centre effectively gained an extra day's production per week by increasing utilisation of assets by 20%. As we have seen banknote volumes have risen and this trend is expected to continue, so better use of existing assets is receiving renewed attention as a cost effective way of meeting these new challenges.

BI also allows the cash centre manager to react in an instant to any variations from the normal business metrics. Contrast this with the picture at many cash centres today. Data from processing systems is generated, but collecting it is a manual process, costly and time-consuming. It often needs to be packaged into a meaningful report, further tying up precious resources. It is not uncommon for this information to take 4-6 weeks to reach the management layer that can take the appropriate action. By then, of course, it is too late. BI, on the other hand, delivers information in real time no matter where the manager is located. It can even deliver reports direct to a PDA! The data is collected automatically, packaged and presented in a way that makes it instantly intelligible to the recipient. Comparisons can readily be made between machines, shifts or sites, identifying the weaker areas in the operation and allowing corrective action to be put in place, fast.

Performance

The final piece of the jigsaw is performance. Technology continues to move apace, and the cash processing industry is no exception. Functionality

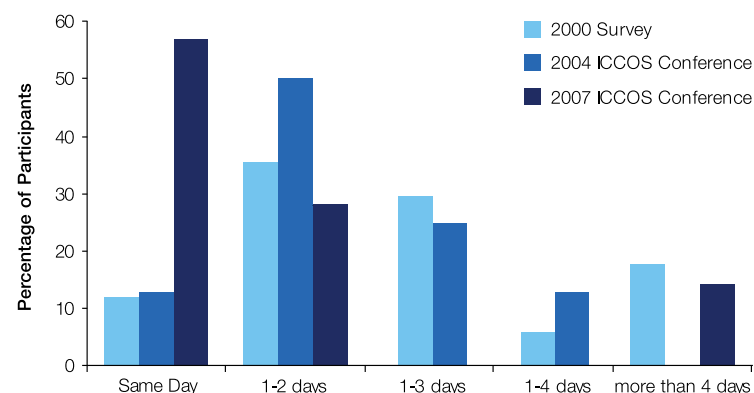
that just a few years ago would have been limited to just the most expensive high end systems is now becoming commonplace in smaller, cheaper systems. High end performance is no longer the exclusive domain of the Central banks and the largest commercial banks – new entrants have moved in using different business models such as financing or click charging (charging per transaction).

The European Recycling Framework (ERF) mentioned previously is taking advantage of this factor – it would not have been possible in the past to expect commercial operators to make the levels of investment necessary to sort to the exacting requirements specified. Indeed, today De La Rue is providing counters, self service devices and teller assist equipment to the smallest bank branches as well as banknote sorters and software to the cash centres.

Perspectives

So what about the future? One thing is for certain - there are real changes in the way cash centres operate. Customers themselves are becoming more demanding. The retailers, banks and companies that send cash in bulk to be processed are demanding faster credit, better levels of management reporting and more tailored services. More regulation seems certain too, placing restrictions on cash holdings based on cash inflows and outflows. One noticeable trend has been that the time taken to turn cash around within the cash centre has fallen dramatically. In the past it may have been normal to process cash within 4 days. Now many organisations turn it around the same day (see figure 2 below):

Figure 2. Deposit turnaround times



Source: De La Rue

No matter what the future holds, De La Rue is confident that the cash business will continue to be attractive for those cash centre operators that embrace change and continue to drive their costs down through industry-wide best practices. We will continue to invest to bring innovative technologies and processes to the market, and help improve organisations' security, productivity and performance.

V International Course on Cash Management (CIGE)

■ **María Eulalia Andonegui** *Banco de España*

The Banco de Portugal has kindly offered to host the 2008 CIGE which is to be held in Lisbon from 26th to 30th May. All the central banks of Latin America have been invited to send one participant, as in principle the numbers are limited to 25, to facilitate active participation by all the participants. Nevertheless, any central bank interested in sending more than one person to Lisbon should contact the Banco de Portugal which, as the Course organizer, has the final say on the number of participants to be admitted, according to demand.

The Course lectures will be given by officials from several central banks, to students from 23 different countries. The Course content is both theoretical and practical and active participation and collaboration is expected from all students. The Course will consist of the modules reflected in the table.

The Banco de Portugal has also organized a visit to its Carregado Complex, including a tour of the peripheral security area, the banknote processing room, the counterfeit analysis centre, the vaults and the VALORA banknote printing works.

For further information on the V CIGE, please contact:

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MODULES

I. Money and issuance of currency

- History of money
- Creation and destruction of money
- Monetary income
- Calculation of banknote production requirements

II. Design and production

- Production of banknotes
- Printing substrates
- Banknote security features

III. Currency operations

- Deposit and withdrawal of banknotes
- Optimum level of stocks
- Security

IV. Quality, processing and destruction of banknotes

- Quality of banknotes in circulation
- Automated banknote processing and packaging systems
- Destruction of banknotes
- Comparative analysis of banknote processing models

V. Coins

- Management of coins

VI. Counterfeiting

- Identification of counterfeit coins and banknotes
- The fight against counterfeiting

VII. Cash management models

- Outsourcing of banknote production functions
- Outsourcing of banknote processing functions
- Comparative analysis of different organizational models

VIII. Specific cash matters

- Central bank emergency contingency plans
- Central bank training and communication strategies

IX. Contemporary topics

- The cost of using cash as a means of payment
- Cash from the point of view of the credit institutions
- Future challenges for cash management

International events

II Conference on the European Banknote Recycling Framework



The II Conference on the European Framework for Euro Banknote Recycling was held at the head office of the Banco de España in Madrid on 6 March 2008. This is the second occasion on which the Banco de España has brought together representatives of the banking industry, cash-in-transit companies and manufacturers of specialist banknote machinery, to inform and provide a forum for exchange of opinions on the implementation of Eurosystem decisions in the area of recycling. The Conference was opened by Mr. Javier Alonso, Director General of the Banco de España, who offered a clear institutional message on the importance of compliance with the Framework.

The Conference was attended by some 180 executives and experts in the field of banknotes. Three presentations were made and three work sessions held, representing an opportunity for the credit institutions, cash-in-transit companies and manufacturers, as well as the Banco de España, to present their views. The Conference provided a forum for open debate for all the parties involved in guaranteeing the quality of the banknotes in circulation in Spain, attracting active participation and widespread debate on the question of compliance with the Framework. The Banco de España also made a presentation on some of the different banknote handling machines successfully tested by the Eurosystem for euro banknote recycling.

The Deutsche Bundesbank, an exhibitor at CeBIT 2008 in Hannover



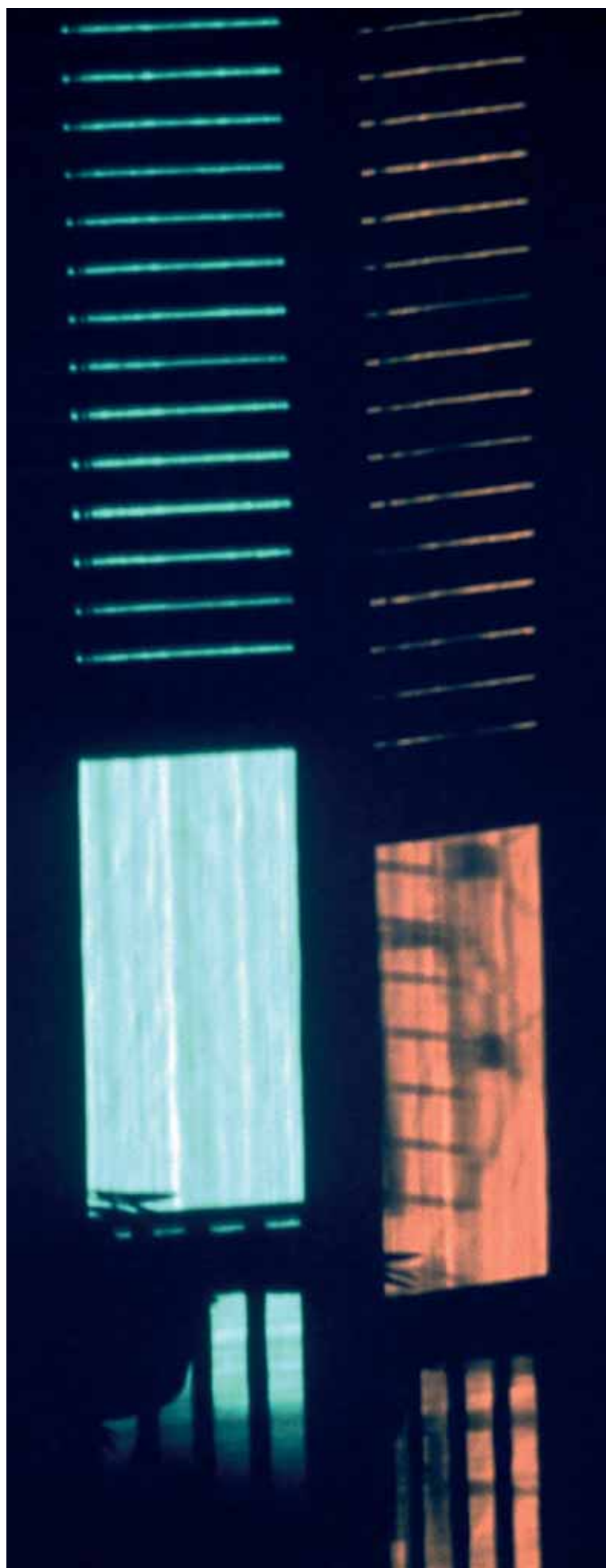
CeBIT, held every spring in Hannover, is the world's most important information technology trade fair, showcasing the latest advances in information technology and telecommunications. The Deutsche Bundesbank took part in CeBIT 2008, held between 4 and 9 March, in the banking and finance area. At a stand installed for this purpose, the German central bank presented information on its Cash Electronic Data Interchange which is, as its name suggests, an application for electronic exchange of data on cash between credit institutions, and on the Eurosystem policy for banknote processing by the private sector.

Dutch National Bank. Cash Seminar 2008



On 28 and 29 February 2008 around 50 banknote experts from 30 different countries and the European Central Bank gathered at the congress centre of Amsterdam's Artis Zoo. To enable fruitful discussions the Dutch National Bank limited the number of attendees to 50. The program included eight knowledgeable speakers and six qualified discussants. The main theme of the seminar was the exploration of ways to improve fitness sorting. Below are a few examples of the statements made:

- Sorting systems today are certainly not uniform. The fitness detectors used are very different and will lead to different fitness decisions.
- A single note checked several times by the same detector will lead to a rather wide recording variance.
- Soil is the most frequent reason for declaring a note unfit.
- A model to simulate the circulation behaviour was presented by the Dutch National Bank, introducing 'circulation load' as a new descriptive parameter. This model - CIRQSIM - is available to all interested parties.
- The quality efforts made by central banks in 'producing' re-issuable banknotes are hardly developed, integrated and acknowledged compared with those efforts made in the production of newly printed banknotes.



Central banking news

Euro launch in Cyprus and Malta

On 1 January 2008 euro banknotes and coins were put into circulation for the first time in Cyprus and Malta. The operation to replace the Cypriot pound and the Maltese lira was a great success: by 2 January approximately half the banknotes in circulation in both countries were euro notes. Automatic cash dispensers were adapted to the euro on the first day of the changeover and all change in shops and other businesses was given in euro; these were both decisive factors in the fast and smooth introduction of the new currency.

The success of the changeover was also due to the efficient preparations made by the cash departments of the central banks and corresponding authorities, including cooperation with credit institutions and other professional cash handlers and an important advertising campaign.



The national currencies coexisted with the euro for one month in both Cyprus and Malta; accordingly, on 1 February 2008, both the Cypriot pound and the Maltese lira ceased to be legal tender. With these new incorporations, the euro is now legal tender in a total of 15 European countries.

The 1-quetzal banknote back in circulation

On 20 August 2007 the Banco de Guatemala put a polymer substrate 1-quetzal banknote into circulation. The issuing authority chose the 1-quetzal note as the first to incorporate polymer technology in Guatemala, as there were no banknotes with this denomination currently in circulation. The news of this issue, which will be limited to 60 million banknotes, caused great expectation.



The new banknote will coexist with the 1-quetzal coin that has been in circulation since 1988, when it replaced the cotton paper substrate 1-quetzal note. The new note will thus be the only 1-quetzal banknote in circulation, as all previous notes were withdrawn.



The shadow image of the number "1", with microprinting and a security background, are some of the elements included in the new banknote to verify its authenticity. The note is identical in design to the former cotton paper 1-quetzal note, save for the presence of a "transparent window", a security feature inherent to polymer technology and which is visible to the naked eye on both the front and back of the banknote.



End of the parallel circulation period in Kazakhstan

The National Bank of Kazakhstan issued a new banknote series in November 2006 to replace the existing one. The new series comprises six banknote denominations: 200, 500, 1,000, 2,000, 5,000 and 10,000 Tenge. The new banknotes have been designed mainly to offer better protection against counterfeiting. They have been circulating in parallel with the existing ones of the same denominations for one year. The period of dual circulation finished on 15 November 2007. The new banknotes were generally well received and the replacement of the old banknotes by the new ones was faster than initially expected. The publicity campaigns and the smooth adjustment of the ATMs to the new banknotes facilitated the changeover. According to the data from the National Bank of Kazakhstan, almost 100% of the old design banknotes had been withdrawn from circulation by the end of 2007.



SICPA opens a security ink plant in Spain

On 8 November 2007 the multinational group SICPA opened its new plant in Alcalá de Henares (Madrid). This plant, which is state of the art in Europe, will produce security inks for banknotes and other security documents such as passports, stamps, etc. It will also provide support to SICPA's main plant in Chavornay (Switzerland) for the manufacture of security inks for euro banknotes.

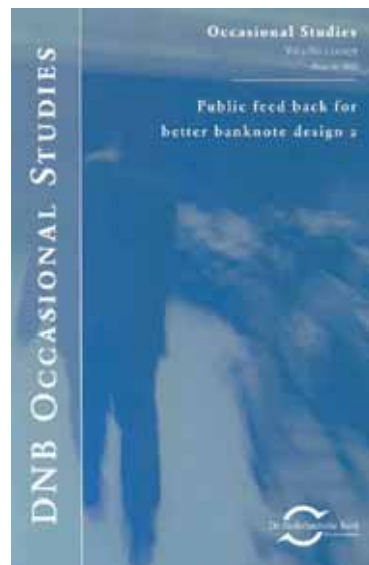
The new plant in Alcalá de Henares, with a fully automated production process, incorporates all SICPA's R&D advances. The security inks produced by SICPA-Spain undergo four manufacturing processes that include numerous analyses, within a strict quality control process. Another new development is that the inks are packaged in aluminium bags and cardboard boxes, a more ecological alternative to the traditional metal drums.

Publications devoted to cash

Public feedback for better banknote design 2

The report appeared in 2007 in the Occasional Studies of the De Nederlandsche Bank (DNB) and is a follow-up to the 2006 paper bearing the same name on the Dutch central bank's research activities in the field of banknotes. The paper reports on the latest findings of the public opinion poll on euro banknotes conducted every two years in the Netherlands and on the DNB's communication policy strategy on the public security features of banknotes. It also contains layouts of public security features used in the design of banknotes. An electronic version of this publication can be found on the DNB website:

http://www.dnb.nl/dnb/home/news_and_publications/dnb_publications/dnb_occasional_studies/en/47-152193-64.html



Banknote printing by central banks: trends, costs and efficiency

Jorge Eduardo Galán and Miguel Sarmiento, both economists at the Banco de la República, the Colombian central bank, present the trends seen in banknote production in the period 2000-2005 with data from 56 central banks. The study reflects the strong growth recorded in demand for banknotes in recent years and the increasing concern on the part of central banks with making banknote production more efficient. The factors that determine production costs are examined and a cost function is estimated in which the key variables are the denomination structure, the size of the banknotes and the production method used. The report shows that the central banks have raised their productivity levels, on the back of efficiency gains and technological advances. The report forms part of the research program on central banks conducted by the Planning and Budgetary Department of the Banco de la República. A previous version of the report was presented at the IVth International Course on Cash Management organized by the Banco de la República in 2007. An electronic version of this report in Spanish or English may be ordered from:

jgalanca@banrep.gov.co and nsarmipa@banrep.gov.co



Notas e Moedas – Boletim Trimestral

Since 2005, the Banco de Portugal issues a periodic publication on currency denominated Notas e Moedas – Boletim Trimestral. It publishes information on the development of banknote recycling in Portugal and contains an important section on counterfeit monitoring and on technical and educational knowledge regarding euro banknotes and coins. Notas e Moedas disseminates initiatives of the Banco de Portugal as the issuing authority and contains technical articles on subjects related to cash management. In parallel, it provides useful insights into rules and good practices associated with the use of cash which are of interest to both bank tellers and the public at large. It also regularly publishes information on banknotes issued and withdrawn by national central banks not belonging to the euro area and on commemorative and collector coins issued by countries which have adopted the euro. Address for subscriptions:

cncontrafaccoes@bportugal.pt



The Banco de España's auxiliary depositories

Since 2005, the Banco de España uses a system of auxiliary depositories to supplement the banknote distribution activity conducted through its branch network. These depositories were introduced to make the distribution system more fluid and to improve the quality of the banknotes in circulation. The article begins by describing how the cash cycle operates in Spain, and in particular how the credit institutions recycle banknotes. It also describes the characteristics of the auxiliary depositories and the impact they have had on the general public, the banking system and the Banco de España itself. The electronic version of the article, published in the Economic Bulletin of the Banco de España of July-August 2005, is available at:

<http://www.bde.es/informes/be/boleco/2005/be0507.pdf>



Banknote security features

■ Banco de España *Cash and Issue Department*

This section presents a catalogue of the main banknote security features recognisable by the public and currently in use worldwide. The features have been grouped according to their common functional properties for detection by the general public and retailers. The picture of each feature is accompanied by a brief explanatory text. The list will be subject to constant review, adding new security features resulting from technological advances and discarding those that are no longer relevant for the industry.

WATERMARKS



1. Multitone watermark

Image incorporated into the paper which is visible when the banknote is held against the light. It is created during the paper making process by varying the thickness of the paper. The resulting variations in opacity give rise to an image with bright and dark areas.



2. Electrotype watermark

It is a filigree visible when held against the light. It is created during the paper making process using a filament which takes the form of numbers or different types of characters.

SECURITY THREADS



3. Embedded security thread

A thin band of plastic inserted into the paper. It is usually made of 1-2 mm wide and 30-40 microns of thickness. It often bears microtext and fluorescence. It can also contain electric and magnetic properties readable by banknote processing machines.



4. Window thread

This band is made of a thread wider than the abovementioned, 3-4 mm, that weaves in and out of the paper. The uncovered sections are visible and could contain an optically variable element like an ink that changes colour when the banknote is tilted.



5. Thread with floating images

A window thread inserted into the paper using a standard window embedding technique. The floating image effect is produced by embedding microlenses into the thread. When the thread is tilted, the microlenses move producing floating images.

INTAGLIO FEATURES

Tactile



6. Intaglio printing

The printing with relief is detectable by the sense of touch. It is a printing technique in which the ink is transferred directly from the plate to the substrate under high pressure and temperature conditions. The printing produces a relief effect due to the thick layer of ink deposited and the embossing of the substrate. The main motif of a banknote is usually printed in intaglio.



7. Tactile marks for the visually impaired

These tactile marks are detectable by touch. They are printed in intaglio and are usually located near the borders of a banknote to facilitate its recognition by the visually impaired.

Visual



8. Colour gradation in intaglio

Gradual superimposition of colours printed in intaglio that are very difficult to reproduce by copiers.



9. Latent image

A hidden image that becomes visible when the banknote is viewed at a certain angle. It is made by intaglio printing using a particular structure of lines.



10. Blind embossing

An embossed colourless image that becomes visible when the banknote is viewed from an oblique angle. It is created by deforming the substrate by the high pressure of the intaglio printing without ink.

OPTICALLY VARIABLE FEATURES

**11. Iridescent ink**

A brilliant ink that changes colour when the banknote is tilted. The ink can be applied in a stripe and displaying an image.

**12. OVI ink**

Printing with optically variable ink (OVI), implies it will change colour when the banknote is tilted. Its effect is increased when the whole surface is covered by a layer of this ink applied in silkscreen printing.

**13. SPARK ink**

A particular type of OVI ink which changes colour, containing magnetic particles which can be oriented in such way as to produce a dynamic colour effect when the banknote is tilted. The effect is increased when the whole surface is covered by a layer of this ink applied in silkscreen printing.

**14. Optically variable devices (OVDs)**

Images produced onto holographic elements which change form and colour when the banknote is tilted. These are anti-copying devices based on the light diffraction principle, such as kinograms. OVDs can be stamped onto the substrate in the form of a patch or stripe.

**15. Moiré variable colour**

Feature that uses the latent image principle. It produces a rainbow effect which appears when the banknote is tilted. It is performed by means of an offset printing combined with an intaglio printing.

VISIBLE BY MEANS OF A MAGNIFYING GLASS

**16. Microprinting**

Printing of small characters that are not visible to the naked eye but can be seen through a magnifying glass. When printed onto a banknote, it usually combines characters in positive and negative.

ULTRAVIOLET AND INFRARED PROPERTIES

**17. Ultraviolet properties (UV)**

These properties are incorporated into the fluorescent pigments of the printing inks which are not visible in daylight but are visible under UV light. Ultraviolet properties in banknote printing turn out really notorious as the substrate used is non-fluorescent under UV light.

**18. Fluorescent fibres**

Fibres made of synthetic material and differently coloured embedded into the paper that are not visible in daylight but are visible under UV light. Their length is usually 3-6 mm. There are certain fluorescent fibres in which each fibre has several colours. The fibres are incorporated onto the banknote in a random way while elaborating the paper mass.

**19. IR properties (IR)**

These are incorporated into the pigments of the inks. These are inks with different infrared performance due to different absorptions in that spectrum. The IR characteristics are usually applied combining transparent inks with inks opaque to IR.

OTHER FEATURES

**20. See-through register**

Some elements of an image are printed in offset on the front side of the banknote and the remaining elements of the image are printed on the back. The whole image with perfect coincidence is visible when the banknote is held against the light. This feature is also known as 'perfect register' as it is printed simultaneously on front and back sides in register.

**21. Structure of fine lines (moiré effect)**

Set of fine and narrowly printed lines which produce an optical confusion, named moiré effect, when reproduced by copiers.

**22. Rainbow printing**

Offset printing that creates in the banknote an area with different colours that are gradually mixed together to create a rainbow effect.

**23. Numbering**

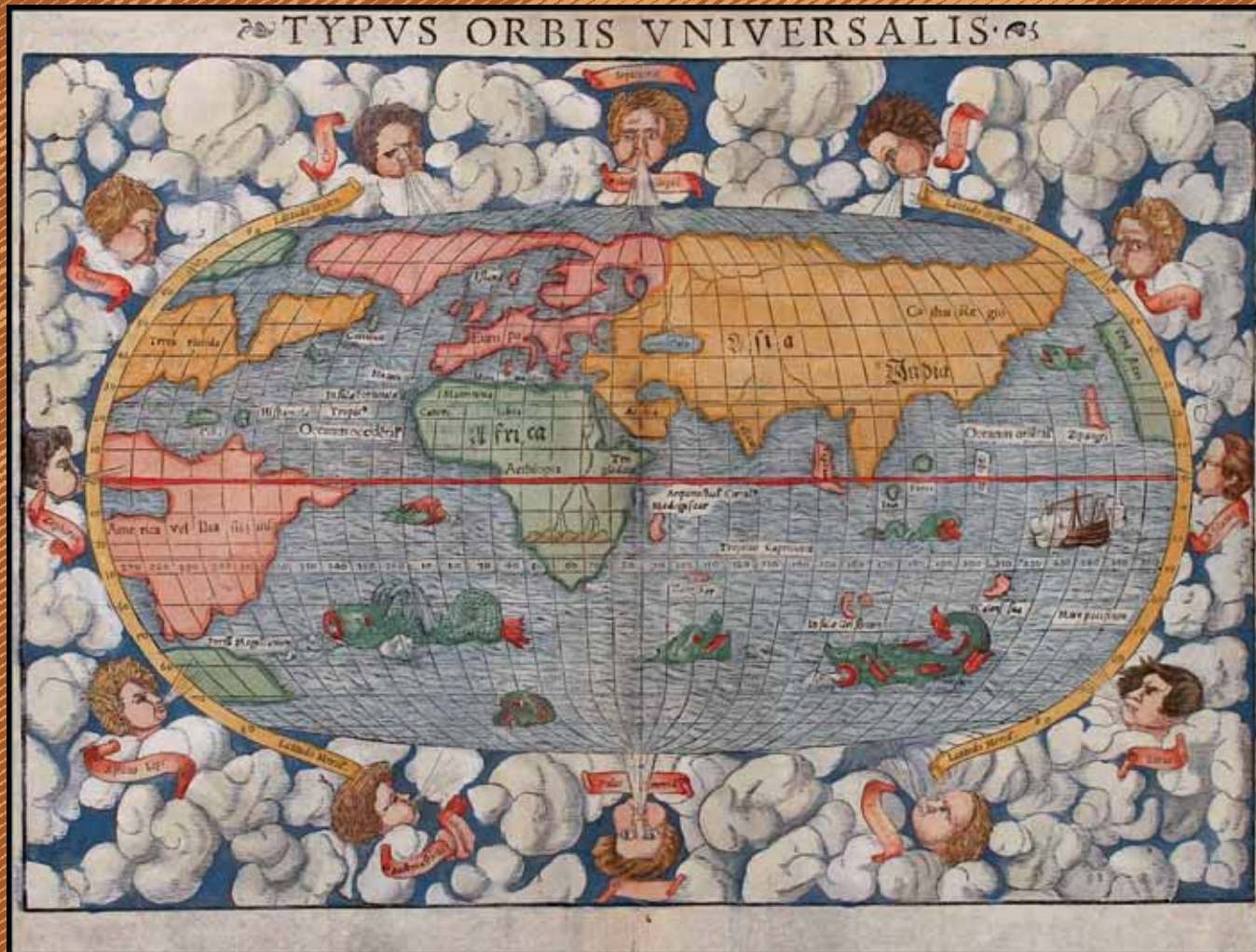
The serial number on each banknote, which enables it to be identified. It is usually printed in letterpress, naked eye readable and may also be machine readable if mechanically readable characters are used. The ink usually incorporates magnetic properties.

**24. Transparent window**

Transparent area on a banknote on which optical effects are incorporated by applying various elements, such as a blind-embossed image or an optical device. It is used in polymer banknotes and is beginning to be used in paper banknotes too. In these, the window is placed on a holographic band.

**25. Microperforations**

An image made up of a large number of microholes in the paper, which becomes visible when viewed against the light. The microholes are drilled by means of laser.



Typus Orbis Universalis. S. Munster, 1554.

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