

## BILLETARIA

YEAR VIII

ISSUE 16

OCTOBER 2014



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# Editorial

■ **J. Darío Negueruela** *Banco de España*

Once again BILLETARIA is publishing a special issue. On this occasion, as announced, the chosen topic is the use by central bank cash departments of opinion surveys and market research as management tools. To that end we have had direct contributions from eleven central banks, who have written opinion articles on their experience in this field, and twice as many again have been good enough to answer the short questionnaire the *Banco de España's* Cash and Issue department prepared with a view to completing the picture on the general use of these tools.

Among the intense changes that have taken place since the start of the century in the way cash departments are managed, one of the most significant has been the use of surveys, which tie in closely with communications. In 2000 just one or two central banks ran opinion surveys. Today, more or less regular consultations with the public, merchants, retail banks, and professional cash handlers have become widespread (used by 70% of our survey's sample of central banks). This issue aims to explore the reasons for this phenomenon, what these surveys or consultations can tell us, what methods and principles are used to conduct them, if they lived up to the expectations with which they were created, if the results obtained are taken into account or not in shaping specific measures or management policies, etc. And the truth is that the results are full of surprises.

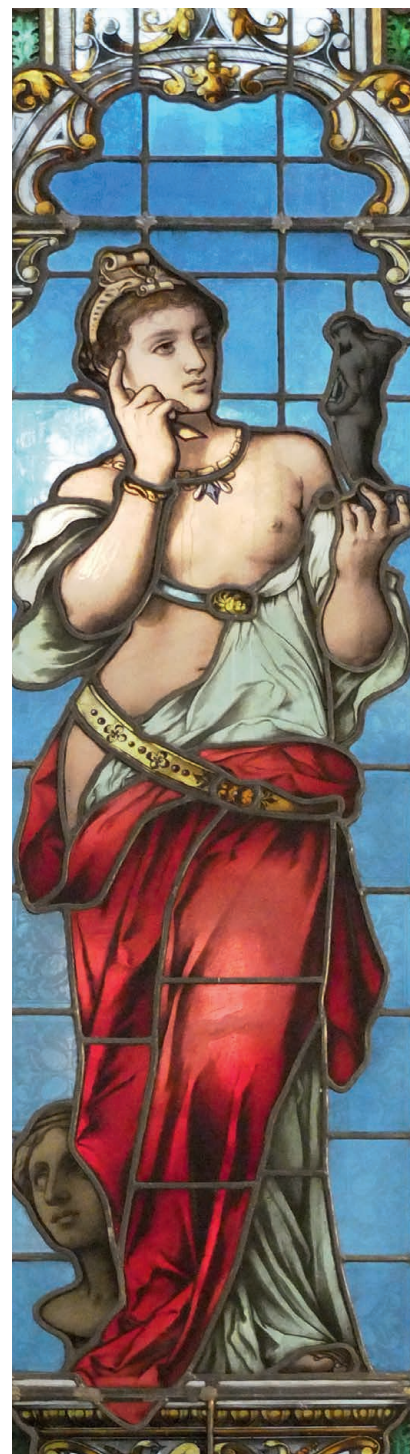
The use of opinion surveys or market analysis (in the form of "payments diaries") began to spread in the middle of last decade and is now extremely common. However, the way they are used varies considerably from one central bank to another. Surveys are not always annual (barely 40%), the sample group is usually fairly small (between 200 and 500 people are interviewed), personal interviews are used only rarely as an information collection technique (telephone or internet surveys predominate), and the results obtained have not always been useful for the central bank concerned. Other central banks, however, are con-

vinced that these are extremely useful management tools and that they are a very fruitful way of finding out how much we currently know about the national cash cycle. A number of myths have been overturned thanks to this direct search for information. We have found out directly how we can redirect certain policies or measures, and we have learned about some of the public's previously unknown patterns of behaviour and activity.

It is also interesting to examine the confrontation between "opinion survey" and "payments diary" and the way central banks rate them differently. Proponents of surveys attach particular value to qualitative information that questions on how people judge or rate things, their information and needs, considering that quantitative information can be obtained through other channels. Exponents of payments diaries put the need for directly quantifiable statistical information first, facilitating and enabling more "objective" analyses. Both approaches are obviously valid, and their suitability will most often depend on the other management instruments and tools available.

As on previous occasions, and it is well known that it is no mere formality, we reiterate our gratitude for the generous readiness with which the friends of BILLETARIA respond to our requests. If, as we are convinced it is, BILLETARIA is contributing to disseminate ideas, analysis and opinions, study issues, delve into case studies and exchange experiences, all the credit is due to our contributors. Little by little the journal is strengthening the ties between central bank professionals and helping enhance their work. Our thanks therefore to everyone who has contributed to this issue in one way or another and we look forward to seeing you again next time.

NOTE: Over the coming days BILLETARIA's subscribers will receive an electronic edition of the special issue summarising the second four years of the journal (issues 9-16 inclusive).



"Sculpture" Stained glass window of the Banco de España building / JDN

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# Interview with Mauri Lehtinen

■ J. Darío Negueruela *Banco de España*



When this, the 16th issue of *BILLETARIA*, is published it will have been four months since Mauri Lehtinen retired from his position at the head of the Cash Department at the Bank of Finland. Mauri Lehtinen started working at the Bank of Finland in the sixties, and since then has remained at the institution in which he held a wide variety of positions over the course of his lengthy career. In 2006 he became chief cashier and

a permanent member of the Eurosystem Banknotes Committee where his opinions and contributions have always been heard with interest. Now, from the distance and tranquillity that undoubtedly comes with his new situation, we would like to draw upon his experience and wisdom to help us explore some of the topical issues in the world of cash. For his experience and good judgement, balance and professionalism, the excellent way in which he has managed to situate the Bank of Finland in a context of privileged international relations inside and outside the Eurosystem and last, but not least, for the friendship he has extended to me over all these years, it is a huge pleasure to chat with Mauri Lehtinen and share with *BILLETARIA*'s readers the opinions of a seasoned central bank professional.

**Q. Mauri, could you briefly summarise your professional experience at the Bank of Finland (Suomen Pankki)?**

**A.** My career at the Bank of Finland (BoF) began 50 years ago, with a summer job while I was still in my youth, but I joined the BoF on a permanent basis in 1969. I have a degree in Economics from the Helsinki School (today known as the Alvar Aalto University). I began processing local and foreign payments and credit administration. Later I began business analysis and financing in relation to export and investment credits that the BoF gave Finnish companies. In the late eighties, when the Finnish capital market was deregulated and the BoF stopped providing credit to private companies I became head of support in the Payments and Settlements Division. In 2002 I was appointed head of department and placed in charge of payments and settlements relating to monetary policy operations, foreign currency, and bank accounts at the BoF. I then went on to become Chief Cashier at the Bank in 2006.

**Q. Could you outline the role of the BoF's Cash Department? To what extent has it changed since Finland joined the euro?**

**A.** To put BoF's mission in the cash cycle in Finland in a nutshell, we could say that it consists of ensuring the legitimacy, quality and availability of cash throughout the country. The BoF's interest is in overseeing cash operations as a whole and directing cash operations towards a bigger role

for private operators. This is a gradual process that is still ongoing. There is no doubt that the euro changed our cash department considerably. The BoF came to place less emphasis on banknote technology, on tenders for banknote procurement and on systems – topics on which we had the support of the European Central Bank (ECB) and other central banks in the euro area (for example, on the CashSSP banknote packaging identification system and the joint tendering system for banknote procurement as part of the JET consortium, where we work together with other national central banks).

**Q. How would you describe the chief cashier's position and responsibilities?**

**A.** The chief cashier's main task is to run the Cash Department, which is one of the BoF's six departments. The individual holding this position plays a very interesting and varied role in between the BoF's Board and the Department, and between the ECB, the BoF and local operators. What is more, they represent the BoF on various international and local groups and work groups. The main focus is on cash operations, but cash policy matters are also the cashier's responsibility.

**Q. Could you tell us something about the BoF's decision to sell its printing works, Setec Oy?**

**A.** After BoF sold Setec Oy, the company closed part of its banknote printing works. It should be borne in mind that banknote printing was one of Setec Oy's smaller areas of production and the buyer of the company was interested in other security products Setec manufactured.

**Q. Central banks base themselves on a variety of strategies to make production and supply of cash to the economy more efficient. What does efficiency applied to cash management mean in your view?**

**A.** The BoF used to have its own paper mill. It was sold off in the seventies. As I mentioned, Setec Oy was sold off about ten years ago, and the printing works closed two years later. In the late eighties and early nineties, eight of the BoF's thirteen branches were closed and during my time three more. There are now just two branches left, one in the north of Finland and the other in Vantaa. I would venture to say that this process of closing branches has not had a negative impact on the cost and quality of Finland's cash cycle, but rather that it has been positive. Of course, the euro has had a significant impact in recent years. In my view of the role of the central bank in the cash cycle, what is important is not who performs the operations, but their end result, i.e. if it is sustainable for society as a whole, if people are happy with the services, if the cost is reasonable without public subsidies, if it complies with euro standards, etc. I am not sure that greater interference in operations from the public sector guarantees the best possible cash cycle. Of course, central banks cannot abdicate their general responsibility and authority over cash, which is, by definition, a monopoly. I am alluding to the fact that when the role of private players increases, good cooperation and perfect control systems at the central bank have to play a key role. We can still see various types of cash cycle in the euro area countries, which have been evolving over the centuries, shaped by history, culture, political systems, etc. The first twelve years have not brought substantial integration in the cash cycle, but I am sure that we are on track towards a greater integration.

**Q. What is the key to the efficiency of a central bank's cash cycle?**

**A.** In my view, there needs to be more centralization of certain basic cash activities through the ECB. I know that it is not easy, especially for the largest countries, but we have all seen how ineffective the development of the





Mauri Lehtinen

current new series of euro banknotes has been, for example. Another example is the management of banknote logistics. Fortunately, some progress has been made on procurement. Rather than outsourcing, I would talk in terms of cooperation or division of operating tasks. As I said, it is the results that count rather than who does the work. I appreciate that it is a demand task and it takes time, but we cannot give up.

**Q. What can you tell us about the process of the design and production of the euro?**

**A.** As a small central bank our main goal in the cash cycle has not been to be an important player in the development of banknote technology. We have more or less left it in the hands of specialists at the ECB and central banks with adequate resources. However, there are some policy issues of common interest. The first is that the current system for the design, origination and manufacture of a new series of banknotes is unsatisfactory. It takes too long, and can mean that by the time the banknote series comes into circulation it is already technically obsolete. Secondly, we have to recognise that the costs are much higher. Have we been blinded by the high level of seigniorage? To my mind the current system is simply too decentralised to be efficient.

**Q. From Finland's experience with euro banknotes and coins, what do you think of the structure of euro denominations (eight coin and seven banknote denominations)?**

**A.** Finland did not use the one and two cent coins right from the start. There are signs that the euro zone should be getting ready to follow suit. I think it should be done as soon as possible. On the question of the banknote denominations, for me the existence of 200 and 500 euro banknotes has always been a mystery. Is there a need for them as a means of payment? Is it again a question of seigniorage? Or are they a hangover from the past? If we look at sterling or the U.S. dollar we see things are done differently. In my opinion, 100 euros is an appropriate maximum value for euro denominations. Just imagine for a moment how much cheaper and easier cash production and the whole supply chain would be if we were to cut two denominations from the top and two from the bottom.

**Q. What is your opinion on the subject of buying banknotes or producing them in-house?**

**A.** It is again one of those topics that are in fashion, and there are various opinions about how to proceed. I also think that on this subject, simplicity is beauty, and in most cases, it is efficient too. I think we still have too many public printing works, even after the National Bank of Belgium closed its. The basic concept of a group of central banks with their own printing works together with a group of central banks running calls for tenders for banknotes seems appropriate to me. However, the standards and the

rules of the game ought to be simpler. It is also important to have a better idea of the cost of public printing works and try to define their role in the design and origination more clearly, while bearing in mind the role of the private sector and the ECB. A banknote is a strategic product and this is why a large area sharing the same currency, such as the euro, will always need its own banknote production to some extent. Half way between the public and private printing works could be an appropriate model from the overall structural point of view, and, to a lesser extent, from the point of view of cost.

**Q. What advice could you offer on managing central bank's coin activities?**

**A.** Coins always seem to be somewhat problematic for most central banks. They involve a lot of effort and expense, and in most cases the income goes elsewhere. The coin cycle is a mess compared to the banknote cycle, where there is the right to seigniorage. Over the longer term there is only one solution: leaving currencies entirely to central banks and pooling manufacturing in the same way as with banknotes. Another, much worse, solution would be to leave them entirely in the hands of institutions other than central banks. In any event, I think the current system has more or less reached the end of the line.

**Q. In the battle for the payment instruments of the future, with banknotes pitted against credit cards and other electronic means of payment like mobile phones, do you see a future for banknotes?**

**A.** By and large, the future of cash widely depends on political and economic developments. Another factor is the will of monetary areas and central banks. There have been signs that cash is being used less in developed countries than in developing ones. It is impressive how different the way the use of cash is evolving even within the euro area and there are reasons behind these differences. Are central banks neutral as regards the different means of payment? Do we obtain cross subsidies using cash rather than e-Payments? How much emphasis is placed on seigniorage when we talk about rates or the financial functions of a central bank? What do we expect from the euro as a global cash currency? Do we properly understand the way in which cash is being used in criminal activities and by smugglers? If we expand the use of the euro globally, are we benefiting developing countries or extracting seigniorage revenues from them?

**Q. Going forward, should the Eurosystem's national central banks' cash departments be integrated or does it make sense to have a single currency and 18 cash departments?**

**A.** The single currency is perhaps the most tangible and important symbol of the European Union (EU). Creating the euro and euro cash represented a huge and successful effort at the time. This explains why progress since



then has been slower. However, having clearly shown the cash sector the road towards EU integration, why should it not be a powerful guide for the future? I see wonderful opportunities for this while we remain able to cooperate, avoiding narrow national interests and trying to make wider use of national best practices. And the ECB's coordination role should not be forgotten: it is there to serve national central banks and we should not treat it as a competitor. I still think there are many topics that would be handled more efficiently if they were managed more centrally by the ECB.

**Q. Finally Mauri, have you read all the issues of BILLETARIA? What is your impression? Do you think BILLETARIA contributes to communication between central banks?**

**A.** I have always liked BILLETARIA and I greatly appreciate the huge effort the Banco de España and its Cash Department put into it. From its wide range of articles I select those of most interest to us. Whenever I have read it I have always found it to be very professionally edited and produced. It is one of the few not-for-profit publications on cash, if not the only one. This sets it apart and makes it particularly important for the central bank community. I hope BILLETARIA continues to be published and widely circulated in the future.

Thank you to Mauri Lehtinen for the sincerity and honesty with which he has answered our questions and for the courage with which he has addressed certain issues that are currently the subject of political debate. It is always a rare pleasure and pride to hear the views of someone as with the professional experience and sound judgement of Mauri. And we are of course also grateful for his kind words of encouragement and recognition for those of us struggling to keep the flame of this project and international meeting point that is BILLETARIA alive. Thank you Mauri and all the best for the future.



Mauri Lehtinen and J. Darío Negueruela at a meeting in Madrid in 2009 / BILLETARIA



Mauri taking a stroll during the break at a meeting / JDN



# The Banco de España's cash survey

■ Marina Pérez, Sonia Guinea and J. Darío Negueruela *Banco de España*

In 2004, following discussions with some of our colleagues in the euro area about the differences between countries, we became aware of the scarcity of information on how the cash cycle actually works in Spain. This gave rise to three different initiatives that sought to fill this gap: a) the design and implementation of a national cash survey, aimed at the general public and small retailers, to determine end users' opinions and how they rate and use cash, b) the preparation and implementation of a statistical information system based on the cash-handling activities of credit institutions and cash in transport companies, and c) a system to collect information from large supermarkets, factories, and other cash users.

Combined analysis of the three new forms of information, together with a new use of daily lodgements statistics and delivery of banknotes through Bank branches, should be an instrument to obtain first-hand information and evaluate Spain's cash cycle, as a possible input to decision-making.

This gave rise to the national currency survey, developed and created by the Banco de España's Cash and Issue Department over the course of 2004 and launched in 2005. Since then, the survey has been run each year without interruption and it is envisaged that it will be continued. As mentioned, the qualitative information obtained from the survey is complemented with further information from two other sources, enabling the information to be understood and evaluated as a whole from a broader perspective. This allows the adoption of new measures to be evaluated and analysed, or the development of new projects to be studied, in order to improve the quality of the service.

## 1. Survey characteristics

The survey is run annually, targeting two different groups: the general public and the small retail and hospitality sector. The process, lasting around six months, starts with a public call for tender to select the specialist firm entrusted with carrying out the field work. While the call for tender is under way the Cash and Issue Department starts designing the questionnaire. Once the firm has been selected, the interview phase begins. This takes place on site with a representative group of members of the public be-

longing to the two target groups, including 2,000-plus respondents. The data produced are processed and analysed during the interview phase. Finally, once this stage of the field work has been completed, and with all the possible information, the relevant reports are prepared, and the results of the survey presented.

Table 1. General characteristics of the survey

General characteristics	
Geographical scope	Spain
First survey	October 2005
Frequency	Annual
Survey groups	1 <sup>st</sup> General Public 2 <sup>nd</sup> Small-retail and hospitality sector
Firm responsible	Selected by call for tender
Sampling technique	Face-to-face interviews at homes and businesses
Sample	Proportional and stratified by: - Territorial area - Size of municipality - Economic activity
Source of sample	National statistics institute (INE)
Duration of interviews	At least 20 minutes
Error margin	±2.8 %
Confidence level	95.5 %

## Selection of the sample

For both groups, the selected sample is sufficient and of reasonable size for the final degree of representativeness it provides. The type of sample is proportionally allocated with stratification by territorial area, size of municipality, and where applicable, business sector (retail and hospitality).

Using the classification data in the survey, the general public group in the sample can be segmented by sex, age, marital status, level of educational attainment, occupation and income, and, for the retail and hospitality group, by specific business sectors, establishment type, number of employees, and average turnover. The sources used to select each of the samples are the municipal census and the central directory of businesses, respectively, both prepared by the National statistics institute (INE).



Table 2. Headline aggregates figures. Progress of survey

Public	2005	2009	2013
No. interviews	1,024	1,200	1,266
No. questions	60	80	80
Retail and hospitality			
No. interviews	800	1,000	1,270
No. questions	60	63	65

### Questionnaire design

The questionnaire is the basic tool used to extract the necessary information that will subsequently be collated and analysed. Its design is therefore fundamental to achieving the survey's goals. It comprises between 60 and 80 questions, most of which have a closed set of possible answers, so as to avoid confusion during data collection and facilitate subsequent processing. Open-ended questions are only used when unavoidable. The answers to these questions have a code associated with them that groups similar answers for later statistical processing. Moreover, to confirm the consistency of the respondents' replies, cross-check questions were included in various sections of the questionnaire. The questionnaire may be analysed in various different ways:

a) The questionnaire is divided into three blocks, according to the information sought from each question. The first is the main—and quantitatively most significant—block. It includes a series of fixed questions that are repeated each year so as to collect long-term information allowing trends and other developments to be identified and analysed. The second block comprises questions that refer to specific events and generates information that is only relevant at a particular point in time<sup>1</sup>. The third block comprises questions on specific aspects about which the Bank wants information to support new activities, design changes in existing management policy, projects impacting directly on the structure of the cash cycle or the use of means of payment in general<sup>2</sup>.

b) In the light of the subjects it covers, the questionnaire is divided into a number of sections grouping questions together according to the issues covered. These sections are:

**1. Use of cash and other means of payment:** compiles questions on the public's preferences for the various means of payment, how often they use them, what transactions they use them for, what level of security they offer, etc.

**2. Financial institutions' banknote service for the public and retailers:** the issues raised refer to members of the public and retailers' experience with banks, what services they use, how they rate them, what banknotes ATMs and bank counters offer, what quantities they usually withdraw, the quality of the banknotes they receive, and the fees they are charged, etc.

**3. Cash use habits:** members of the public are asked questions such as how much money they usually carry in their wallet, where they store

it, if they hoard low denomination coins, etc. In the case of retailers, they are asked if they refuse cash payments with certain banknote denominations and why, or if they set a maximum cash limit to ensure there is cash in the till, etc.

**4. Checking the authenticity of banknotes and coins:** this section includes questions about counterfeits and the measures users adopt to avoid them. In particular, users are asked about their familiarity with banknote security features; if they check the authenticity of the banknotes and coins they received, and, if so, how; if they had ever been given a counterfeit banknote and what they did about it; if they considered they had been given enough information, etc.

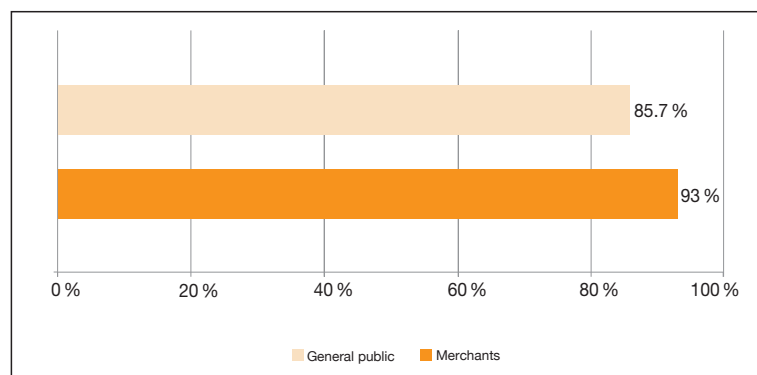
**5. Quality of banknotes and coins in circulation:** includes questions about the cleanliness and conservation of banknotes and coins, the causes of their deterioration, the importance users attach to banknote quality, and who is responsible for keeping them in good condition.

**6. Public services from the Banco de España:** includes a series of questions on the public's knowledge of the Banco de España and its cash-related services. They were asked about their experiences, whether they have ever visited the Bank's central offices or branches, what procedures they carried out, how they rated the service received, etc. There was also a section on how useful they found the Bank's website.

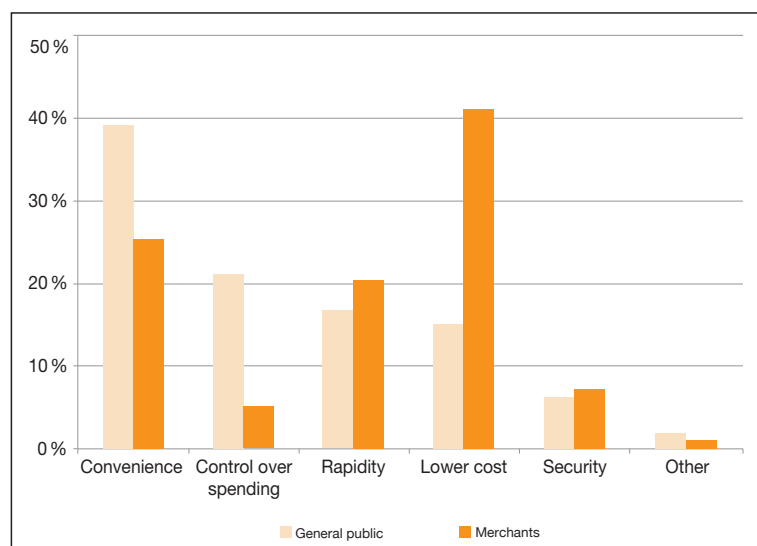
### Running the survey

Before starting field work two pilot trials were run, one self-application by the interviewer and another with 10 people from the target group to con-

Graph 1. Preference for cash as a usual means of payment. 2013 survey



Graph 2. Reasons why cash is preferred. 2013 survey



1. In 2005 questions of this kind included specific questions on the public's and retailers' adaptation to the new currency – the euro. Similarly, the most recent survey, carried out in 2013, contains questions aimed at finding how well people know and accepted the new Europa series banknotes.

2. For example, questions on the public's opinions about the Banco de España's website, the preference for 1 and 2 cent coins, or the country of origin of the coins in their pocket, would be included in this category.

firm the clarity of the questions. Additionally, each interviewer receives specific training. Interviews are conducted face-to-face at the respondent's home or establishment, according to whether they are general public or retailers. The survey interview lasts between 20 and 30 minutes, and interviewers usually carry out between 8 and 12 a day. The field work therefore takes around two months to complete. The interviews are timed to avoid the end of the year, when Christmas shopping tends to affect certain aspects of people's perception of cash use.

### Data processing

Once all the interviews have been completed, the next step is to sort, structure, and analyse the information gathered in order to draw conclusions from the study. This is a four-stage process:

1. Filtering the information: the data are collated and information from the codes associated with the open-ended questions is collected and a free-format file of inconsistencies generated.
2. Drafting of statistical tables: distribution of frequencies, averages and deviations.
3. Calculation of averages: in the case of numerical answers, the average is calculated with the corresponding figures. If the answer is a range, the mid-point of the range is taken as the average value.
4. Obtaining results: each variable is analysed individually and then bi-variate analysis is carried out to determine whether each pair of variables may be interrelated.

## II. Findings

Some of the main findings are set out below:

– Cash remains the payment mechanism preferred by 85.7 % of the general public and 93.0 % of the retail and hospitality sector (Graph 1). The reasons for this preference are different in each case (Graph 2): whereas for the general public the main reason for this choice is convenience (39.2 %), followed by the ease of controlling spending (21.1 %). For the retail and hospitality sector the preference is due to lower cost (41.2 %) and convenience (25.3 %). Thirdly, there is the rapidity of payment, both for the public (16.6 %) and merchants (20.4 %).

– Since the survey was first run in 2005 there has been an improvement in the perception of the quality of banknotes and coins in circulation by both the general public and merchants. In both cases the perceived quality of banknotes and coins in circulation has increased by almost two points, rising from five points in 2005 to almost seven points in the 2013 survey (Graph 3).

– As regards banknote counterfeiting (Graph 4), it has been seen that since 2005 there has been a significant drop in the number of people who reported having received a counterfeit banknote, with the latest figure available just 7 % of respondents. When verifying banknote authenticity, the security features most often checked by both the public and merchants are the paper, the security thread, the raised print, the watermark and, finally, the hologram, in that order (Table 3).

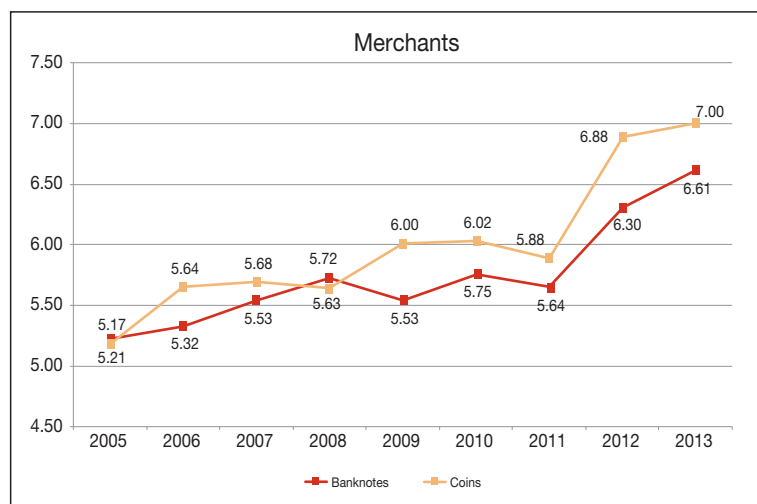
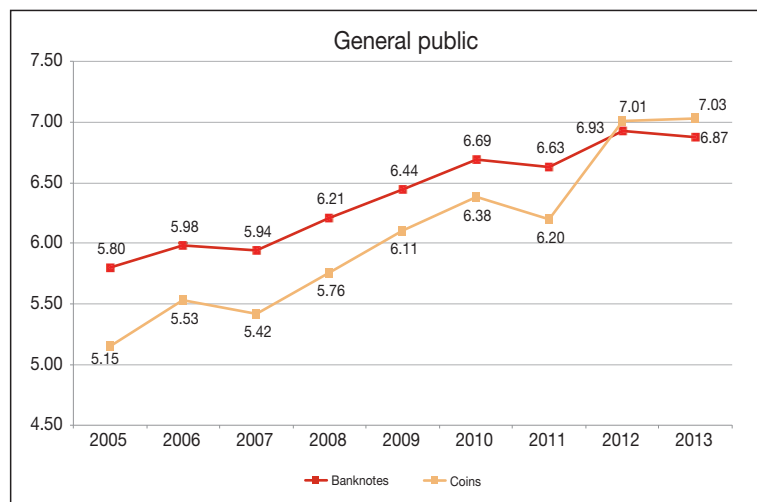
– As Graph 5 shows, the means most often used to withdraw (question aimed at the general public) or deposit (question aimed at the retailer and hospitality sector) cash are ATMs and bank counters. More than half of respondents from the general public (53.8 %) use ATMs to withdraw cash, while 25.0 % use commercial bank counters. In the case of

cash deposits, a large majority of respondents in retail and hospitality (69.3 %) commonly uses bank counters, while just 14.7 % pay in cash using ATMs.

– Table 4 summarises some of the aspects of the services offered by the *Banco de España* to both the retail and hospitality sector and the general public. Around 10 % of respondents of both groups have sometimes visited the Bank, mainly for counter transactions ( $\approx 70$  %). Although it has been more than 12 years since the euro was introduced, exchanging pesetas for the new currency remains the most frequently requested transaction ( $\approx 80$  %). The high rating the public (8.0) and merchants (7.4) give to the service from Bank staff stands out. Both groups rated the website highly, with more than 90 % considering it fairly useful, although only a small percentage of respondents had visited it. One aspect on which it is necessary to continue working is providing public information about banknotes and coins, as suggested by 68 % and 74 % of public and retail respondents, respectively.

**Graph 3. Perceived quality of banknotes and coins in circulation. 2005-2013**

(On a scale of 1 to 10, where 10 is the highest quality)



## III. Concluding remarks

The national cash survey has proven itself to be an extremely useful tool in understanding how the public and merchants behave as regards banknotes and other means of payment. When this edition of BILLETARIA is published, the tenth edition will be under way, and a significant time

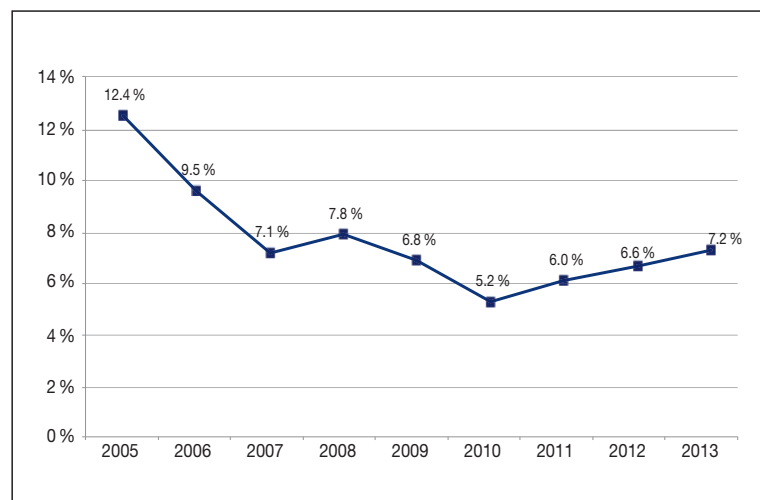


series of data has already been accumulated. The firm carrying out the survey has changed on three occasions, without any affect on the results, confirming that the working methodology is consistent, as is the sample selection method and the stratification system. Moreover, numerous central banks have expressed an interest in having more details of the work being done and the Department has forged closer links with peers on this issue.

The survey has made it possible to confirm or reject a number of insufficiently founded hypotheses, some of which were relatively widespread, and help define *Banco de España* policies on banknotes and coins. Thus, for example, while some experts stress the anonymity of banknotes as a characteristic justifying their use by the majority of the population, the survey shows that is in no way a decisive factor in users' decisions (in statistical terms). The survey also shows that the public pays closer attention to optically variable inks than to the watermark, suggesting that many of the designs highly regarded by experts are not popular with most of the population and that people are generally not in favour of radical design changes. The way in which the public distinguishes the concept of money clearly from that of the banknote, the way they react to the phenomenon of counterfeiting or information policies, etc. are issues of great importance in which the Department has come to recognise that proximity to the public is a basic component of understanding the market.

The survey has also shown itself to be useful in obtaining rapid and concrete answers, and at the same time, observing behaviours and defining long-term trends. It tells us how many banknotes an average citizen holds and in what type of transactions they prefer to use them how they react

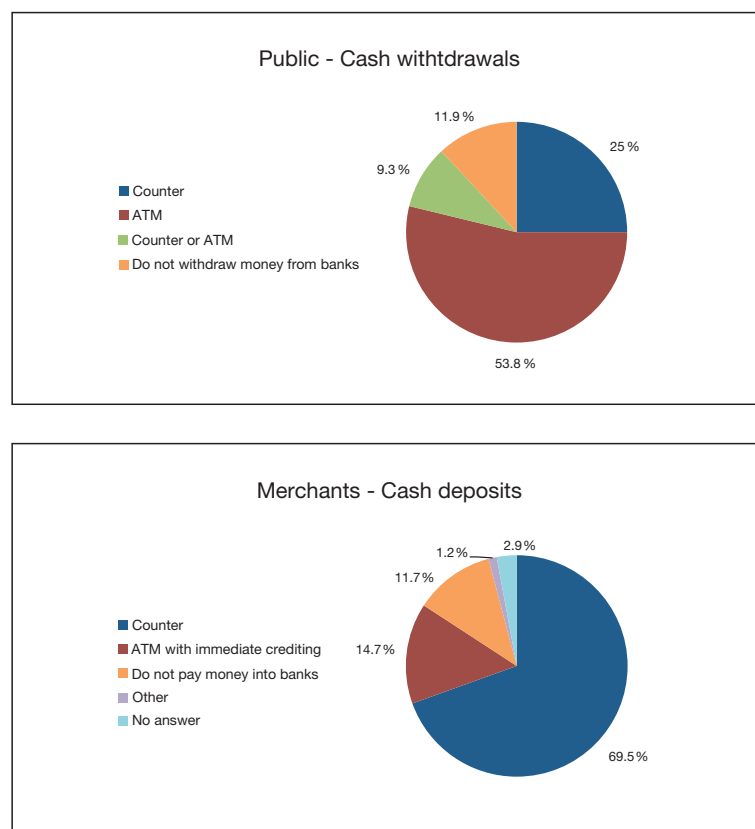
**Graph 4. Counterfeit banknotes: percentage of members of the public who report having received a counterfeit banknote in the last twelve months. 2005-2013**



**Table 3. Most frequently verified security features. 2013 survey**

FEATURE	PUBLIC	RETAIL
Paper	65 %	56 %
Security thread	47 %	32 %
Raised print	35 %	30 %
Watermark	33 %	24 %
Hologram	29 %	25 %

**Graph 5. Cash withdrawals and deposits. 2013 survey**



to low value coins, and what they expect from the *Banco de España* on this and other topics, how the public values other alternative means of payment and the extent to which they alter their consumption habits, etc. About to reach its tenth edition, thanks to the value of its results over the year, this consistent, rigorous and well structured nation survey on cash use has become a hugely important information tool, making a positive contributing to guiding the *Banco de España's* cash management.

**Table 4. Opinion on the Banco de España's cash service. 2013 survey**

	POINT EVALUATED	PUBLIC	RETAIL
Dealing with BdE	Have ever visited the <i>Banco de España</i> (BdE)	9.2 %	10.0 %
	Rating of service received	8.0	7.4
	Main reason for visiting the <i>Banco de España</i>	Counter cash service 71.7 % and 67.5 %	
	Main operation carried out	Changing pesetas for euros 80.2 % and 81.3 %	
BdE Website	Have visited the website	2.2 %	3.1 %
	Rating given to the website as useful or informative	90 %	91.7 %
Communication	Considers that the <i>Banco de España</i> should be more active in informing the public about banknotes	68.4 %	74.5 %

# The *Bundesbank* study on payment behaviour in Germany

■ Helmut Rittgen and Martina Eschelbach *Deutsche Bundesbank*

Since the introduction of euro banknotes and coins in 2002, the *Deutsche Bundesbank* has issued around €450 billion in banknotes and €7 billion in coins. German net issuance of cash accounts for roughly 50% of total net issuance by the entire Eurosystem. These salient figures are often used to argue that Germany is predominantly a cash-based country. However, it would be naive to think that these figures reflect the actual amount of cash in circulation in Germany. Coins and banknotes migrate from one country to another, they get lost, or they are permanently hoarded. To shed more light on the whereabouts of German banknotes and on current payment behaviour in Germany, the *Deutsche Bundesbank* conducts a regular consumer survey on this subject. The main topics of interest are as follows. How much cash does an average German consumer carry around in his or her pockets? How much cash is used for private payments (including transactions between private individuals)? Which cashless payment instruments are used by consumers in Germany, and how will this influence the demand for cash in the long run?

Besides looking into the whereabouts of the cash issued by the *Deutsche Bundesbank*, the payment behaviour study fulfils another important purpose. According to section 3 of the *Deutsche Bundesbank Act (Bundesbankgesetz)*, the *Deutsche Bundesbank* “shall arrange for the execution of domestic and cross-border payments and shall contribute to the stability of payment and clearing systems.” To fulfil this task, the *Deutsche Bundesbank* needs reliable and objective information on how people actually effect payments. A great deal of research has been conducted into this subject in recent years. However, this research was predominantly of a commercial nature, and the results might have been influenced by private interests. By initiating a study of its own on payment behaviour, the Bundesbank has created a reliable source of data which provides neutral information for the general public and can be assessed by policymakers and researchers alike.

## I. Management

So far, the *Deutsche Bundesbank* has conducted three surveys of payment behaviour in Germany (2008, 2011 and 2014 forthcoming), and it is planning to conduct one every three years. The surveys are carried out by a market research institute in close coordination with the *Deutsche Bundesbank*. The *Deutsche Bundesbank*'s team consists of a market research expert, an econometrician, two experts for cash and two for cashless payment instruments. They draw up the survey questions and monitor the progress of the interviews. Later, they also analyse the data and take charge of publication.

In the first survey, it took the *Deutsche Bundesbank* around two years to get from drafting a questionnaire to publishing the first results. This timeframe was shortened to around one year for the two subsequent surveys.

## II. Methodology

Each survey featured around 2,000 German-speaking respondents aged 18 years and above, residing in private households in Germany. It was crucial for the data to be representative. On the basis of the master sample of the Association of German Market Research Institutes (*Arbeitskreis Deutscher Marktforschungsinstitute e.V. – ADM*), a representative random sample was taken from this population using a three-stage selection process. This sophisticated approach is more expensive, but it produces extremely reliable results.

The surveys consisted of two parts. First, a computer-assisted personal interview (CAPI) in which participants are invited to describe their usual payment behaviour. They are asked around 40 questions which take around 30 minutes to answer. At the end of the interview they receive a small package of shredded banknotes as a gift.

Second, respondents were given a one-week payments diary and asked to make a note of each purchase as well as the amount, location and payment instrument used. The diary data are particularly valuable because they reflect individuals' actual payment behaviour. Respondents were offered an incentive of €10 to hand in their diaries.

The questionnaires varied slightly from one survey to the next. Several core questions are asked on a regular basis in order to build up time series on key indicators. For example, these questions cover the amount and frequency of cash withdrawals, which are used to calculate consumers' transaction balances. Furthermore, the sections of the diary which are used to calculate the relative shares of cash and card payments remained largely unchanged.

In addition to the core questions, each survey has questions of topical interest. In 2011, for example, participants were asked to give their opinion of small coins and whether they would be in favour of commercial rounding. The 2014 study will include a special section on the security risks of different payment instruments.

## III. Use of the results

One major purpose of the study is to provide the general public with objective information on payment behaviour in Germany. As soon as the data are available, the *Deutsche Bundesbank* publishes a descriptive report aimed at the public at large, which summarises the main findings of the study (*Deutsche Bundesbank* 2009, 2011). Two key figures are at the heart of the report: the transaction balances of German consumers, and the share of cash payments.

The transaction balances of German consumers are an important piece of information for calculating the amount of cash circulating in Germany. In 2011, an average German consumer had around €103 of cash in his or her wallet. Drawing on further figures, Bartzsch *et al* (2011)<sup>1</sup> estimated that the number of banknotes used for payments in Germany accounts for only around 15% of the *Deutsche Bundesbank*'s total net issuance. This implies

1. N. Bartzsch, G. Rösl and F. Seitz (2011). *Foreign demand for euro banknotes issued in Germany: Estimation using direct approaches*, *Deutsche Bundesbank*. Working document no. 21/2011.



## Share of payment instruments broken down by turnover and number of transactions in 2011 and 2008

Payment instrument	Breakdown by turnover			Breakdown by number of transactions		
	Turnover in euro	Percentage share	Percentage share* (2008)	Number of transactions	Percentage share	Percentage share* (2008)
Cash payment	317,137 €	53.1%	57.9%	16,285	82.0%	82.5%
Girocard with pin	124,946 €	20.9%	25.5%	2,004	10.1%	11.9%
Girocard with signature	44,147 €	7.4%		665	3.3%	
Credit card	44,369 €	7.4%	3.6%	360	1.8%	1.4%
Prepaid credit card	33 €	0.0%	0.1%	4	0.0%	0.2%
GeldKarte	782 €	0.1%	0.5%	48	0.2%	0.5%
E-payment scheme	10,115 €	1.7%	0.3%	148	0.7%	0.1%
Retailer card with payment function	715 €	0.1%	0.2%	11	0.1%	0.1%
Direct debit	4,268 €	0.7%	1.9%	58	0.3%	0.6%
Credit transfer	49,181 €	8.2%	8.9%	259	1.3%	1.8%
Contactless payment with a card	318 €	0.1%	—	7	0.0%	—
Other	1,269 €	0.2%	0.4%	21	0.1%	0.2%
Contactless payment via mobile phone	0 €	0.0%	—	0	0.0%	—
Other payment schemes via mobile phone	0 €	0.0%	—	0	0.0%	—
Total	597,280 €	100.0%	99.0%	19,870	100.0%	99.0%

Note: The figures refer to the transactions made by the respondents (2,098) during the diary recording week and are representative of Germany as a whole.

\*Percentage share (2008): Missing percentage point to 100 %: payment instrument not stated.

that the bulk of German banknotes go abroad or are hoarded. The share of cash payments, meanwhile, reveals the extent to which cash is gradually being replaced by cashless payment instruments. In 2011, around 53% of German expenditure was made using cash. Although this figure was slightly higher in 2008, cash remains the most popular payment instrument in Germany.

The descriptive reports usually attract a great deal of attention in the media. The *Deutsche Bundesbank* holds a press conference and presents the results at various conventions. In a second step, the data are used as inputs in more extensive research projects. The results of these projects are published as academic discussion papers and in international journals.

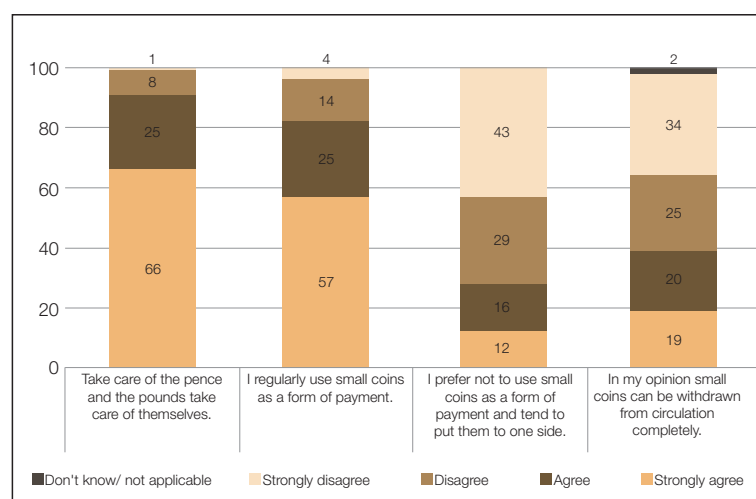
Von Kalckreuth, Schmidt and Stix (2013), for example, were interested in exploring whether the selection of payment instruments can be described as a rational choice or whether it instead reflects habit persistence. It appears that consumers in Germany use the payment instrument they judge to be best according to different criteria (eg speed, convenience or anonymity) and thus, indeed, act rationally in their choice of payment instrument at the point of sale. In a further paper, the same authors discover that one important reason for using cash is that it offers an easy way to monitor expenditure (Von Kalckreuth, Schmidt and Stix 2014). Eschelbach and Schmidt (2013), meanwhile, find that consumers who usually prefer cash start to use cards when they risk running out of cash. Thus, consumers seem to keep precautionary cash reserves during a shopping trip to hedge against unforeseen purchases that require cash payments.

The *Deutsche Bundesbank* also participates in international research projects with other central banks that conduct similar surveys, the aim being to discover the extent to which the institutional setting in a given country can affect payment behaviour (Arango *et al* (2013)<sup>2</sup>, Huynh *et al* (2014)). Of particular interest are comparisons with the Netherlands, where the institutional setting is very different and cash usage is particularly lower.

#### IV. Outlook

With one survey being conducted every three years, the *Deutsche Bundesbank* plans to build up a long-term database on payment behaviour that can be used by policymakers and researchers alike. A long-

#### Public opinion of small coins (1 and 2 euro cent coins)



term database will facilitate more accurate predictions on the development of payment behaviour and the demand for cash. This information can then be used to better assess the future German cash cycle and its logistical requirements.

Furthermore, the *Deutsche Bundesbank* wants to promote international cooperation. Partners so far include the *Oesterreichische Nationalbank* (OeNB), the *Nederlandsche Bank* (DNB), the US Federal Reserve, the Canadian and Australian central banks as well as the French university Télécom Paris Tech. The aim is to build up a network of central bankers and researchers with knowledge spillover. Cooperation with other central banks of the Eurosystem that have similar structures in the cash cycle, such as the *Banco de España* or the *Banca d'Italia*, would be highly beneficial. This is also the reason why the Bundesbank regularly organises a research-oriented conference and a policy-oriented symposium on cash usage and payment behaviour. Moreover, it would be desirable to have studies on the usage of cash in a larger number of countries. In particular, payment behaviour surveys in each country of the euro area would be a valuable source of insights and help to complete the picture of coin and banknote migration. To achieve this objective, the *Deutsche Bundesbank* is supporting the ECB in its considerations to conduct a study at the European level.

2. C. Arango, Y. Bouhdaoui, D. Bounie, M. Eschelbach and L. Hernández (2014). *Cash management and payment choices: a simulation model with international comparisons*, Deutsche Bundesbank. Working document no. 4/2014.

# European Central Bank surveys

■ Marina Nunes *European Central Bank*

When thinking about surveys on banknotes, most of us think about the occasional surveys involving the public on the use of cash or on people's perception of banknotes. However, for the European Central Bank (ECB), surveys are very important and are carried out regularly in all kinds of areas owing to the decentralised structure in which the Eurosystem has been set up. It means that each national central bank (NCB) of the Eurosystem is responsible for its own cash operations, and that there are wide-ranging differences between how national branch networks are set up, how sorting machines are operated, how banknote stocks are managed, etc. However, owing to banknote migration between the euro area countries and the resulting need for the use of banknote stocks to be shared, common policies on cash management are necessary. Both the decentralised structure and the need for common policies require an extensive exchange of information between the NCBs in the Eurosystem, in particular on national organisation. Working practices at a national level could be affected if policies have to change with a view to further harmonising procedures or processes.

The ECB has held countless surveys since the euro was established; as is always the case with surveys in a European context, the more you know about a topic, the more you become aware of what requires further improvement and increased efficiency. Every year, therefore, new surveys are conducted in order to better understand national situations and to fine-tune common policies. Examples include surveys on packaging standards, banknote processing, the organisation of national cash cycles, national interpretations of European Union law, production and issuance costs, etc.

Surveys are also conducted on the perception of banknotes and their security features. These are more common and are carried out by many central banks across the world, with the ECB being no exception. Indeed, it has gained a vast amount of experience in carrying out these surveys, which often do not only involve the public, but also cash handlers or other specialised stakeholders. However, although very relevant and interesting, this article will not focus on communication matters on the banknotes, but will instead focus on the issuance of the banknotes. The article will look at surveys initiated by the ECB which address the banknote equipment manufacturers (BEMs) and other third parties, including banks, retailers, vending/ticketing industries, cash-in-transit companies, professional associations and federations involved in the adaptation of banknote machinery to the new euro banknotes.

## I. Monitoring stakeholders' preparations for the new €10 banknotes

Soon after the launch of the Europa series €5 banknote on 2 May 2013, it appeared that some third parties had not adapted all their banknote han-

dling machines and authentication devices, which caused problems when using the new banknotes, for example with ticket and vending machines. The reasons given for not adapting the machines included the claim from some third parties that they were unaware that their banknote equipment had to be updated, while some did not see the need to do so or did not want to invest in the necessary changes, and others did not have enough time to adapt their equipment in the time between the new €5 banknotes becoming available for loan and the launch of the banknotes. Another reason given was that the security and financial terms set for borrowing new banknotes were too stringent.

With the lessons learnt from the preparation and launch of the Europa series €5 banknote, the Eurosystem has therefore decided to monitor the progress of third parties' preparations for the upcoming new €10 banknotes, right up until their introduction on 23 September 2014. To this end, several surveys have been launched targeting various categories of third party. The status of the new €5 banknote has also been reviewed, as not all machines and devices had been adapted by the end of 2013.

## II. Methodology

Four successive surveys were launched at key moments in the run-up to the issuance of the new €10 banknote (mid-January and the end of March, June and August 2014), with the objective of measuring the progress made in adapting to the new banknote.

The ECB conducted the surveys, targeting those "ECB-registered" BEMs that have signed a Euro Series 2 (ES2) confidentiality agreement. Throughout the development and testing of the new banknotes, the ECB has worked in close cooperation with these BEMs. Most of them operate at European level. Meanwhile the NCBs of the Eurosystem handled the surveys which targeted other BEMs, suppliers (e.g. of cash processors) and third parties which operate at national level.

Respondents were asked to answer questions about the level of readiness of software and hardware updates for roll-out on machines and devices, as well as the proportion of machines and devices per country and sector that have been adapted for the new €10 banknote. Plans for adaptation were also included, as were questions about the status of adaptation to the new €5 banknote. Questions were adapted for the different fields of activity.

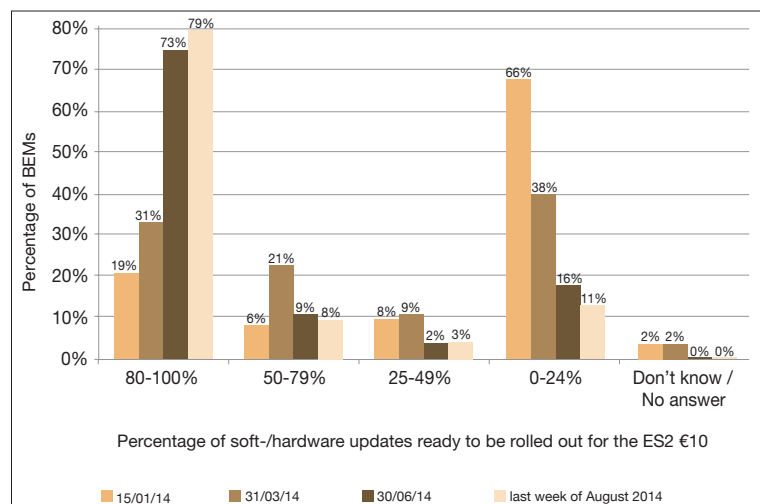
## III. Challenges

The timeline for monitoring the progress of third parties' preparations in the run-up to the launch of the Europa series €10 banknote was one of the main challenges. The first survey was conducted in January 2014 and the fourth and final survey at the end of August in order to collect the latest data available before the launch.

Except for the ECB-registered BEM surveys which were undertaken centrally by the ECB, the surveys were conducted in a decentralised manner



#### Percentage of BEMs' software/hardware updates ready to roll out on customers' machines and devices by end August 2014



by the NCBs so that sufficient data across the euro area could be collected at national level. This, in addition to centralised reporting to decision-making bodies, added to the complexity and time pressure of the task.

Sampling of the third parties surveyed was also a challenge, as the proportion of national BEMs and third parties that received the questionnaire was not necessarily the same across the different surveys and it also depended very much on the variability of the actual respondents to each survey. It is therefore difficult to compare results across the euro area countries and to accurately measure progress over time, but nevertheless the results do give a good indication of the status of the adaptation of the machines and devices.

#### IV. Results on the status of adaptation of machines and devices to the new €10 banknote by the end of August 2014

Around 550 third parties –all categories included– responded to the first two surveys, while the number of respondents to the fourth and final survey in August increased to over 800. This has now closed and further details on the results are provided below.

The following information focuses on adaptation to the new €10 banknote, so does not cover the questions about adaptation to the new €5 banknote which were included in the first three surveys.

By the end of August 2014 roughly 80% of the ECB-registered BEMs had between 80% and 100% of their software and hardware updates for the

new €10 banknotes ready for roll-out on their customers' handling machines and authentication devices (see Chart).

The results of this latest survey show that, on average in the euro area, 64% of the machines and devices had been adapted for the new €10 banknote by the end of August 2014. Nevertheless, the respondents plan to have, on average, 88% of their equipment adapted for the new banknote before the launch on 23 September 2014 (see Table).

#### V. Other cash-related surveys

Another example of a survey that has recently been conducted concerns cash-in-transit (CIT) companies and their role in the cash cycle. Following the introduction of the ECB's banknote recirculation decision, many NCBs in the euro area have reduced their involvement in the cash cycle, with cash recirculation now increasingly taking place via cash management companies. It has thus become critical for the Eurosystem to develop a deeper knowledge of CIT companies, which have been transformed over the years from pure cash transporters into general cash management companies, not only transporting but also processing cash on behalf of banks and large retailers, as well as filling and maintaining ATMs.

#### VI. Conclusion

The ECB has conducted a large number of surveys since its foundation in order to better understand the different situations across the euro area. Surveys have been conducted in a vast array of fields of activity related to issuance, communication, public perception, etc.

Recent developments after the introduction of the Europa series €5 banknote have led the ECB and the NCBs of the Eurosystem to take a closer look at stakeholders' preparations for the launch of the Europa series banknotes. Good preparations are indeed key to a smooth introduction of new banknotes. The ECB and the euro area NCBs have drawn lessons from the experience of the launch of the new €5 banknote and have since provided extended support to facilitate the adaptation of banknote handling machines and authentication devices, ready for the new banknotes. While it is the duty of the owners to adapt their banknote equipment for the launch of new banknotes, it is nevertheless the responsibility of the ECB and the euro area NCBs to initiate and support the process of adaptation as far as possible. To this end, the Eurosystem has surveyed the industry not only to measure the progress of its preparations but also to identify possible ways of further facilitating the adaptation and thus the use of the Europa series banknotes from the day they are introduced.

#### Status of the adaptation of machines and devices to the new €10 banknote and plans for the adaptation according to sector by end August 2014

	Response rate	Number of machines / devices used for €10	Percentage already updated to ES2 €10	Percentage that will be updated to ES2 €10 for the launch
Banks	79%	111,559	69%	98%
CITs	76%	11,955	62%	100%
Vending	51%	178,588	68%	82%
Retailers	73%	49,079	63%	88%
Other	28%	27,256	27%	73%
<b>Total</b>	<b>55%</b>	<b>378,437</b>	<b>65%</b>	<b>88%</b>

# Cash plays a key role in consumer spending

## Evidence from the *Diary of Consumer Payment Choice*

■ James Narron and Barbara Bennett *Federal Reserve System*

Worldwide, predictions about the demise of cash abound. In the United States, consumers' use of the other major physical payment instrument, the check, has been plummeting in favor of payment cards, especially debit. In addition, large national retailers report that cash payments as a *share* of total sales transactions are declining, particularly with the growth in online and mobile commerce. However, this is not the same thing as a decline in the actual number of cash transactions, and evidence from the *Diary of Consumer Payment Choice* (DCPC) survey that was conducted in October 2012 by the Boston, Richmond, and San Francisco Federal Reserve Banks shows that consumers continue to use cash more frequently for day to day transactions than even debit or credit cards. Indeed, cash plays a particularly important role in small-value transactions and as a ready alternative when other options are not available. And in the case of certain, mostly lower-income consumers, for whom alternatives to cash are often too costly or difficult to obtain and use, cash is the primary payment instrument.

### I. Consumers use cash more often than any other payment instrument

In 2012, American consumers used cash for 40 percent of all their transactions, followed by debit cards at 24 percent and credit cards at 17 percent (Graph 1). Electronic methods (online banking bill pay and bank account number payments) accounted for 8 percent, while checks made up 7 percent. Text and other payments had less than a 5 percent share of transaction activity.

However, cash's share of the total value of consumer transactions is much lower, suggesting that consumers use cash predominantly for low-value transactions. Indeed, consumers have a *lot* of low-value transactions each month. Nearly sixty percent of consumer transactions involve a "ticket size" less than \$25, and of these low-value transactions, cash accounts for 60 percent.

As shown in Graph 2, cash is the leading tender type for several expenditure categories, including gifts and other transfers between people ("Person to Person," or "P2P"); food and personal care supplies; entertainment

and transportation; and medical, educational and personal services. It is the second most frequently used payment instrument for all other categories except housing (and a distant second for financial and professional services). For P2P transactions, cash is particularly dominant, arguably in part because alternatives are simply less available. Indeed, if a mobile payment solution were to become ubiquitous for these types of transactions, it is likely that cash's dominance could erode significantly. At the same time, no matter how important cash may be to P2P transactions, these transactions make up less than five percent of all cash transactions. Instead, consumers use cash mainly for food and personal care supplies and other sorts of everyday expenditures. For these expenditures, noncash payment options typically are readily available to them. In fact, in most of the categories where cash is strong, consumers also use debit and/or credit cards quite frequently, suggesting that whatever their motivation to use cash, it is not a lack of access to alternatives (although it is possible that some merchants may discourage card payments for very low-value transactions). It is more likely that consumers choose cash for so many of these transactions because it is convenient, and doing so helps them control their spending on the incidental items for which they typically don't need a record of their purchase.

### II. Lower income consumers use cash differently

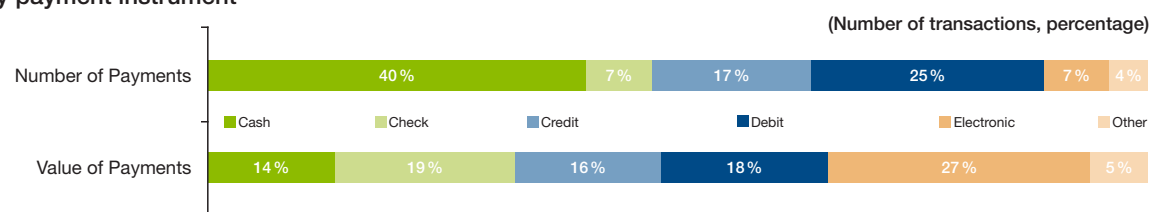
When we look at the choices consumers in different income groups make concerning the payment instruments they use, we find a very strong preference for cash among the lowest income group and an equally strong preference for credit cards among the highest income group. Not surprisingly, the payment instrument that consumers use most often is generally consistent with their preference. However, it is interesting to note that regardless of their preference and their income level, consumers use cash approximately the same number of times a month. What is different is that those in the lowest income households use cash for a much wider variety of transactions than do those with higher household incomes. Specifically, lower income consumers use cash for higher value transactions than do the more affluent consumers. They also use cash much more frequently for bill payments like housing than other consumers, perhaps due to a lack of access to banking and financial products (or a belief that these products are too expensive or too difficult to obtain).

### III. Cash is the preferred back-up payment instrument

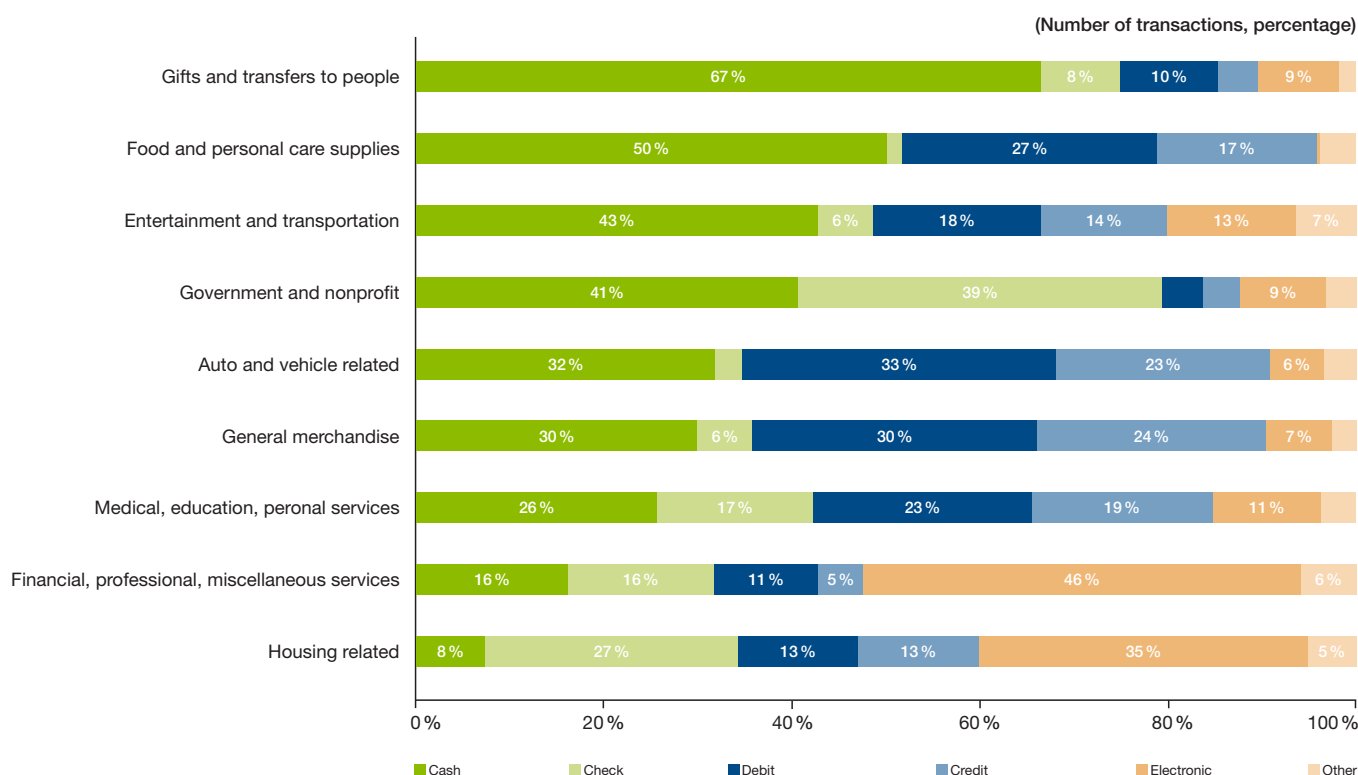
Not only does cash play an important role in small value transactions and as the primary payment instrument for lower income consumers, it also plays a significant role as the fallback payment instrument for most consumers. When asked which payment instrument they prefer to use, 44 percent of consumers overall indicated debit cards as their first choice, while 30 percent cited cash. However, when asked about their backup payment instrument, most consumers who preferred a non-cash payment instrument declared cash as their second choice. Sixty percent of consumers who prefer the debit card, for example, picked cash as their



Graph 1. Shares of transactions by payment instrument



Graph 2. Payment instrument shares, by spending category



second choice. A similar observation holds true for the other non-cash payment instruments.

This result is not surprising to the Federal Reserve Banks, particularly in light of the role cash plays in the wake of natural disasters and other types of business disruptions. The Reserve Banks serving the areas affected by seasonal hurricanes, for example, work closely with their financial institution customers to meet spikes in demand and ensure that the public has ready access to cash, particularly through the ATM networks in the region. In the days and weeks following “Superstorm Sandy,” financial institutions increased their orders from the Federal Reserve Banks significantly compared to the same period the prior year.

#### IV. Methodology

The DCPC was developed jointly by the Boston Fed’s Consumer Payments Research Center (CPRC), the Federal Reserve’s Cash Product Office (CPO) in San Francisco, and the Payments Studies Group (PSG) at the Richmond Fed with the intent that it would be repeated approximately every three years. First conducted in 2012, it complements the CPRC’s annual Survey of Consumer Payment Choice. It is used for strategic planning by the CPO, and to enable economic analysis of the payments choices consumers make.

The diary study is based on a random sample of 2,468 respondents from across the United States, based on the American Life Panel<sup>1</sup> administered

by the Rand Corporation. Using the Census Bureau’s Current Population Survey, responses were weighted to match national population estimates. October was selected as a “typical month” to minimize seasonality effects in consumer spending patterns. The survey was staggered over the month of October 2012 to ensure that there were nearly equal people participating each day of the month.

Participants were asked to log all of their transactions for three days, including their purchases, bill payments, cash withdrawals, and deposits. The diary also asked participants how much cash they had in their wallets at the start of the study and at the end of each day. To track the detail of each payment made for each day, participants were given a paper journal-like memory aid that also contained a reference list of payment methods, merchant type, etc. to help respondents classify their payments (Graph 3). Participants then logged into a website and entered their activity for the day.

Participants were also asked to identify and rank their preferred payment instruments at the outset of their diary entries. This allowed insight into the relationship between the consumer’s preferences and the actual payment instrument used in transactions. For more information on the DCPC, the Cash Product Office and the Consumer Payments Research Center, please visit <http://www.frbsf.org/cash/>, and <http://www.bostonfed.org/economic/cprc/index.htm>.

1. The American Life Panel is a group of more than 5,000 people above 18 years that have agreed to participate in interviews through Internet. It owns an American non-profit organization devoted to research and development.

### V. Conclusion

In summary, the DCPC offers evidence that cash is the most commonly used payment instrument and that it plays several key roles in consumer spending. All income and age groups use cash in roughly equal frequency, and particularly for small value items, making cash the dominant payment instrument for very low-value transactions. Moreover, consumers use cash especially heavily for certain types of everyday expenditures like food and personal care items. They also rely heavily on cash as their primary back-up payment instrument

in situations where their first choice may not be available. Finally, low-income consumers are much heavier cash users – even for bill payments – than other consumers who may also have a stated preference for cash but who tend to choose other options for bill payments and other high-value transactions.

Thus, while debit and credit cards are growing strongly, and cash's *share* of total consumer transactions may well be declining, the 2012 Diary results suggest that cash still plays a very significant role in the U.S. consumer payments landscape.

Graph 3. Example of a Diarist's Memory Aid Journal

Time	Amount Spent	Payment Method	Location	Device	Merchant Type	Merchant name
5 pm	\$ 60	P4 Debit	L1 In-Person	D6 None	M2 Grocery	Falletti Foods
8 pm	\$ 15	P1 Cash	L1 In-Person	D6 None	M17 Movie	Multiplex

Time	Cash Amount	Cash Location	Cash Source	Did you pay a fee?
5 pm	\$ 40.00	C2	S1	Y / <input checked="" type="checkbox"/> N

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# Market research by the *Banco de México* cash department

■ Office of Cash Studies and Analysis *Banco de México*

The *Banco de México* applies eight guiding principles to identify the issues on which it needs focus in the medium term. The Issuance Directorate (cash department) is aligned with three of them, relating to the production and distribution of banknotes and coins, the Bank's security, and institutional communication. These guiding principles are structured into thirty-five institutional objectives, reflecting more specific aspects. Indicators are used to measure the level of fulfilment of each. Market research is used to measure some of this Directorate's indicators, which has made it possible to explain social conduct in relation to cash.

In order to comply with its constitutional mandate of supplying the country's economy with the national currency, the *Banco de México*, through the Issuance Directorate, manufactures banknotes, orders the minting of coins, and puts both types of currency into circulation. A number of important issues are considered when these activities are carried out: the quality of the banknotes in circulation, the availability of the different denominations, and the service retail banks are expected to provide the public. For the Bank it is also important to know what problems the public faces when making cash payments, the trends in uses and habits relating to banknotes and coins, and people's perception of counterfeiting. To monitor the foregoing, the Issuance Directorate periodically carries out studies.

## I. Qualitative studies

These annual qualitative studies involve focus groups and in-depth groups. Both bring together a small number of people who, guided by a moderator, freely express their spontaneous opinions on a particular issue. The difference between the focus group and the in-depth group is that the latter comprises individuals who record their cash transactions over a fortnight in a "payments diary." Individuals taking part in the in-depth group tend to be more receptive and their input is more objective.

Since 2008, three sessions have been run with focus groups and three with in-depth groups in each city covered by the studies: one group in socio-economic levels AB/C+ (upper and upper middle class), another in levels C-/D+ (lower middle class), and another comprising retailers or people who regularly handle cash in their work. The selection criteria for participants' cities of origin are: two cities where the *Banco de México* has a regional vault<sup>1</sup>, two cities in which there is a correspondent bank of the *Banco de México*, and two cities in which there is at least one



Façade of the main building / BM

bank branch, apart from Mexico City. Between 10 and 12 adults took part in each session;<sup>2</sup> women accounted for between 40% and 60% of participants.

These qualitative studies made it possible to uncover the reasons for attitudes and patterns of behaviour that can be used to assess new security features, dissemination campaigns, and the level of understanding of the procedures and services that retail banks are expected to provide. In general, the factors underlying people's liking for or rejection of certain features of banknotes and coins have been identified. In some instances, answers obtained from this type of study are useful in refining details of the process of preparing quantitative studies (surveys).

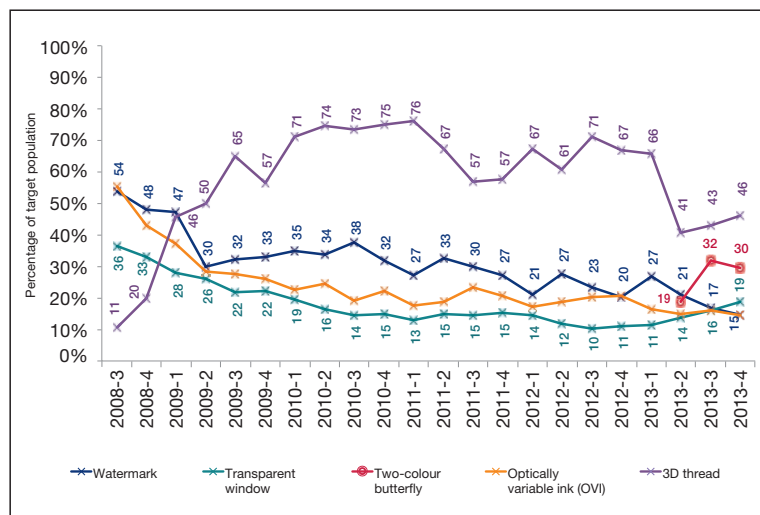
1. The *Banco de México* has regional vaults in the cities of Veracruz, Guadalajara, Hermosillo, Mexicali, Mérida and Monterrey.

2. Individuals are considered adult in Mexico when they reach 18 years of age.

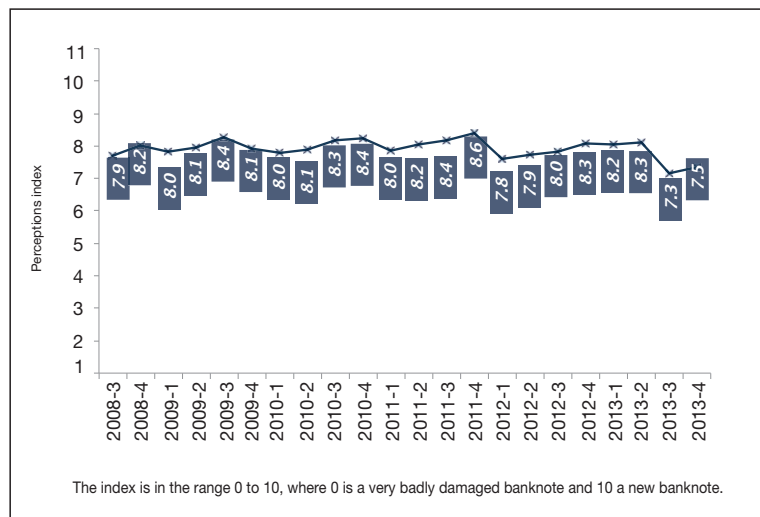
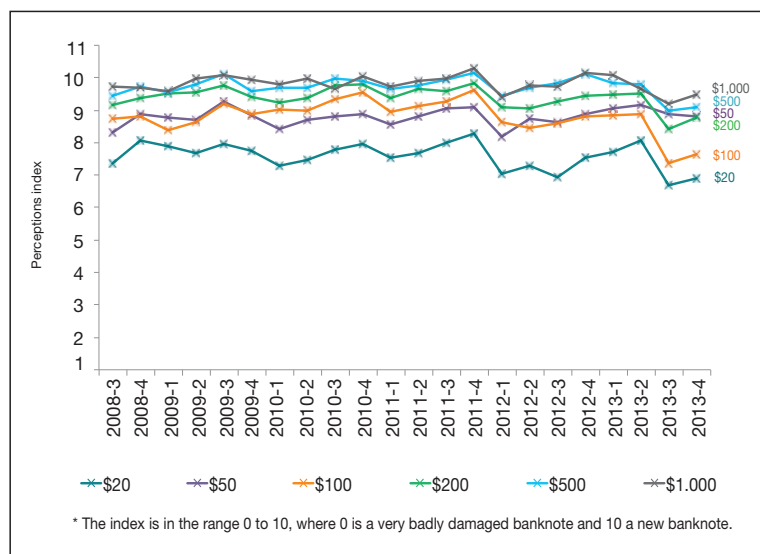
## II. Qualitative studies

Surveys are the main method of quantitative study used by *Banco de México*, as they represent the most widely used way of collecting data from the public, and the most widely used way of determining the public's

**Graph 1. Public awareness of banknote security features**



**Graph 2. Indicators of the public's perception of the quality of banknotes in circulation**



tastes, preferences, and reactions to products –in this case banknotes and coins– and advertising.

Quarterly surveys have been run since 2008, and the results have enabled a series of indicators to be prepared, such as problems with change, banknote security features used by the public, and public perception of quality and satisfaction with the banknotes in circulation (calculated using structural equation modelling). Annual surveys have also been run, covering cyclical issues, for the Issuance Directorate. For example, the level of recall following advertising campaigns, new banknote security features, the design and themes of banknotes and coins, and awareness of the exchange service for damaged banknotes provided by commercial banks, etc.

These surveys take the form of a face-to-face interview in homes with people aged over 18 living in towns and cities of over 50,000 inhabitants, considering a sample size of between 2,000 and 2,100 respondents, a confidence level of 95%, and measurement error of 5%.

## III. Mystery Shopper study

Since 2011 an annual study has been conducted each year using the “Mystery Shopper” market research technique. This involves a market researcher pretending to be a shopper and performing specific tasks, such as requesting a service, asking questions, or behaving in a particular way, in order to observe and assess the services provided. The “mystery shoppers” collect samples of banknotes by undertaking specific transactions at retail establishments, ATMs and bank counters. The information generated in each transaction is registered on a questionnaire.



Facilities of the Issuance Directorate / BM



### Characteristics of samples in the *Mystery Shopper* studies, 2011-2014

Year	Urban locations	Semi-urban locations	Number of transactions	Items in the sample
2011	37	26	5,031	42,155
2012	54	24	5,533	34,262
2013	27	117	6,672	39,515
2014 <sup>1)</sup>	26	120	—	—

1) The figures are provisional as the 2014 study is still under way.

The study is conducted in urban locations with 50,000 or more inhabitants, considering the eight banks with the most branches nationally, which account for 80% of the branches in the country. In the case of retailers, the study is conducted in the same urban locations, and in semi-rural locations (with 10,000 inhabitants or fewer); in commercial establishments that range from micro businesses to large corporations, commercial activities and services.

The results obtained have enabled indicators to be constructed, such as the share of banknotes in circulation that, in view of their degree of deterioration,<sup>3</sup> ought to be deposited at the *Banco de México*, the availability of the various banknote denominations from bank branches and ATMs, the level of fulfilment of the banknote and coin exchange service that banks are expected to provide, and the treatment given to suspect banknotes and coins. The sample of banknotes obtained has made it possible to monitor the quality of banknotes in circulation and estimate their average life. The results have also enabled decision-making on the use of new materials to extend banknote lifetimes.

The results obtained show that the quality of banknotes supplied by banks is better than that of banknotes supplied by retailers. ATMs supply the highest proportion of fit banknotes, followed by bank counters, urban retailers, and lastly, semi-rural retailers. The *Banco de México* has also detected misuse and bad habits among banks in the way they treat banknotes, such as the use of staples, and stamping or marking banknotes.

As regards the availability of all banknote denominations, ATMs do not supply notes in the lowest denomination (\$20), and the denominations in shortest supply at bank counters are the \$20 and \$50 banknotes. Only 55% of bank branches were able to supply \$20 banknotes and the \$50 banknote was only available at 84% of bank branches.<sup>4</sup>

In the case of the banknote and coin exchange service banks are expected to provide, only in 27% of cases did bank branches change a fraction of a \$5 banknote correctly,<sup>5</sup> where slightly more than half of the banknote was present and it still conserved its value.



Withdrawing cash from an ATM / BM

### IV. Neuromarketing study

The *Banco de México* is currently conducting a study on how the population perceives money on an unconscious level, covering various topics relating to Mexican banknotes and coins, and the use of cash. The study will allow innovations to be included that improve the perceptions of security, trust and duration of monetary tokens. The study draws on disciplines such as ethnography, anthropology and neuroscience, in relation to the human limbic system, cortex and reptilian brain. The study seeks to find relevant information for the design of a new family of banknotes, with which to determine the banknotes' characteristics in terms of substrate, security features, size, colours and contrasts, and relief and tactility. It will also help obtain information about the design of a new series of coins.

### V. Conclusion

The various qualitative and quantitative studies conducted by the Issue Division are tools allowing the *Banco de México* to obtain important information for decision-making on cash. Each of these studies yields different information. However, as a whole they complement one another to give a broader view of the areas of opportunity in relation to patterns of banknote and coin use and future trends.

3. A fit banknote must be complete and free of cuts, rips, tears or perforations, and markings, and its state of wear and cleanliness be adequate for it to remain in circulation. A damaged banknote is one that must be withdrawn from circulation as a result of its degree of soiling or wearing of its ink, or if it has suffered, cuts or tears, has been repaired with adhesive tape, has parts missing of up to 6.16 cm<sup>2</sup>, or has marks, numbers, writing or drawings on its, provided they do not disseminate messages to the public or a political, religious or commercial nature.

4. Results of the 2013 *Mystery Shopper* study.

5. Banknote fractions of value are banknotes with missing portions that still have value after the banknote has been examined applying the criteria set out in Annex 3 of the *Banco de México* Circular on Cash Operations.

# Bank of Canada's currency surveys

■ Currency Department *Bank of Canada*

The mandate of the Bank of Canada's Currency Department is to design, produce and distribute banknotes that Canadians can use with confidence. To help meet this mandate, and with a view to maintaining and/or increasing confidence in Canada's banknotes, the Currency Department carries out a survey-based research programme to better understand the use and acceptance of banknotes by retailers and the general public. The Currency Department has also conducted surveys to deepen its understanding of electronic methods of payment to assess their potential impact on banknote demand and the implications for the Bank of Canada.

Use and acceptance surveys help the Currency Department to gauge the impact of its communication activities, assess attitudes and behaviours toward banknotes, and plan for future communications and banknote designs. The data obtained through the surveys are central to the Bank's research, policy analysis and decision-making processes.

## I. Time-series and ad hoc surveys

The Currency Department undertakes both time-series and ad hoc surveys. Time-series surveys reveal trends, while ad hoc surveys complement the time-series approach by allowing for a deeper understanding of a specific situation or by simply investigating a particularly timely issue. Another benefit of long-term time-series surveys and related benchmarks is that setting (and publishing) currency-related targets gives Canadians confidence that the Bank will meet those targets. Benchmarks also allow the Bank to assess its communications activities and strive for continuous improvement. For example, letting Canadians know that confidence has consistently risen over the past 10 years demonstrates rigour and the Bank's commitment to maintain or increase public confidence in Canada's banknotes.

Past surveys have been used to establish benchmarks, targets and trends for certain behaviours and perceptions. Data obtained from the National Retailer Research Program (NRRP) survey have provided a benchmark for the levels at which retailers verify paper banknotes. With the *Polymer* series now in circulation, data from the updated NRRP will establish new benchmarks, set new targets and allow the Bank to determine whether authentication rates increase with training. Having data that span several years minimises the risk of a negative situation going unnoticed because analysts can more readily spot changes or anomalies from cycle to cycle. For example, the current benchmark on banknote refusal signage (between 2% and 4%) plays a key role in assessing a counterfeiting situation and its relative importance or geographic range. Any local increase in that number represents an immediate red flag.

Currency's Economic Research and Analysis team uses data from the Canadian Financial Monitor and Methods-of-Payment surveys to measure cash usage, determine the substitution of card payments for cash and assess how retail payment innovations may affect this substitution. This

research is made public in the *Bank of Canada Review* and other discussion papers and working papers published by the Bank.

When the Currency Department needs a quick, timely or in-depth understanding of a situation, ad hoc surveys are conducted. For example, when polymer was being considered as a substrate for the new notes, the Currency Department conducted focus groups to gauge the acceptance of the new material by cash handlers and the general public. The results were very favourable, indicating that the new material would not be an issue. Then, when the new polymer notes were introduced, the Currency Department again wanted to assess public acceptance of the new notes. To that end, the Acceptance Survey was conducted in 2013; the resulting analysis indicated that the majority of the respondents believed the change was a positive one. This result showed that the Bank's communications strategy had been effective.

## II. A flexible and exploratory approach

To respond to evolving situations, the Bank strives to remain flexible and is always ready to test new survey methods. In 2010, for example, data on Internet usage in Canada showed that "8 out of 10 Canadian households had access to the Internet" (Statistics Canada, Canadian Internet Use Survey, 2010). An online survey was therefore added alongside the telephone Confidence Index survey to compare the results of the two survey methodologies. This approach showed that online and telephone results were very similar. In 2013, interactive voice-response (IVR) systems were tested to see if a more cost-effective method could be used for the survey. The IVR systems proved to be less effective, since respondents too often associated them with mass-marketing calls.

The Currency Department has now begun using a new survey method: online forum discussions. The forum functions as a focus group, with a moderator asking a group of online participants open-ended questions on specific topics. Online forums are more flexible and timely than traditional "in-person focus groups," because analysts can easily adapt the questions or give a new direction to the discussion based on answers received or a change in situation. An additional benefit is the considerable cost savings since participation is exclusively online.

The content of the Canadian Financial Monitor, Cash-Handling Habits of Canadians and Methods-of-Payment (MOP) surveys is revisited annually to improve the design of the surveys and add or delete questions as necessary. For example, in recent years, questions regarding PayPal and Google Wallet were added to gauge the prevalence of innovations in online retail payment methods.

## III. Comprehensive Information

When appropriate, the Bank combines quantitative and qualitative methods to generate comprehensive information. While quantitative surveys yield easier-to-use data, they can lack the in-depth information of a qualitative survey. An example of the combined approach is the strategy used to measure Canadians' acceptance of the new *Polymer* series of banknotes. The 2013 Acceptance Survey provided a good indication of how much the Canadian public liked the new notes, but it lacked key intelligence with respect to where improvements to the communications strategy could be made to increase the rate of acceptance. By using a qualitative online forum, analysts were able to determine precise ways in which the Curren-



	Survey Name	Year or Starting Year	Audience	Purpose	Key Findings
AD HOC SURVEYS	Online Forum Discussions	2013	General public / Retailers	Gauge Canadians' perceptions of polymer banknotes	The perception of polymer notes is neutral to positive.
	Acceptance Survey	2013	General public	Gauge Canadians' acceptance of polymer banknotes	The acceptance of polymer notes is neutral to positive.
	Acceptability Survey	2009	General public	Gauge acceptance of polymer as a substrate for new notes	The results indicated that the polymer substrate would not be an issue.
	Cash-Handling Habits of Canadians	2011	General public / Retailers	Determine banknote handling and wear	Over its life cycle, the average banknote is handled approximately 1,000 times by people and machines.
	Methods-of-Payment (MOP) Survey	2009 and 2013	General public	Provide a detailed description of consumers' preferred methods of payment	Cash is still the dominant payment choice for purchases under \$25, but is giving way to card payments.
	2006 Merchant Cost Survey	2006	Retailers	Determine costs to merchants of various payment methods	Cash is the least expensive form of payment for purchases under \$15.
	2004 Payment Survey	2004	General public	Determine usage of cash and debit and credit cards	Convenience and counterfeiting risks influence payment behaviour.
ONGOING SURVEYS	National Retailer Research Program (NRRP)	2002–2012 (will reinstate in 2014)	Retailers	Track trends in the acceptance and authentication behaviour of retail clerks	Authentication and acceptance of the \$100 note have increased steadily. Banknote refusal signage remains between 2% and 4%.
	Confidence Index Survey	2004	General public	Monitor the level of confidence in Canadian banknotes	Confidence is high and typically increases year over year.
	Perception Studies	2004	General public	Test security features	The most effective security features are those that are user-friendly.
	Canadian Financial Monitor Module (CFM)	2009	General public	Monitor cash usage and methods of payment	The share of cash has decreased, while the adoption of alternative payment methods has increased.
	Awareness Survey	2011–2012	General public	Gauge Canadians' awareness of the transition to polymer banknotes	Awareness has gradually increased to 77%.
	Authentication Research	2011	General public	Assess authentication behaviour, based on wear and tear	People reject suspicious banknotes.

cy Department could help retailers and the public adapt to the new note series. The forums also worked as an early indicator of potential issues.

The MOP survey (conducted in 2009 and 2013) is a detailed two-part survey that captures cash and non-cash payments. The first part consists of a questionnaire to establish a detailed picture of how and why Canadians use and adopt specific payment instruments. The second part is a three-day diary that asks respondents to track in detail their payment choices for all daily expenditures. This research has enabled the Currency Department to conclude that the major drivers of payment choice in a landscape of increased options include demographics and pricing incentives such as rewards.

#### IV. Collaboration

Collaboration is promoted among different teams within the Currency Department, among the Bank's departments, and with suppliers and other external organisations. Another collaborative endeavour begins this year with the Currency Department's regional offices (five offices across the

country) taking on a greater role in gathering currency-related intelligence, fielding test questionnaires, and finding appropriate subject-matter experts and stakeholders to include in specific surveys.

The 2009 MOP data allowed the Bank of Canada to participate with five other central banks (Austria, Australia, Germany, the Netherlands and the United States) and one research organisation in France in a cross-country comparison of cash usage (Bagnall et al. 2014)<sup>1</sup>. This research revealed that cash is still a predominant payment choice, especially for low-value transactions.

The perception studies undertaken by the Currency Department's Banknote Development and Technical Analysis (BDTA) team are another

(continued on page 26)

1. J. Bagnall, D. Bounie, K. Huynh, A. Kosse, T. Schmidt, S. Schuh and H. Stix. 2014. *Consumer Cash Usage: A Cross-Country Comparison with Payment Diary Survey Data*. Bank of Canada Working Paper no. 2014-20.

# Cash surveys: Peru's experience

■ Juan Medina and Javier Pereda *Banco Central de Reserva del Perú*

The tasks of the *Banco Central de Reserva del Perú* (BCRP) include the issuing of banknotes and coins, and ensuring the economy's needs for cash are met in terms the quantity, denominations, and quality supplied. To achieve this, the Bank needs to know the public's cash preferences and how it uses cash, the level of counterfeiting, and the results of cash management policies in place, so that the cash cycle can be managed appropriately (design, manufacture, issue, circulation, processing, recycling, and destruction). To this end, the BCRP decided to conduct a series of cash surveys. Between 2005 and 2012 three national surveys were conducted, aimed at the general public and small retailers.

The first survey, conducted in 2005, sought to obtain information about the counterfeiting of banknotes and coins, and the availability of all the various denominations. The second survey took place in 2008 and also included questions on the use of other means of payment as alternatives to cash. The third survey was carried out in 2012 and, additionally, addressed issues relating to the introduction of a new family of banknotes and the issue of a new series of coins<sup>1</sup>. A survey on cash use and awareness is currently in preparation, and is due to be run in the second half of 2014.

## I. Survey preparation process

The information required for the survey is prepared by the Currency Management Department and covers the following points:

- **Use and holding of cash:** the use of cash and alternative means of payment, together with the public's preferences for the various different denominations, the sums of cash the public holds, and the places where they carry out everyday transactions.
- **Cash quality:** studying the public's perception of the quality of each denomination of banknotes and coins in circulation.
- **Awareness of security features:** used to analyse the public's awareness of banknotes and coins security features.
- **Dissemination:** measuring the public impact of the BCRP's various dissemination activities.

The company conducting the survey was chosen by public call for tender. The company concerned collects information through interviews with members of the public in both rural and urban areas, grouped by age, sex,

socio-economic status and region. The results of the survey are submitted to the Central Bank's Board of Directors, and corrective measures are proposed where necessary. Table 1 shows the size of the sample used in the 2012 survey.

Table 1. Size of 2012 survey sample

Total	Persons							
	Sex		Age					Domain
	Male	Female	18-25	26-35	36-45	46-60	61-70	Urban Rural
2,429	1,221	1,208	585	629	503	499	213	1,751 678
100 %	50 %	50 %	24 %	26 %	21 %	21 %	9 %	72 % 28 %

## II. Survey results

The results obtained in the 2012 survey are set out below.

### Use and holding of cash

Table 2 shows the various means of payment the public uses in its transactions. As the table shows, 84 % of transactions are paid in cash, and 7 % and 6 % are paid using debit and credit cards, respectively. The 2008 survey found cash use to reach 98 %. People in rural areas (92 %) and women (86.4 %) mainly use cash. By ages, the use of cash is seen to decrease with age, up to the 36-45 age range, then rising after this age. Cash use is also much more widespread among people with lower levels of educational attainment. Use of credit and debit cards rises with educational level (see graph 1), with a positive impact on financial literacy. Cards

Table 2. Means of payment used

(percent)

Means of payment	Total	Sector		Age (years)					Sex		Level of education			
		Urban	Rural	From 18 to 25	From 26 to 35	From 36 to 45	From 46 to 60	From 61 to 70	Male	Female	Primary	Secondary	Technical	University
Cash	84.4	81.7	92.0	87.8	83.1	81.2	84.6	86.1	82.4	86.4	94.5	88.5	81.7	70.5
Debit card	6.9	8.0	3.5	5.9	7.4	7.6	6.5	6.9	8.0	5.7	1.6	4.8	9.2	13.1
Credit card	6.1	7.1	3.1	4.7	6.8	7.9	6.5	2.4	6.5	5.7	2.3	4.3	6.9	12.1
Cheque	0.3	0.3	0.5	0.2	0.1	0.5	0.3	1.2	0.3	0.4	0.2	0.3	0.3	0.5
Internet	0.4	0.6	-	0.3	0.5	0.6	0.3	-	0.4	0.4	0.5	0.3	0.5	0.5
Interbank transfers	1.9	2.3	0.8	1.2	2.0	2.1	1.7	3.3	2.4	1.4	0.9	1.8	1.4	3.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1. In March 2010 issue of nuevo sol coins in the coin series "Wealth and Pride of Peru" began. To date, 17 coins in the series have been issued.

Table 3. Preferences for different banknote denominations

(percent)

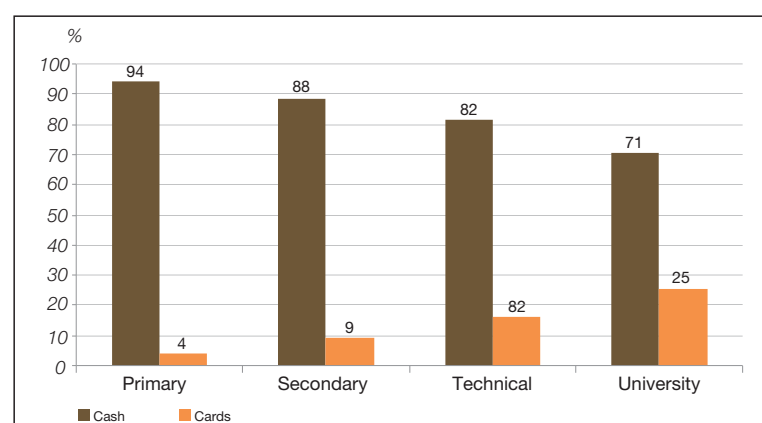
Denomination	Total	Sector		Age (years)					Sex		Level of education			
		Urban	Rural	From 18 to 25	From 26 to 35	From 36 to 45	From 46 to 60	From 61 to 70	Male	Female	Primary	Secondary	Technical	University
10 PEN	77.7	76.9	80.0	80.8	78.0	74.6	76.4	79.0	75.7	79.8	83.8	82.5	75.3	75.6
20 PEN	15.1	15.5	14.2	13.6	14.4	17.2	15.9	14.6	16.6	13.6	10.8	11.3	17.0	15.4
50 PEN	5.1	5.2	4.8	4.4	5.5	5.9	5.1	4.4	6.2	4.1	4.3	4.2	5.3	6.9
100 PEN	1.9	2.2	0.9	1.2	1.6	2.2	2.6	2.0	1.3	2.5	1.0	1.7	2.3	1.6
200 PEN	0.1	0.2	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.0	0.3	0.3	0.0	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4. Location from which banknotes are obtained

(percent)

Place of withdrawal	Total	Sector		Age (years)					Sex		Level of education			
		Urban	Rural	From 18 to 25	From 26 to 35	From 36 to 45	From 46 to 60	From 61 to 70	Male	Female	Primary	Secondary	Technical	University
Bank counters	41.8	43.2	38.0	37.1	42.4	42.4	44.9	44.0	45.2	38.3	34.1	42.8	44.5	44.3
ATMs	19.8	23.9	9.0	22.4	22.7	20.7	16.1	10.2	21.2	18.4	5.8	16.9	24.8	35.4
Correspondent ATMs	4.9	4.7	5.4	4.3	5.4	4.6	5.4	4.6	4.9	4.9	5.0	4.4	5.8	5.2
Do not obtain banknotes from financial system	29.1	24.7	40.9	32.3	24.7	28.7	27.2	39.4	23.1	35.3	47.8	31.0	20.8	13.8
Other	4.4	3.5	6.7	3.8	4.9	3.6	6.2	1.9	5.6	3.1	7.2	4.9	4.0	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Graph 1. Use of means of payment and educational level



are also used more widely in urban areas than rural ones, and their use increases with age up to 45 years, and then declines.

As regards preferences for different banknote denominations (Table 3), the most widely used is 10 nuevos soles (77.7 %), followed, to a lesser extent, by 20 nuevos soles (15.1 %). Both are mainly used for low-value transactions. The preference for these banknotes is stronger in rural areas than urban ones.

The public's least preferred banknote is the 200 nuevos soles note, which is the highest face value banknote in circulation.

As regards preferences for coins, it was observed that the most widely used were the one nuevo sol (54.7 %), followed by the 0.50 nuevos soles (15.3 %), and the 0.10 nuevos soles (10.3 %). The preference for these coins is due to the fact that they are widely used for payment in public and private transport. One thing that stands out is the very low preference for 0.05 nuevos soles coins.

Grocery stores (44.6 %), followed by markets and service stations, are the commercial establishments in which the public, when making its payments using banknotes, obtains the smallest denominations. Just under 14 % obtain change at banks. The place most often used for the public to obtain its banknotes is the counter of a financial institution (41.8 %), followed by ATMs (19.8 %), and, to a lesser extent, corre-

spondent ATMs<sup>2</sup>. It is worth noting that, according to the statistics, a third of all cheques the public receives are cashed at bank counters. Finally, 29% do not use banking channels to withdraw cash, this percentage being higher in rural areas (40.9%). Therefore, a significant proportion of the population obtains banknotes through its transactions (Table 4).

### Cash quality

The 2012 survey found the quality of the banknotes and coins in circulation to have improved since 2008. Thus, the "very good" and "good" ratings rose from 30.7% to 52.8% in the case of coins, and 24.9% to 57.4% in that of banknotes.

### Awareness of security features

Most respondents said they checked the banknotes and coins when they received them. Moreover, more than 60% said they did not have difficulty recognising banknotes and coins security features. The main features the public checks when it receives banknotes are the texture (26.5 %), optically variable ink (18.3 %), the watermark (16.9 %) and the security thread (12.7 %). This pattern is seen in both rural and urban areas, but with differences between the sexes. Both men and women mainly check the texture. Women also check the optically variable ink, but men pay more attention to the watermark.

In the case of coins, the public were found to mainly check the edges (26.4 %), the surface (17.1 %), and the details of the national coat of arms (15.1 %). The latter is the security feature most widely publicised by the Central Bank. In rural areas, the public also checks the design of the lettering on the coins.

### Dissemination

According to survey data, more than half of respondents, particularly those living in rural areas, learned to recognise the security features by themselves. The public also frequently learns about security features at their place of work. Thirdly, television is a common medium of dissemination, particularly in urban areas.

2. These are service operators who operate in establishments of their own or belonging to third parties outside the financial system, that provide certain transactions and services through a contractual arrangement, under the responsibility of a financial institution.



# Reserve Bank of Australia's Survey of Consumers' Use of Payment Methods

■ Crystal Ossolinski and Eden Hatzvi *Reserve Bank of Australia*

In 2013, the Reserve Bank of Australia conducted its third Survey of Consumers' Use of Payment Methods. This predominantly online survey uses a diary and supporting questionnaires to collect transaction-level data on the use of a range of payment methods including cash, demographic data about participants and information about special topics. In 2013, the special topics included reasons for cash use and cash holding. This article presents the design of the survey and some key results regarding cash use and cash holdings.

## I. The survey

In 2007, 2010 and 2013, the Reserve Bank of Australia conducted a Survey of Consumers' Use of Payment Methods. A primary goal of the survey is to collect information about the use of cash, although the survey also collects information on the use of a wide range of retail payment methods. The exercise generates a rich transaction-level dataset that can provide information on when and by whom cash is used and held, as well as evaluating the effect of new technologies on the consumer's choice of payment method. The 2013 survey achieved a sample of over 1,000 individuals and captured around 15,000 payments through a range of payment methods (including cash, debit and credit cards, personal cheques, direct debits and direct credits) and 800 cash withdrawals.

There has been some evolution in the survey scope and design over time; the 2013 survey materials are described here. The survey consisted of three parts: a pre-diary questionnaire capturing demographic characteristics; a seven-day diary; and an end-of-survey questionnaire on key topics.

The demographic information collected in the pre-diary questionnaire included characteristics thought to relate to payment use, specifically gender, age, personal and household income, family status and household size, and location of residence (both postcode and whether the participant lived in a capital city or not). Information about the financial services used by the participant was collected, including a list of the credit cards and debit cards held by the participant and which of these were the primary credit and debit cards. Each participant also answered questions about whether he or she typically paid off their credit card balance every month (a 'transactor') or let the balance roll over from month to month (a 'revolver').

In the seven-day diary, individuals were asked to record every payment (except automatic direct debits) made within the seven-day period and every transfer to a family member or friend or between the individual's financial

accounts.<sup>1</sup> Business payments (e.g. as part of an individual's employment) were not included. For every payment and transfer, participants reported the day and date, the payment amount, the payment method used and the merchant category. They were also required to select the payment channel from five options: in person (i.e. point of sale), internet (desktop, laptop or tablet), smartphone, phone (voice call) or mail; the smartphone option was included for the first time in 2013.

For card payments, participants recorded the type of card used: debit, which includes payments through the domestic Eftpos network<sup>2</sup> and through the MasterCard and Visa debit networks; MasterCard or Visa credit card; or American Express or Diners Club cards. Participants also recorded the value of any surcharge<sup>3</sup> paid (either as a percentage or an Australian dollar amount) and, for point-of-sale payments, whether the payment used contactless payment technology.

Participants were also asked to record cash 'top-ups', that is, additions to the cash they held on their person, for instance in a wallet or purse. Top-ups include withdrawals from the banking system as well as transfers from others or from cash stored at home. The participant recorded the amount, the source of the cash (ATM, cash-out at the point of sale, over the counter at a branch, or other) and the level of cash they held after the top-up.

A focus of the end-of-survey questionnaire was to gather further information about cash use. Key areas of interest were the potential effect of new technologies on cash use and the use of cash as a store of value. Specifically, the end-of-survey questionnaire asked:

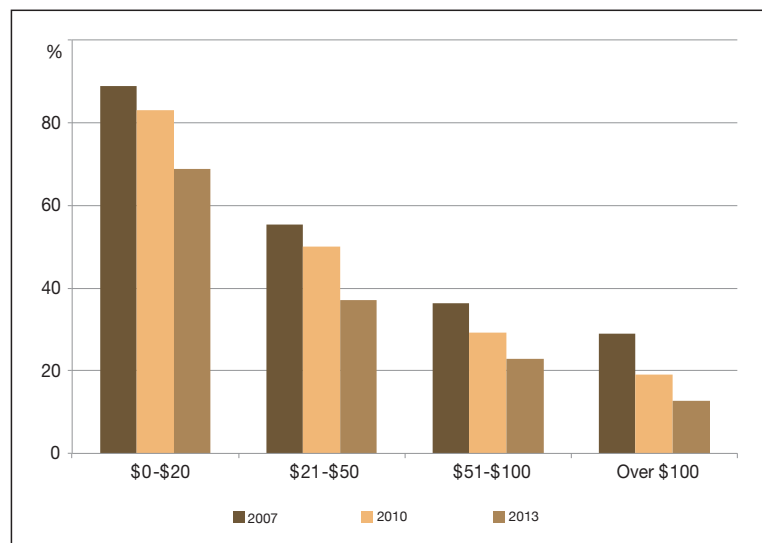
- how comfortable participants were in using cash to make payments of different sizes;
- the factors that led participants to choose cash instead of a different payment method;
- the number of banknotes of each denomination held on the participants' person (for example, in their wallet) at the start and end of the diary week;
- how much cash was stored by participants and for what reasons; and
- which payment method would have been used previously for payments that are made today using mobile or contactless card technology.

1. Transaction-level information about direct debits was collected in the end-of-survey questionnaire to allow respondents to refer to financial statements.

2. Eftpos is the domestic debit network in Australia managed by Eftpos Payments Australia Limited (ePAL) and owned by 12 financial institutions and two retailers.

3. In Australia, the Reserve Bank established standards that required card schemes to remove their 'no-surcharge' rules; recent changes to the standards enable the schemes to establish rules limiting surcharges to the reasonable cost of acceptance.

**Graph 1. Use of cash by payment value**  
Share of number of payments made in cash



Sources: Colmar Brunton; Roy Morgan Research

The Bank engaged a survey firm which had an established database of potential participants to conduct the survey. To ensure the results were representative, recruitment targets for age, household income, credit card ownership and regional groupings were set in line with Australian population statistics. To account for any deviation from these targets in the final sample, an individual weighting factor was applied at the participant level to the final sample. The survey was conducted when seasonal factors (for example due to holiday spending) were expected to be neutral and an incentive payment was offered to participants to increase participation in the week-long study.

The 2013 survey was delivered over the internet via computer, tablet and smartphone to 1,250 participants, and to around 240 additional participants without access to the internet. Offline participants were recruited by telephone to complete a paper-based survey to reduce the potential for sample selection bias.

There were several advantages and challenges in using an online survey compared to a paper survey. In the paper diary, a key issue was designing the visual layout of the diary so that it was easy to use and captured all the required information, as well as being small enough for participants to carry around. The design of the online survey was somewhat easier as the virtual rather than physical form enabled greater flexibility in the way questions were presented. This, combined with ability to use inbuilt logic to order questions and force participants to answer each question, meant that the online survey was simpler to answer than the paper survey and provided data that were near to complete. One challenge was to ensure that no bias was introduced relative to the previous paper surveys in the measurement of small value transactions. Participants to the online survey were therefore provided with a paper diary to use as a memory device to improve recall of smaller value payments relative to periodic online entry; 64% of participants made use of this.<sup>4</sup>

The response rate to the online survey was around 85% (yielding 1,069 participants), considerably higher than the 40% response rate to the paper-based survey (which yielded 98 participants). In part, this reflected the relative complexity of the paper diary and that the paper-diary sample included a greater number of older people. Twenty per cent of participants reported using a smartphone at least some of the time to enter payments online as they occurred.

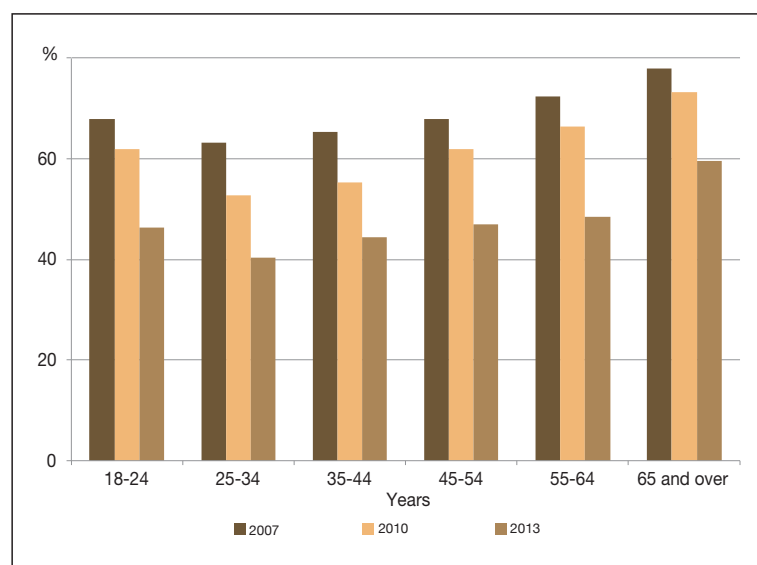
## II. Results<sup>5</sup>

Cash remained the most frequently used payment instrument in the 2013 survey but its use declined compared with earlier surveys. Cash accounted for 47% of the number of transactions in the 2013 survey, compared with 69% of transactions in the 2007 survey. Consistent with the previous surveys, cash was the preferred payment method for low-value transactions. Participants used cash to make 69% of payments worth A\$20 or less, but only 13% of payments exceeding A\$100 (Graph 1).<sup>6</sup>

The survey's demographic information provides insights into who uses cash. One consistent result across all surveys is that older participants have a stronger preference for cash than those in younger age groups. Cash payments accounted for around 60% of all payments made by participants aged 65 years and over in the 2013 survey, much higher than the share of payments made using cash by participants in all other age groups (Graph 2). Another interesting result is that the share of the value of cash payments was lower for participants in households with higher incomes than it was in households with lower incomes. While individuals in households with incomes greater than A\$110,000 used cash for 10% of the value of their purchases, cash accounted for around 30% of the value of transactions for individuals in the lowest income bracket (less than A\$20,000) and around 20% for individuals in households in the next highest income bracket (A\$20,000–A\$49,999).

In the end-of-survey questionnaire, participants indicated that they were generally comfortable making a cash payment worth up to A\$200, although the results from the diary suggest that they clearly preferred other methods for payments of this size. When asked why they used cash, around one-quarter of participants identified avoiding credit card surcharges as the most important factor, around one-fifth of participants stated speed or ease of transaction, and a similar proportion indicated a preference for using their own funds (Graph 3). Only 3% of participants indicated privacy as the most important reason for using cash.

**Graph 2. Cash payments by age**  
Share of payments made in cash within an age group



Sources: Colmar Brunton; Roy Morgan Research

4. Jonker and Kosse (2009) find that use of a memory device improves recall of small-value cash payments relative to solely filling in a retrospective online survey.

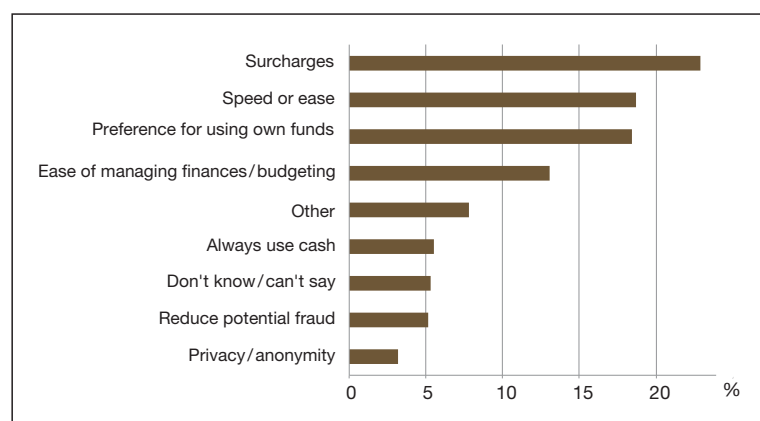
5. Detailed survey results have been published in Ossolinski, Lam and Emery (2014) and Meredith, Kenney and Hatzvi (2014).

6. One Australian dollar was equivalent to around €0.70 at the time of the survey.

Participants who stated at the end of the survey that they had made contactless payments in the past were asked which alternative method they would have used prior to contactless card payments becoming available. Around half of the participants indicated that for at least some of the purchases they had made using a contactless card payment they would previously have used cash. However, only a relatively small number indicated that this was the main substitution effect. For most participants, contactless card payments were predominantly a substitute for existing methods of card payment at the point of sale.

In addition to recording transactions, participants were asked about cash holdings. At the start of the survey, participants held a median of three banknotes on their person with a value of A\$55 in 2013, up slightly from around A\$50 three years earlier. Around three-quarters of participants indicated that they held cash in other places, with 12% of people stating that they held over A\$500.

**Graph 3. Why choose cash?**  
Most important factors, 2013

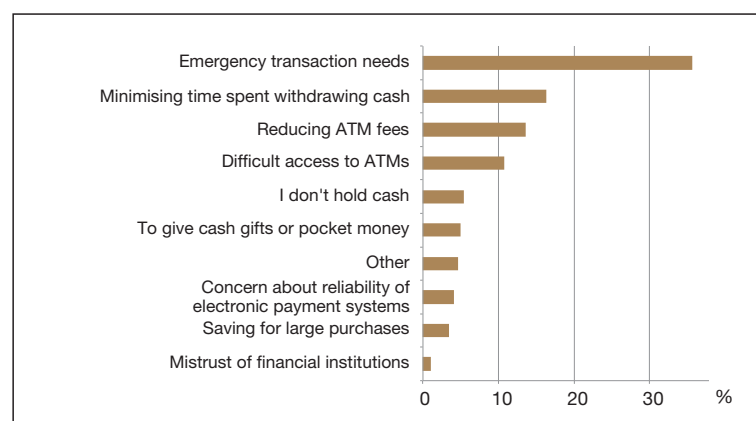


Source: Colmar Brunton

As expected, the main reason that participants gave for holding banknotes was to fund day-to-day transactions. However, while cash use relative to other payment methods is declining in Australia, the value of cash in circulation has continued to grow at around its trend pace, suggesting a role for cash apart from transaction needs. Other than to make transactions, participants indicated that the most important reason for holding cash was in case of emergency transactions (36%; Graph 4). Considerations relating to obtaining cash were also an important reason for people storing cash. In particular, minimising time spent withdrawing cash, reducing ATM fees, and limited access to ATMs accounted for a further 41% of responses.

Taken together, the continued preference for cash by older participants and the dominance of cash for lower value transactions suggest that cash is likely to remain an important part of the system for the foreseeable future. Further, the results suggest that the use of cash as a store of value may also continue to underpin demand for cash.

**Graph 4. Why choose cash?**  
Most important factors other than day-to-day transactions, 2013



Source: Colmar Brunton

(cont. from page 21)

example of collaboration. The studies began 10 years ago and are run on a continuous basis. The Department of Psychology at the University of Waterloo (Waterloo, Ontario, Canada) worked with the BDTA to develop an approach to better understand what the public notices about security features and banknotes in general, which will aid in developing effective designs.

## V. Solid data

One of the critical elements of a survey's credibility is the reliability of its data. Each survey methodology is reviewed by Currency Department's Economic Research and Analysis team, suppliers, and/or peers. For example, the NRRP has been suspended during Canada's transition to polymer notes so that the methodology can be revised to appropriately capture authentication behaviour with respect to the new polymer notes.

The Currency Department publishes most survey results on the Bank's website or in working papers and discussion papers. Through regular publications and transparency, a virtuous cycle emerges: analysts ensure that the data meet external review standards, and external review pushes the Bank to constantly strive for better data and top-notch research.

## VI. Conclusion

The research and survey programme carried out by the Bank of Canada's Currency Department is comprehensive. It helps the Bank to monitor and understand Canadians' acceptance and perceptions of banknotes and the methods-of-payment environment. It also aids in the development of communication and training programmes, policy-making, and, ultimately, decision-making.

Performance measures are based on benchmarks and targets developed through long-standing surveys, while answers to more timely situations are obtained through ad hoc surveys. Some surveys also act as excellent early indicators of potential issues that may need to be addressed through timely communications efforts. Collaborating and allowing for flexibility are crucial in conducting excellent research and surveys. The solid data gathered can then be shared and published.

The benefits attached to the research and survey programme have proven to be essential and will continue to be indispensable in an environment of evolving electronic means of payment and changing consumer behaviour.



# The Bank of England's public consultation programme on polymer banknotes

■ Victoria Cleland and Chris Sullivan *Bank of England*

The Bank of England has been issuing banknotes for over 300 years. These have evolved from handwritten paper notes signed by the Bank's Cashiers in the 17<sup>th</sup> century to the high quality paper printed banknotes containing a range of complex security features seen today. This progression is allied to one of the Bank's core purposes of maintaining confidence in the currency by issuing high quality secure banknotes that the public can use with confidence. As part of this evolution, the Bank announced in December 2013 that its next £5 and £10 banknotes will be printed on polymer instead of cotton based paper. An important input to this decision was the views of the public. The Bank therefore undertook a public consultation to gauge reactions to the suggested introduction of polymer. This article outlines how this public consultation was completed and what information the Bank collected.

## I. Research

Prior to conducting the consultation the Bank undertook a three year research project to assess the substrates that banknotes are printed on with a view to further enhancing counterfeit resilience and increasing the quality of banknotes in circulation. This project involved detailed technical research as well as discussions with other central banks. Our research concluded that printing our next banknotes on polymer would bring considerable benefits to both the durability and cleanliness, while also enhancing the strong security which the public associates with our banknotes. In addition, the Bank commissioned PE International to assess the environmental impact of the Bank's current paper banknotes and polymer banknotes which concluded that for the majority of indicators covered by the life cycle assessment, polymer had a lower environmental impact than paper. Polymer banknotes also presented benefits from a financial perspective.

The Bank recognised that a change in banknote substrate would have an impact upon retailers, businesses and the general public who rely on banknotes within their day to day lives. Prior to public engagement, key cash industry stakeholders were consulted to provide the Bank with an initial view of the impact a switch to polymer would have on the cash industry. Feedback was generally positive with many seeing the long term benefits of polymer, and questions around upgrading machinery, transitional logistics and potential costs; this information provided a platform from which further industry consultations could be based upon.

Following the supportive response from cash industry contacts and prior to making a final decision, the Bank was keen to gauge the public's acceptance of polymer. This feedback was captured via a public consultation programme.

## II. Polymer Public Consultation Programme

From 10 September to 15 November 2013 the Bank carried out a nationwide public consultation programme with three main aims.

- 1) To enhance public awareness and understanding of polymer banknotes.
- 2) To provide the public with information about polymer banknotes.
- 3) To present the Bank with an understanding of the public's views on polymer banknotes.

The consultation sought views from a broad range of the United Kingdom public by combining a range of communication tools. These included utilising the Bank's website, producing YouTube videos introducing key facts about polymer, setting up a polymer display in the Bank's museum, publishing detailed fact sheets on the research undertaken by the Bank, and conducting interviews with national and regional media.

At the heart of the consultation was a regional roadshow. A pool of over 20 Bank staff engaged with the general public at stands located in 13 shopping centres and various drop-in sessions with, for example, employees of national companies and students at universities. These were supplemented by smaller meetings and presentations with other relevant stakeholders such as local Chambers of Commerce<sup>1</sup>. In total 47 events were held right across the United Kingdom and many public events were publicised on local radio and via social media.

At each event Bank staff used a range of materials designed to educate, encourage discussion and gather feedback from the general public in regards to polymer banknotes. These included signage displaying our key message of 'Clean, Secure, Durable'; with further details of the research undertaken by the Bank available for the public to read or take home. Information about the planned reduction in size of polymer banknotes (15% smaller than paper banknotes) was also displayed with a sizing guide made available for comparison.

Staff also had prototype £5 and £10 notes printed on polymer for the public to compare with existing paper banknotes. The polymer prototypes were current design banknotes (Elizabeth Fry £5, Charles Darwin £10) printed on polymer with a see-through window in place of the watermark. The prototypes also had raised print and contained ultraviolet (UV) features. These were a key part of the consultation and were designed to give the public an opportunity to feel polymer and evaluate its texture, as well as provide them with an insight into the basic security features available on polymer banknotes.

1. Chamber of Commerce: An association to promote and protect the interests of the local business community.



Shopping centre event / BoE

Demonstrations of polymer's improved durability and cleanliness were made using examples of polymer and paper banknotes which had either been through a washing machine cycle or soaked in strongly coloured liquids. The public were also allowed to try and tear polymer banknotes. The notes clearly exhibited the robustness of polymer compared to paper.

Following this interaction each member of the public was encouraged to complete a comment card indicating their perception of polymer. Five options ('Strongly in favour', 'Somewhat in favour', 'Neutral', 'Somewhat opposed' and 'Strongly opposed') were available in tick box form with an area for further comments also available. All opinions and comments were recorded and the completed comment cards helped the Bank gauge the public's perception of polymer banknotes.

During the consultation the Bank team spoke to over 14,000 people receiving quantifiable feedback from over half of those spoken to. An online comment form was also made available on the Bank's website for the duration of the campaign with respondents able to register their opinions using the same voting template.

To add further independence the Bank used an external market research company (TNS) to run 36 public focus groups, each comprising 6 – 8 people,

and conducted face-to-face omnibus surveys in the homes of over 2,500 members of the general public. Within these focus groups and face-to-face interactions all respondents were given an opportunity to handle prototype polymer banknotes.

### III. Key Messages from the Consultation Programme

The feedback received during the consultation was overwhelmingly supportive of the introduction of polymer banknotes – 87 % of people who responded were in favour (69 % in favour and 18 % somewhat in favour).

As shown in the table 1, support for polymer was positive across all formats of the consultation. It was also noticeable that after handling prototype polymer banknotes members of the public were more likely to be in favour of polymer. Respondents on the Bank of England website did not have the opportunity to handle Bank of England prototype polymer notes prior to completing their assessment, and provided comparatively more negative results.

A range of views and opinions were provided by the public as to why they were in favour of polymer. The most common reason was that notes would



Table 1. Feedback summary

	Total interactions	Comment cards completed	In favour	Neutral	Opposed
Public Events	14,116	7,978	93 %	4 %	3 %
Bank of England Museum	n/a	977	89 %	4 %	7 %
Focus groups	239	239	90 %	7 %	3 %
Omnibus Surveys	2,704	2,704	74 %	18 %	8 %
Subtotal	17,059	11,898	88 %	7 %	4 %
Bank of England Website	1,076 <sup>2</sup>	1,074	72 %	2 %	26 %
Total/average %	18,135	12,972	87 %	7 %	6 %

Note: n/a, not applicable.

remain better quality for longer. Other reasons mentioned were polymer's durability – notably its ability to withstand a washing machine cycle, the fact that over their life, polymer notes are more environmentally friendly than paper notes; and that polymer notes were already in use in several major economies. Respondents also understood that moving to polymer would enhance the security of banknotes and acknowledged that this was important.

Support for polymer was broadly consistent across different geographic regions, demographics and socio-economic groups.

Whilst the consultation clearly indicated that the public would accept a move to polymer, a small minority of respondents raised concerns which the Bank can learn from to ensure a smooth transition. The three most frequently raised concerns were the texture of polymer notes (some people disliked the 'different' or 'slippery' feel of the notes), how the notes handled (before handling the notes, some people had misconceptions that the notes would be thick and difficult to fold), and implementation issues (concerns raised about the impact on ATM machines and the cash industry). The Bank will build into our plans for the launch of polymer more opportunities to show the public the properties of polymer notes (e.g. flexibility and thinness). We have already begun, and will continue, to collaborate with the cash industry to ensure a smooth transition to polymer.

The press and public welcomed the Bank's openness during the consultation. Broad press coverage mostly focused upon the factual research undertaken by the Bank with articles outlining the benefits of polymer and timescales of when polymer could be introduced. Overall media coverage was primarily supportive of the proposal which helped increase awareness of polymer.



Prototype polymer banknotes / BoE

#### IV. Summary and Conclusions

Following the overall positive reaction received during the consultation programme, the Bank concluded that the public would accept, and many would welcome, a move to polymer. The feedback from the public consultation and industry engagement, coupled with the detailed research completed by the Bank, led to an announcement on 18 December 2013 that the Bank would print its next £5 and £10 banknotes on polymer.

The Bank aims to introduce a polymer £5 note (featuring Sir Winston Churchill) in 2016, followed by a polymer £10 note (featuring Jane Austen) around a year later.

2. Two online responses contained only comments with no vote box ticked.

# The *Banco Central do Brasil's* cash surveys

■ João Sidney de Figueiredo<sup>1</sup> *Banco Central do Brasil*

For some time central banks have been looking for ways to evaluate the cash-related services they provide to the public. Public surveys have been run in Brazil since 2005 to guide cash policies and activities. The government's main control body also uses the findings of these surveys to evaluate the central bank's efficiency indicators.

In order to conduct the surveys and guarantee their results, specialist firms are contracted via a call for tender, as required under Brazilian law.

The survey "Brazilians and their relationship with money" is carried out regularly. The survey was conducted in 2005, 2007, 2010 and 2013, and the main aspects of the use of cash in Brazil were evaluated.

Surveys also aim to determine the quality of the cash in circulation. The last on this issue was run in 2012 and also examined the hoarding of coins.

■ **Cash use:** some of the questions were used to evaluate what denominations the public carries around, what banknotes or coins they prefer to use, if they feel that any particular denomination is in short supply, where they withdraw cash, if they give change or refuse to take any particular denomination, if they hoard coins at home, and what their preferred means of payment are for their various everyday transactions. Merchants were also asked about the proportion of sales paid for in cash compared with alternative means of payment, where they obtain change, if banks meet their cash provision needs, if they keep cash to facilitate change, if they feel that the supply of cash of each denomination is satisfactory, their preferences for each denomination, and if they consider the volume of banknotes and coins available to be sufficient.

■ **Looking after cash:** some of the questions asked the public whether they looked after their cash, whether they carried notes in wallets, avoided folding or crumpling banknotes, if they used a purse for coins, if they looked after different denominations differently, and how they judged the quality of the banknotes in circulation. Merchants, on the other hand, were asked if they sorted unfit banknotes from those fit to put back into circulation, and if banks often supplied them with cash in poor condition.

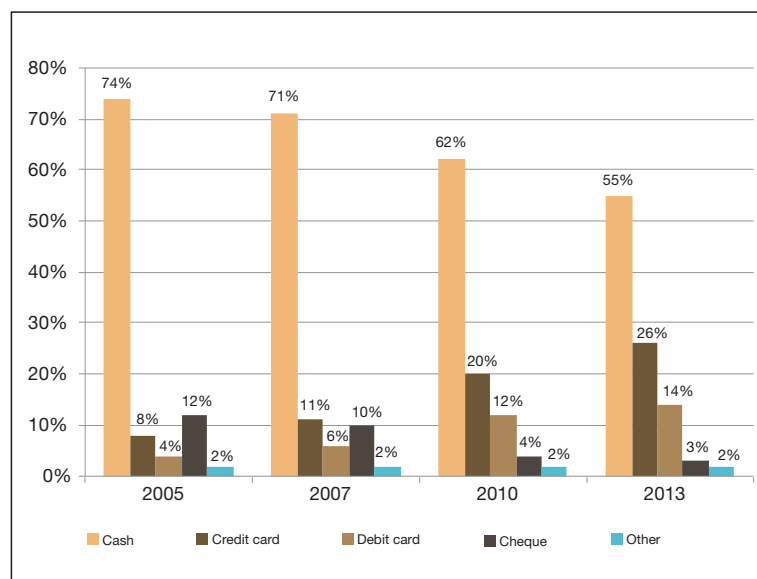
■ **Recognising security features:** interviews with both groups covered topics such as what they would do if a suspect banknote turned out to be counterfeit, if they had ever received counterfeit banknotes, if they checked banknote security features, and what steps they took to confirm that cash they received was authentic. In the case of merchants, the interview included a part dedicated to ascertaining what training had been received on security features.

## I. Brazilians and their relationship with money

Since 2005 a quantitative study reveals the Brazilian public's cash use habits. Every two or three years, the *Banco Central do Brasil* tries to deepen its understanding of the public's behaviour, and in particular, the behaviour of people using cash every day in transactions with consumers. The detailed information on the use of cash by these groups—the general population and merchants—is a valuable input to cash management strategy. It also yields information on how cash is used and looked after, and the security features it incorporates.

During preparation of the first questionnaire, which was run in 2005, focus groups were set up culminating in the creation of twenty discussion groups in the five main centres, covering all the country's regions. Three main topics arose out of the debate: the use of cash, looking after cash, and recognising its security features. In turn, each topic was subdivided into specific issues, depending on whether the target of the questionnaire was the general public or trade users.

Graph 1. Means of payment used in transactions with merchants



Note: The amount of cash in circulation in Brazil has increased by an average of 14% over the last eight years.

1. With the collaboration of Ricardo Antonio Brasil Danziger, senior adviser, and Tereza Cristina Alves de Oliveira, head of Cash Design.



The public performs an essential role in the circulation, maintenance and security of cash. Understanding the public's habits allows the central bank to identify what investments need to be made to produce new banknotes, extend their lifetime, and prepare programmes on how to use banknote security features. Historical data on the proportion of cash used in payments (data from each survey) can be used as an approximation to trends in the use of cash making it fundamental to support, for example, the decision to set up large new cash handling premises in a central bank, or to make investments in modernising the banknote printing works. These activities make cash provision more efficient, reduce costs, increase security and benefit society as a whole.

## II. Quality of banknotes in circulation and coin hoarding

The study to assess the quality and average lifetime of banknotes in circulation focused on commercial establishments. The latest edition, in 2012, also tried to assess the degree of coin hoarding.

Banknote quality was rated on a six-level scale, on which the last two were considered unfit to return to circulation.

The evaluation of coin hoarding was based on similar studies conducted in Mexico and the United States. The underlying hypothesis rests on the idea that coins are being lost and hoarded continually. This means that old coins will become rarer in the selected sample as time passes. For simplicity, a constant growth rate was assumed for each denomination. The period of circulation of the coins in the sample could be estimated by the year of production, as in Brazil this is generally the same as the year of issue. With the period of circulation and annual production it is possible to estimate the hoarding rate and the total cost of the hoarded coins.

## III. Survey findings

The surveys' findings are always published in Portuguese on the Bank's website. The study on the use of cash yielded information on how the population perceives currency security features and could be used as an input to the design of new banknotes and coins. For example, the first quantitative survey in 2005 showed that the best-known security feature, checked by the Brazilian public, was the watermark. In the design of the second series of reals, which was being developed at the time, the water mark area was expanded and highlighted so as to enhance this feature and improve recognition given that the public was already familiar with it.

The survey data also helped plan and establish objectives for information campaigns. In relation to cash use, for example, it was found that men in the higher social classes were more reluctant to use coins, and consequently left them at home. These data make it possible to target information campaigns on coins directly at specific groups. Also, a map of the country's regions in which banknotes circulate in poorest condition can be used to concentrate educational activities on keeping banknotes in good condition in these areas.

Many cash-management issues can also benefit from a better understanding of the population's cash usage habits: the design of denominations, the volume of each denomination in circulation, the regional planning of distribution, monitoring counterfeiting, communication actions, and the development of new series of banknotes and coins.

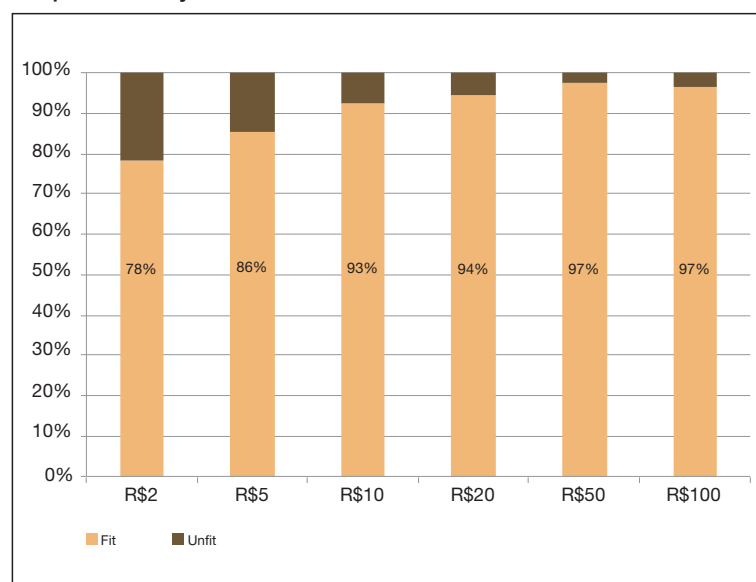
The government's control body uses three aspects of these studies to evaluate the indicators on the effectiveness of the Central Bank's cash-related activities: the level of public satisfaction with the availability of banknotes and coins, and with banknote quality.

The study on the quality of banknotes and coin hoarding found 10-100 real banknotes to be good quality, with approximately 95 % considered fit for circulation, which helps verification of their security features. In the case of 2-5 real banknotes, around 80 % were classed as fit for circulation, which suggests specific actions need to be taken. Another aspect the survey looked at was banknote deterioration. Poor condition banknotes are those with any form of damage, such as graffiti, crumpling, stains, holes, tears, adhesive tape, etc. The values found were between 7.8 % in 20 real banknotes to 17.5 % in 2 real banknotes.

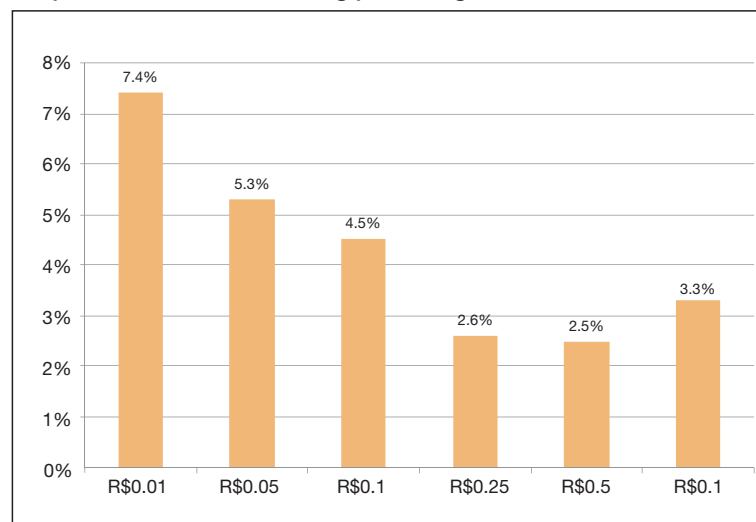
As might be expected, research into coin hoarding suggested that hoarding rates are inversely proportional to the denomination. On average, they were 7 % a year for one real cent coins and 3 % a year for one real coins. Taking these results for reference, it was estimated that 27 % of coins issued were out of circulation.

The findings are significant for policy on planning. The volume of hoarding suggests that information campaigns are needed to encourage users to keep coins in circulation. The percentage of damaged banknotes as a result of carelessness or vandalism reveals that education on cash use needs to be stepped up. Changing behaviour may generate savings in the public resources used to replace damaged banknotes and hoarded coins.

Graph 2. Quality of banknotes in circulation



Graph 3. Annual coin hoarding percentage



# Survey on the supply and fitness of banknotes and coins in Colombia

■ **Bernardo Calvo** *Banco de la República*

The *Banco de la República*, in compliance with its issue functions, is required to adopt the measures necessary to ensure supplies of banknotes and coins of all denominations. In this regard, over the years it has sought to gauge the population's perception of the quality of the services provided by the Bank and the fitness of the banknotes and coins in circulation.

In 2012, on behalf of the Treasury Department, the *Banco de la República* ran the national cash survey to obtain detailed, relevant information about the public's feelings regarding the fitness, availability and quality of denominations of banknotes and coins in circulation and, additionally, to gather information on preferences as use and acceptance of payment instruments.

The survey was designed with two types of questionnaire: one focused on the population, in which men and women aged 18 to 80 resident in urban areas in 35 cities were interviewed, and another aimed at people involved in commercial activities in the same 35 cities. The form for merchants comprised questions relating to the perception of the fitness of banknotes and coins in circulation, the mechanisms used to exchange banknotes and coins, and the use and preferences regarding payment instruments. The form for the population included questions about demographic aspects of the population interviewed.

## I. Specific objectives of the survey

- Determining what denominations of banknotes are in short supply for transactions and obtaining information about the mechanisms the public and merchants use to solve issues of shortages of certain denominations of banknote when giving change.
- Ascertaining users' opinion on banknote quality and security.
- Obtaining information from the public and merchants about the process of distributing banknotes and coins.
- Determining payment instruments use and preferences in Colombia.

The survey firm was contracted through a bidding process in which three of Colombia's most renowned firms in the field took part.

## II. Main findings of the population survey

For the general population cash is the preferred means of payment for transactions (90.6%), followed to a lesser extent by debit cards (6.7%), credit cards (2.5%), and finally cheques, with a share of less than 1%. Graph 1 shows the distribution of the answers to the question: "List the

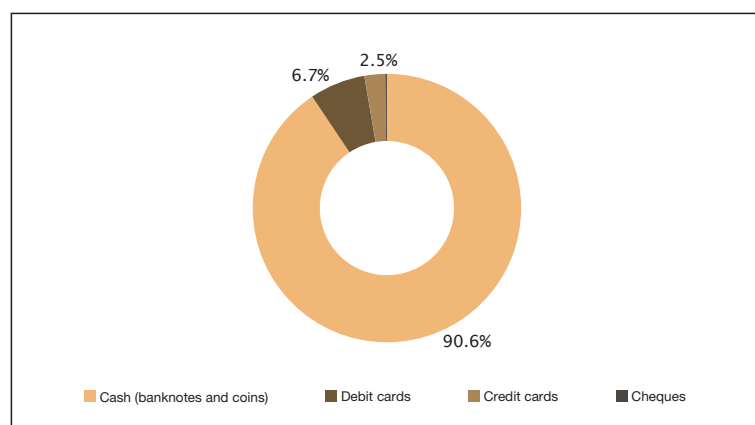
## Technical specifications of the survey

Target group	Population: men and women aged 18 to 80 in all strata living in selected cities. Merchants: business owner or manager.
Effective sample	General population: 3,099. Merchants: 2,256.
Sample method	Probabilistic – Random stratified multistage sample of elements.
Collection technique	Face-to-face interview.
Selection of respondents	General population: selection of the block, home, household and person using the Kish method (selection algorithm: one adult in the household). Merchants: block-by-block sweep.
Numer of interviewers	75 interviewers / 20 supervisors.
Sampling error	5 % per region, reliability 95 %.

three payment instruments you use most often for your monthly purchases, where 1 is the most frequently used and 3 the least."

Moreover, two main reasons for the population's preference for cash were identified: the ease of making payments, and the low level of bank use, understood as the lack of linkage to the financial system through savings

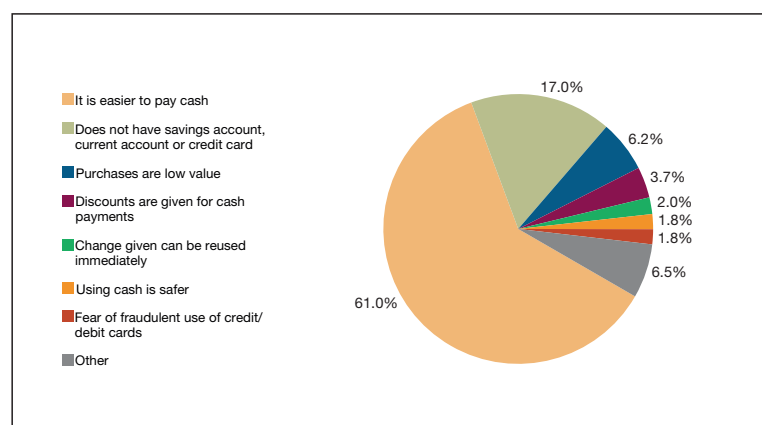
**Graph 1. The population's preferred payment instruments**



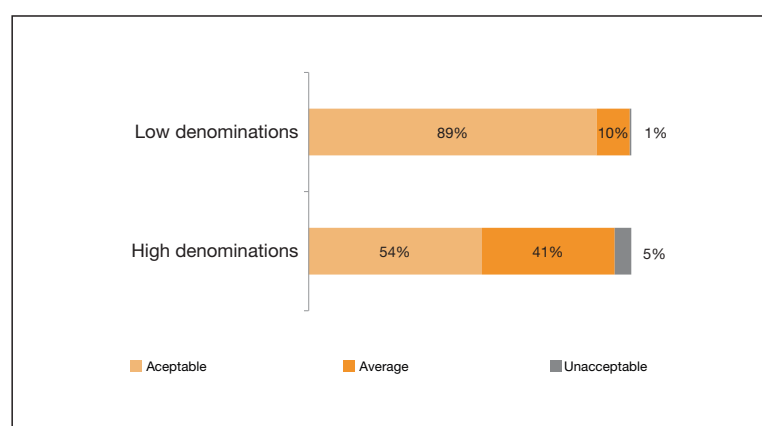
accounts, current accounts, and credit cards (graph 2). Within the category of “Others” respondents attributed their preference for cash mainly for the expense of using cards, taste, custom, and the fact that some establishments do not accept card payments.

On the subject of the perceived cleanliness of banknotes, 89 % of respondents consider the state of high denomination banknotes<sup>1</sup> in circulation to be acceptable, while only 54 % of the population considered the state of

**Graph 2. Main reasons for the use of cash**



**Graph 3. Perception of banknote cleanliness**



low denomination banknotes<sup>2</sup> to be acceptable; 41 % of respondents said that the state of banknotes was average (graph 3).

Moreover, 90 % of respondents said that they had never, or only occasionally, had difficulties obtaining change for their transactions and only 10 % had frequently had difficulties obtaining change. Finally, it was found that the places most frequently used to change high denomination banknotes for lower denomination ones were local shops and large supermarkets, followed by filling stations, along with changing money with other members of the public and on transport.

### III. Main findings of the survey of merchants

For the merchants segment, the questions relating to the use of cash were designed to ascertain their opinion on payment instruments used by their customers, and the main reasons why customers pay merchants in cash. In this case the findings suggested that cash is the only payment instrument accepted by all the commercial establishments surveyed. When seeking to determine the main reasons motivating the acceptance

of cash as payment instrument, was found, first and foremost, the ease of conducting transactions with this instrument, followed by the lack of dataphones, which again reflects a low level of bank use in Colombia. Examining the acceptance of payment instruments by type of establishment shows hypermarkets, supermarkets, and filling stations to be the establishments accepting the largest share of credit and debit card payments. Small retailers (restaurants, local shops and public transport) take electronic means of payment least often, mainly as a result of the ease of using cash.

Among merchants, the answers to the questions about how clean they considered banknotes to be were similar to those of the general population. 90 % of merchants interviewed considered high denomination banknotes to be in acceptable condition, while the state of low denomination banknotes was rated as average by 45 %, and acceptable by 48 %.

Finally, 52 % of merchants said they had experienced problems giving their customers change and that their perception was that low denomination banknotes are the scarcest when giving change to customers. As mechanisms to solve problems with change, merchants mainly use filling stations, changing money with members of the public or local shops to obtain low-denomination banknotes.

### IV. Summary and conclusions

The information gathered in the survey made it possible to obtain a detailed and comprehensive picture of the service the Bank provides in relation to supplying cash, and to ascertain perceptions of the quality of banknotes and coins among the population and merchants, and preferences regarding the use and acceptance of payment instruments in the country. The key findings of this survey were:

- Cash is the most widely used payment instrument on account of the ease with which it can be used to settle amounts due in transactions.
- The population and merchants rated the quality of high denomination banknotes in circulation as high. This reveals the importance of commercial banks as the main distribution channel for these denominations and the good results of strategies designed by the Bank, such as instituting exchange operations. Additionally, the two target groups considered that the quality of low denomination banknotes in circulation is lower than that of high denomination ones. An opportunity therefore exists to develop new strategies allowing them to be distributed better.

Given the significance of the information obtained from the survey, there are plans to continue it in the future so as to be able to continuously assess the Bank's cash delivery service. Opportunities for improvements have also been identified for future surveys, specifically as regards the design of the questionnaire, with a view to eliminating the degree of subjectivity of some of the questions and reducing the number of levels to scores in the answers with multiple options<sup>3</sup>. This will make the survey clearer for both interviewers and respondents. Thus, the 2014 survey will include the use of a “spectrum of deterioration of Colombian banknotes<sup>4</sup>” as a tool for the implementation of interviews. Additionally, the response options relating to the perception of cleanliness of banknotes in circulation will be defined on the basis of the levels set in the aforementioned “spectrum”, and score-based alternatives will be established for most of the questions, so as to minimise subjectivity.

3. Some of the options for answers included categories such as five levels of classification (Acceptable, Acceptable/average, Average, Average /unacceptable, and Unacceptable), between which it was not possible for interviewers and respondents to perceive a clear difference.

4. Brochure illustrating nine banknotes of the same denomination with the purpose of showing the various levels of deterioration observed during banknotes' lifetime. The scale defines level 1 as a completely new banknote and increases as the banknote's level of soiling increases, reaching 9 to complete the range of banknotes with different degrees of deterioration.

1. High denomination: three highest banknote denominations in circulation (10,000, 20,000 and 50,000 Colombian pesos).

2. Low denomination: three lowest banknote denominations in circulation (1,000, 2,000 and 5,000 Colombian pesos).



# The use of surveys by central banks

■ Ángela Benítez, Isabel Alcalde and J. Darío Negueruela *Banco de España*

At the start of the last decade there were almost no central banks anywhere in the world were using population surveys as an operational tool for cash-related matters. However, their use today seems to be widespread and when BILLETARIA decided to publish a special issue on the topic, many of the central banks we asked immediately responded positively.

In order to find out more about the extent to which surveys are actually used and how often they are run, what methodologies are used, and for what purpose, the *Banco de España's* Cash and Issue Department designed a short questionnaire that was sent to ninety central banks in July and August of this year. This article summarises the survey's findings.

## I. Method

### Description of the questionnaire

The information was collected using a questionnaire prepared by the *Banco de España's* Cash and Issue Department. This questionnaire, comprising twenty multiple choice questions, was sent to the cash departments at ninety central banks, asking them if they conducted surveys on cash-related issues, and if so, since when, and how often, etc. These surveys could have several different purposes: understanding citizens' cash needs, studying cash in comparison with other means of payment, evaluating the degree of information and knowledge of banknotes, evaluating the significance of counterfeiting, etc.

The questions were divided into four blocks:

- 1. Historical developments and technical aspects of surveys:** the first thing is to find out whether central banks carry out surveys of this kind or not, and since when, how often, the type of sample used, the survey method, and whether they have components with which to confirm the degree of validity of the surveys.
- 2. Survey characteristics:** this section covers topics such as the geographical areas covered, the group interviewed, the number of questions, and whether answers can be anonymous, etc.
- 3. Survey content and results:** the aim of this block is to find out what cash-related topics are of interest to central banks. Surveys are also sometimes run to find out whether the set goals are being complied with, or if alternatively, the central bank needs to make changes.
- 4. Comments and suggestions:** this is the last section, and allows an open answer to be given. It was added so that central banks could add any comments or suggestions they thought to be of interest that had

not been covered elsewhere in the questionnaire. This yielded valuable information on each central bank's individual experience and specific features.

The questions included in the questionnaire sent to central banks by the Cash and Issue Department are flexible and allow for answers by various types of central bank.

### Sample

A simple questionnaire was designed, which was intended to take no more than 15 minutes to complete so as to facilitate answers and minimise inconvenience for respondents. The survey was sent to ninety central banks in countries around the world. The sample selection gave wide geographical dispersal and ensured the survey was sufficiently representative.

The questionnaire was sent by e-mail, and the rapid and pleasant response received from most respondents stood out. The format used allowed answers to be dealt with quickly and efficiently, so that all the information was available in just six weeks.

## II. Data processing

The data collection process took a month and a half. The results were compiled in a file as they were received. Questionnaires were reviewed to check their internal consistency and various tasks were performed:

- Checks for incomplete answers: questionnaires were rejected if only some of the questions were answered.
- Complementary consistency checks.
- Preparing results: this phase takes somewhat longer and leads to the production of:
  - a filtered file of direct data with the information collected in each survey, once free of inconsistencies.
  - an initial analysis of the results in order to extract the main inputs on how surveys are run, their technical details and content. Graphs and tables in Excel were produced in order to schematise and summarise clearly and succinctly the data contributed in an aggregate form, ensuring the confidentiality of the individual data supplied by each central bank. This format allows rapid and simple access to the data in the basic survey results, allowing some initial findings and conclusions to be drawn.
  - analysis of results: the data from the various central banks were compared and studied to see if there were correlations between them.
  - report with incidents recorded while the work was being carried out, including the possible recommendations for future occasions on which the task is repeated.

Completed questionnaires were sent by 26 countries, i.e. 30% of the total sample, representing 20% of the world's population excluding Russia, China and India.

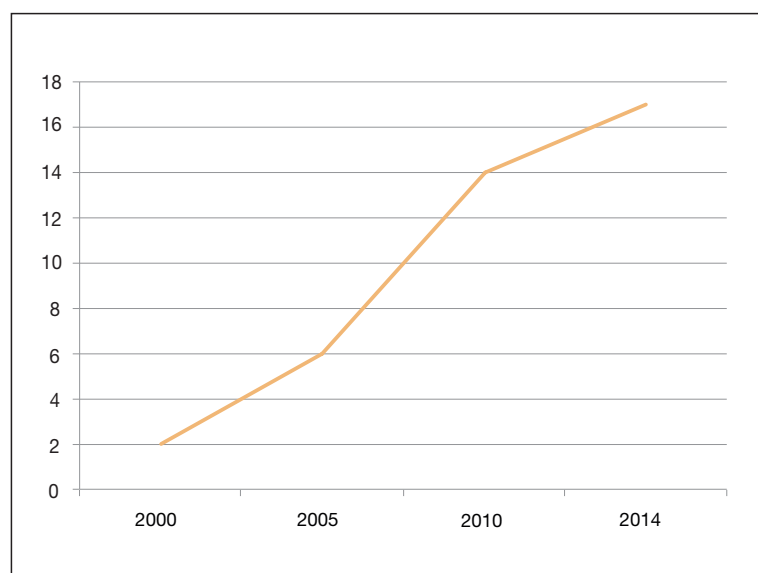
## Number of countries included in the survey

Continent	Sample	Answer given	
	Units	Units	%
Europe	33	10	30 %
Americas	24	8	33 %
Asia	17	4	24 %
Oceania	2	2	100 %
Africa	12	2	17 %
Total	88	26	30 %

## Findings

1. Almost 70% of respondent central banks run consultations aimed at the population on cash-related topics. Most of them use relatively traditional survey systems, with a variety of methods, and just 7% of the national central banks in the survey include dairy of payments among their consultation techniques.
2. The use of surveys has grown significantly in recent years. Indeed, as Graph 1 shows, although at the start of the century there were just a few countries running surveys, between 2005 and 2010 the majority of central banks began to use this tool to increase their knowledge of the public's habits, reactions, tastes and preferences, as final users of banknotes and coins, and to their knowledge of the national currency, the importance and value for the public of the phenomenon of counterfeiting, and how they rate the activities and services of commercial banks and the central bank in relation to cash activities.
3. The surveys most commonly used by central banks are periodic in nature, most often annual (39% of the total). Although some central banks have opted for a two-yearly survey or consultation for reasons of cost or technical complexity, annual consultations have the advantage of facilitating regular follow-up and enabling statistics on patterns and trends

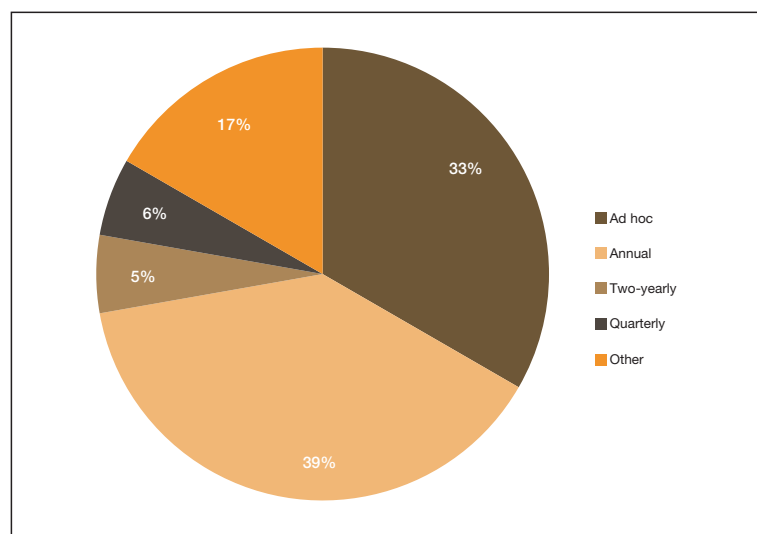
Graph 1. Implementation and execution of surveys 2000-2014.  
Number of countries (cumulative)



to be presented. They also make it possible to measure and quantify the results of policies or measures taken and study the possibility of correcting or stepping up certain policies.

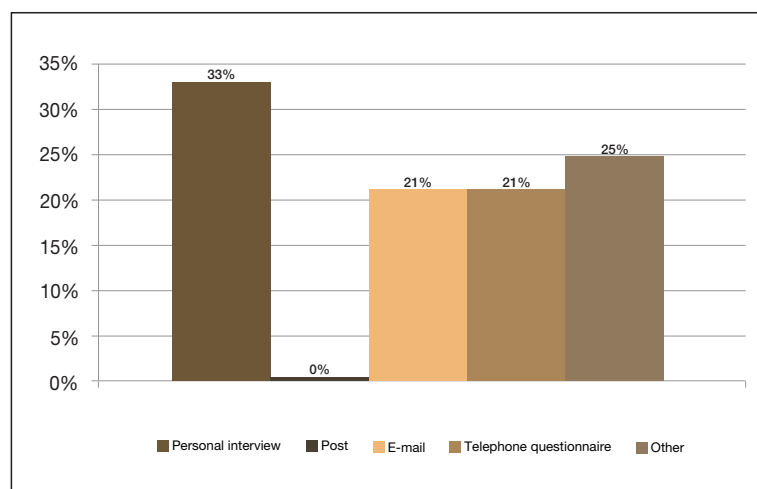
Additionally, a third of surveys are carried out sporadically or ad hoc to timely gather information on specific topics (Graph 2), such as the issue of a new banknote, the switch to a polymer banknote (the case of the UK), or the replacement of a banknote by a coin, as these are issues on which it is worth having timely follow-up of the general public's opinion.

Graph 2. Periodicity of questionnaires



4. The bulk of surveys (33%) are carried out face-to-face. Postal surveys have almost entirely disappeared, while an ever expanding range of new technologies are being used to carry out surveys. Between them, e-mail and telephone surveys account for 42% of the total, the speed and flexibility of e-mail having made it a standard tool.

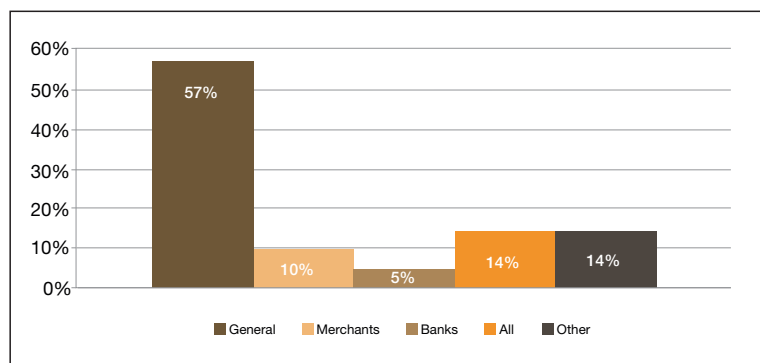
Graph 3. Technique used



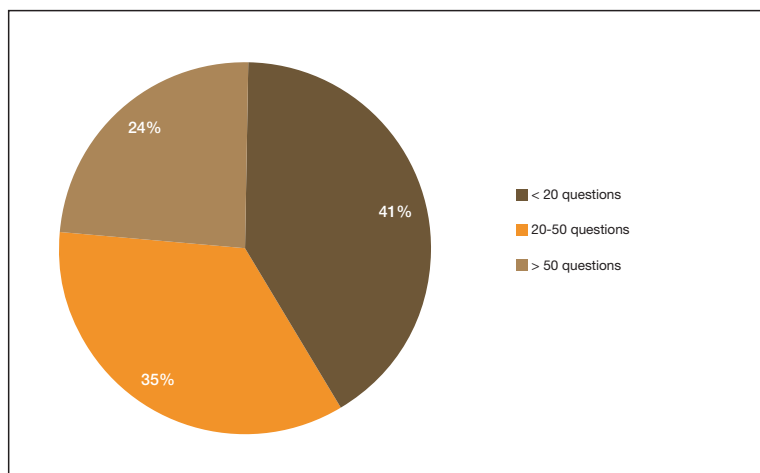
5. The bulk of surveys (57%) are aimed at the general public and a smaller percentage (10%) at merchants, banks (5%), or cash-in-transit companies, as Graph 4 shows.
6. In almost half of all cases (40%) the survey is short and does not include more than twenty questions. A slightly smaller proportion (35%) are medium length (twenty to fifty questions). In short, three-quarters of the banks included in the survey run surveys with less than 50 questions and just 25% use a longer questionnaire (Graph 5).

The results also show that almost 50% of questionnaires include both open and closed questions (see Graph 6), which makes sense if we bear in mind that information is sometimes required on qualitative issues that are difficult to evaluate using a totally closed set of answers.

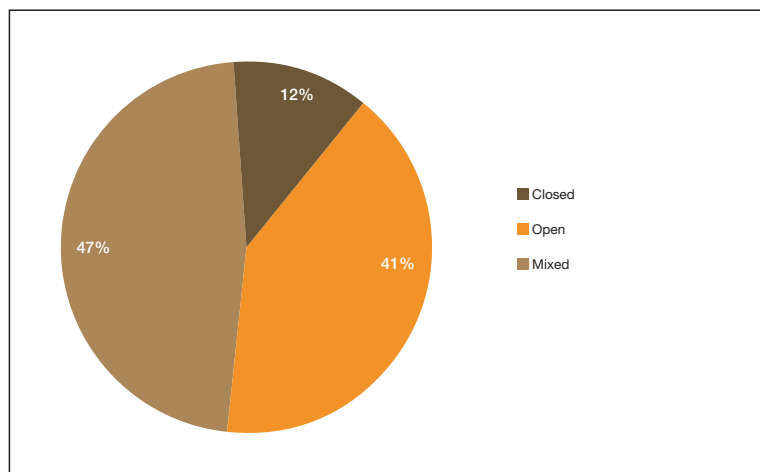
**Graph 4. Target audience**



**Graph 5. Number of questions**

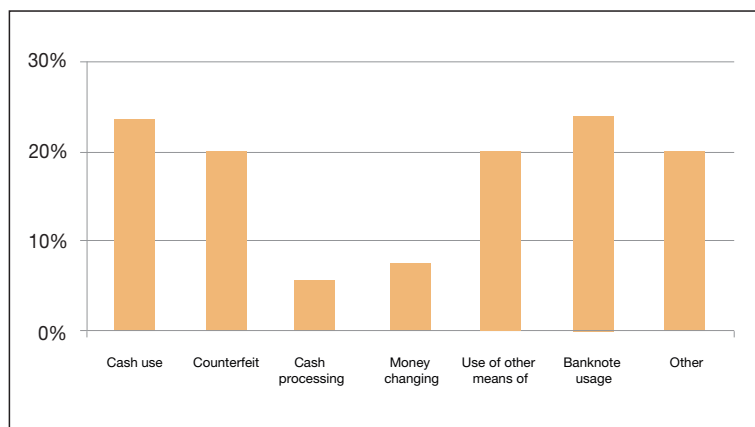


**Graph 6. Question types**



7. Topics of interest in the surveys: many central banks include topics relating to the cash cycle and the daily activity of the department in their surveys (Graph 7). 40% of surveys are geared overall towards finding out about how merchants and the public use cash and the usage condition of banknotes. This is a topic of considerable importance, to which central banks devote much attention. The questions concerning counterfeiting were also of particular interest, considering that 20% of questionnaires focused on the issue. On the other hand, topics such as cash processing and exchanging coins seem to be of lesser importance.

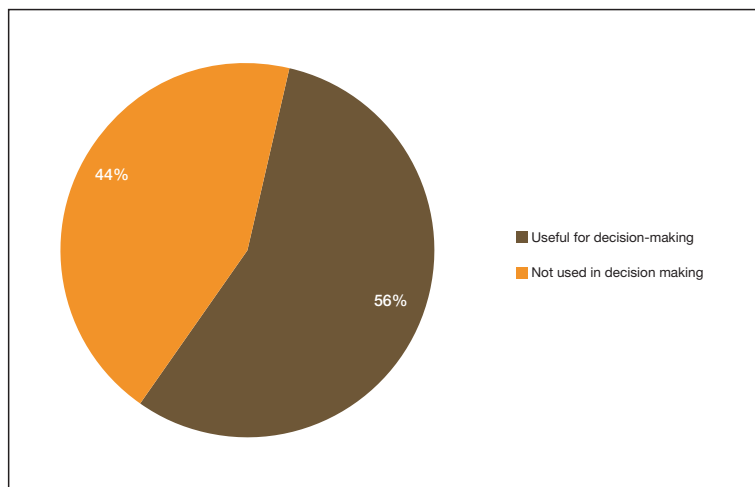
**Graph 7. Questionnaire topic**



### III. Evaluation of results

Using surveys as a social indicator is not trivial. In fact, most central banks use them as a catalyst for general issues regarding how the public manages cash. It is essential to know about the public's cash usage and habits, use of other means of payment, and the general valuation they give to the banknotes and coins in circulation, the degree of familiarity with banknote security features, and the perception of the problem of counterfeiting, or the level of satisfaction with cash services provided by financial institutions, among other issues. The results show that for 56% of central banks included in the survey, evaluating public opinion on these issues is of considerable value for decision-making. Surprisingly, 44% say that they do not take them into account, although the associated reasons seem to be related to a mistrust of the results obtained or possible initial errors in questionnaire design.

**Graph 8. Value for decision-making**



### IV. Final observations

The *Banco de España's* Cash and Issue Department ran this quick survey of a number of central banks to complement the analysis set out on the preceding pages of this issue of BILLETARIA from the contributing central banks. The aim was to be able to give a general picture of how and to what extent surveys targeting the public, merchants or banks are one of the tools used by cash departments to guide their decision-making process. The presentation and analysis of the information gathered offers an overview of the general use made of surveys in central bank's cash departments.

The findings show that questionnaires have become an important information and management tool (for 70% of responding central banks) and their





The simple examined comprises the following countries' central banks:

Australia	Honduras
ECB	Ireland
Belize	Japan
Chile	Malaysia
Croatia	Morocco
El Salvador	Mexico
Slovenia	New Zealand
Spain	Pakistan
Finland	Peru
France	Poland
Greece	South Africa
Guatemala	Thailand
Netherlands	Uruguay

use is relatively widespread among central banks, particularly since 2010. The questionnaires were sometimes carried out to collect information on specific circumstances (33%); at other times questionnaires were designed for annual use (39%) so as to allow trends to be explored.

Personal interviews are the most widely used technique. However, use of e-mail is becoming more central and reaches up to 33%.

Surveys are mainly geared towards the general public, and include an even mix of open and closed questions, and the most common format consists of less than 50 questions (76%). The relatively small size of the questionnaire encourages a high response rate.

Although central banks are interested in a wide variety of topics, the use of cash vis-à-vis other means of payment takes pride of place (18%). It is followed by questions such as the banknote condition (18%) and possible counterfeits (15%).

Central banks consider it to be important to have end users' opinions on their work, and questionnaires have established themselves as a fundamental tool in obtaining this knowledge. Although some central banks have been using them for a long time, it seems that their implementation has been standard practice in recent years. Increasingly, public surveys are used as an information analysis and management tool, and to compare policies, opinions and assessments in the cash field.

# Uruguay's banknotes

■ **Héctor Mantel** *Banco Central del Uruguay*

The *Banco Central del Uruguay* (BCU) was created by Article 196 of the Constitution of the Oriental Republic of Uruguay in 1967. As established in its Founding Charter, its various powers include the issue of banknotes and the minting of coins: "It shall have exclusive authority to issue banknotes, mint coins, and withdraw banknotes and coins from circulation throughout the Republic."

Within the BCU, the Treasury Department has been a pioneer in the ISO 9001-2008 and AENOR quality certification of its processes.

## I. General description of the banknote family

The BCU has designed a harmonic banknote series paying homage to the country's outstanding figures in education, literature, and the arts, which has been in circulation since 1989.

### Personalities to whom the banknotes pay tribute

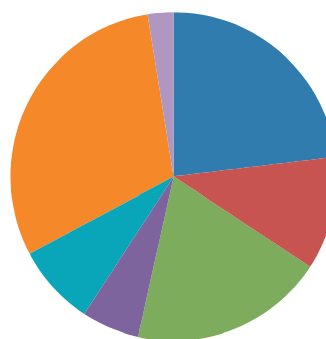
- \$ 20 Juan Zorrilla de San Martín, poet, essayist and journalist.
- \$ 50 José Pedro Varela, educationalist and reformer of public education.
- \$ 100 Eduardo Fabini, composer.
- \$ 200 Pedro Figari, artista.
- \$ 500 Alfredo Vázquez Acevedo, lawyer, educationalist and university vice-chancellor.
- \$ 1,000 Juana de Ibarbrourou, poet and narrator.
- \$ 2,000 Dámaso Antonio Larrañaga, Presbyterian and founder of the national library.

Each of the banknotes in the series shows a portrait of each personality on the obverse and motifs relating to their career on the reverse. All the denominations have the same size (159 x 74 mm) and substrate (100% cotton).

## II. Anti-counterfeiting measures

As part of its anti-counterfeiting efforts, and to promote care for banknotes, the BCU's Treasury Department has set up a Counterfeit Prevention and Analysis Unit with the basic task of forensic analysis of Uruguayan and foreign banknotes withheld by the financial system as suspected counterfeits. A database has been designed in which all the banknotes withheld and examined are registered, and which can be consulted by financial institutions to check the content of the analysis performed.

The Department also organises seminars and workshops throughout the country on banknote security and care, covering both Uruguayan and foreign banknotes. These events are aimed at various stakeholders (financial institutions, cash-in-transit companies, collection networks, retailers, and the general public, and anyone asking to take part) and participants are given a certificate of attendance at the end of the course. Recently, together with the primary education authorities, special attention has been paid to giving these courses in state and private schools, taking the view that education from school age on banknote security and care will reduce costs of banknote destruction and counterfeiting over the long term.



Structure of banknotes in circulation (units)

Denomination	Circulation
\$ 20	23%
\$ 50	11%
\$ 100	19%
\$ 200	6%
\$ 500	8%
\$ 1,000	30%
\$ 2,000	3%

Specific brochures and posters were prepared in this context, and the BCU website is kept permanently up to date on banknote and coin matters, stressing banknote security in particular.

## III. Characteristics of manufacturing and security features

### Technical specifications of the paper

Parameters	Values
Dimensions	159 mm x 74 mm
Composition	100% cotton
Weight	92 g. ± 5 %
Thickness	119 microns ± 5 %
Gluing	Uses polyvinyl alcohol
Breaking length	≥ 6,000 metres
Damp strength retention	≥ 30
Double folds	≥ 5,500
Tearing resistance	≥ 775
Bendtsen porosity	Max. 30 ml/min
Bendtsen roughness	Max. 600 ml/min
Ash	≥ 5
pH	≥ 5
Cobb water absorption	Min. 10, max. 70 g/m <sup>2</sup>
Opacity	≥ 84 %

### Printing techniques

- **Intaglio:** Used for the microprinting, the portrait of the personality, allegories, on the face value of the banknote, on the signatures and the marks for the blind, which have geometrical shapes.
- **Offset:** simultaneous printing on obverse and reverse, used for the banknote background, in the see-through register, the geometrical motifs in the watermark area, the design of which is distorted when photocopied, and the fluorescent ink printing that responds under UV light.
- **Silk-screen printing:** used to apply the dynamic effect printing. (*Spark*) and glossy stripes.
- **Letterpress:** consecutive double numbering on the obverse.
- **Flexography:** used to coat the banknote and apply a glossy seal on the reverse with the letters "BCU" and the value of each denomination. The coating improves the paper's durability and extends banknote life.



#### IV. The \$ 500 banknote, D series, year 2014

The BCU is in permanent contact with the various banknote suppliers, in order to keep abreast of new technology developments they may be able to offer for inclusion in the banknotes in circulation. For its part, the BCU's Counterfeit Prevention and Analysis Unit keeps statistics on counterfeits and the security features that are forged. This information is used as an input to studies of the possible changes to be made in future currency issues.

In 2014 a \$500 banknote was issued that kept the same design as the banknotes in previous series, but incorporates latest generation security features. A map of Uruguay in Spark ink with a rolling bar and colour-shift effect (from green to blue) has been incorporated on the obverse. An intaglio stamp has also been applied that includes the banknote's face value in the outline of the map. The windowed security thread has been replaced by a metallised holographic thread with the Uruguayan coat of arms and the inscription "BCU 500". Intaglio elements for the blind have been included on both edges of the banknotes (three lines) and these elements are designed to line up when the banknote is folded in half. Two stamps have been included on the banknote reverse during the coating process: one with the text "BCU 500" on the right and the other in the bottom left corner with the figure 500. The banknote displays two glossy stripes: on the obverse there is a stripe in the form of a laurel leaf, and on the reverse, a stripe with the face value of the banknote. In relation to the water marks, along with the image of the personality the banknote pays tribute, the face value of the banknote has been added, repeated three times.

The public information campaign for the banknote was based on television interviews. Advertisements were also published in the largest circulation newspapers and the Bank's website was updated. Information post-

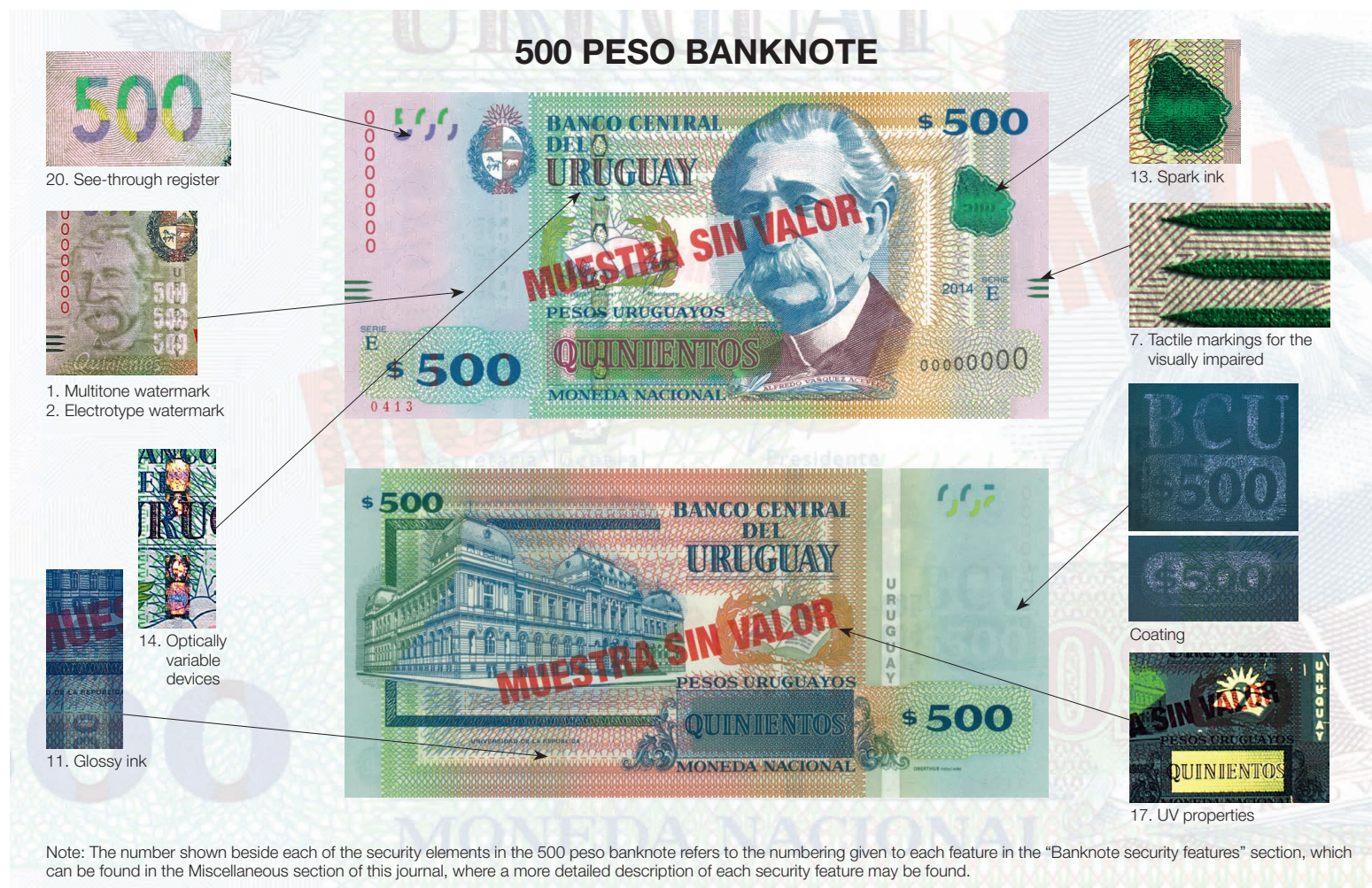
2014 statistics (July)	Uruguayan pesos	Euros
Value of banknotes in circulation (million)	55,004.3	1,760.1
Average value of banknotes in circulation	434.1	13.9
Number of banknotes in circulation (millions)	126.7	
Banknotes in circulation per inhabitant	39.3	
Value of banknotes in circulation relative to GDP	9.6 %	

ers were also distributed throughout the country. With the next print run (2015), all the denominations will have the same security features, varying the threats and special ink used for the map of Uruguay according to the face value of the banknote.

#### V. Plans for the future

As part of the Treasury Department's process of continuous improvement, polymer technology is due to be incorporated in the lowest denomination banknote (\$20). Although the design will remain the same as that of the banknotes currently in circulation, its size will be reduced.

Bearing in mind that this substrate will extend banknote lifetime and improve quality, it has been decided that a limited number of banknotes should be printed to test how well they are accepted by the public and the various economic players. The technical characteristics of the substrate and printing have therefore been designed and the procurement process has begun.





# The numismatic collection of the *Deutsche Bundesbank*

■ **Juliane Voss** *Deutsche Bundesbank*

The numismatic collection at the Central Office of the *Deutsche Bundesbank* in Frankfurt am Main is a relatively young institution. Its origins are not to be found in royal coin collections, nor are they rooted in the issuing processes of banknote printers. A selection of the collection's objects is on display at the Money Museum, which is located in its own dedicated building on the *Bundesbank's* premises.

With a total of more than 350,000 items, the *Deutsche Bundesbank's* collection is one of the four largest in Germany alongside those in Berlin, Dresden and Munich. Even by international standards, the coins and banknotes assembled in the collection are of exceptional importance in terms of their geographical scope and historical range.

## I. History

### *Origins in the German Reichsbank*

In contrast to comparable numismatic collections, the *Bundesbank's* coin and banknote collection is very young. Its nearly 100 -old history can be traced back to the *Deutsche Reichsbank* in Berlin. The *Reichsbank* was founded in 1875 following the unification of German states in 1871 and was responsible for overseeing the unified currency that replaced the diverse currency systems that had existed within Germany up to that time.

During the First World War the *Reichsbank* accumulated gold and silver coins. These coins had found their way to the *Reichsbank's* central office in Berlin and its branches through purchases as well as through deliveries of gold and silver coins by the general public in response to the patriotic initiative "I gave gold for iron" – launched to finance the war effort.

The *Reichsbank* was responsible in large part for the increase in paper money emissions that started in 1918 and culminated in hyperinflation in 1923. The main reason for the hyperinflation of the 1920s was the high level of war reparations. This led to an unstable economic situation with high unemployment and the impoverishment of the lower and middle classes, but also to the erosion of German sovereign debt. The collapse of the currency caused prices to skyrocket. With banknotes in such huge demand, they were issued not only by the *Reichsbank* but also by local authorities, companies and trade unions.

Whereas the *Reichsbank's* collection at first focused on German money, it later became increasingly universal in scope. In the early 1930s, the *Reichsbank* set up a separate department to cater for its coins and banknotes. In 1935, this department took on responsibility for organising and expanding the collection, which became known as the "Money Museum" (*Geldmuseum*) as of 1937. Exhibits of coins were put on display at the *Reichsbank's* large boardroom and later in separate rooms.

At this time, the collection contained about 3,200 coins and banknotes as well as a small library. Purchases of entire collections enlarged its holding of



View of the façade of the Money Museum of the *Deutsche Bundesbank* / DBB

coins, notes and books. In around 1945, the collection was said to comprise more than 180,000 coins, 140,000 banknotes and more than 3,000 numismatic books.

The final stages of the Second World War marked the end of the *Reichsbank's* collection. Before the occupation of Berlin in 1945, the most precious parts of the collection – mainly gold coins – were relocated to the potassium mine in Merkers in central Germany. Only some 23,000 coins (13% of the coin collection) remained, with the banknote collection and the numismatic library being lost. The coins were placed in the hands of a trustee and were purchased in 1954 by the *Bank Deutscher Länder*, which was founded through laws enacted by the Allied Military Government. The coin collection has been systematically enlarged ever since. The most important post-war additions include the purchase of 2,000 Saxon thaler coins and the fairly recently acquired Asia collection, which comprises more than 3,000 items.

### *Origins in a private collection*

The original numismatic collection saw its most decisive enlargement with the purchase of the private banknote collection from Arnold Keller in 1957, which included 195,000 banknotes. Keller had already acquired his first banknotes before the First World War broke out. Given his limited financial means, however, his banknotes could not yet be called a collection. It is highly unlikely that Keller could have assembled a sizeable collection without the emergency money (*Notgeld*) that was put into circulation during the First World War.



Collection highlight: aureus of Brutus (reverse, right; obverse, left), who assassinated Gaius Julius Caesar on 15 March 44 BC / DBB

When the First World War began, vast amounts of cash were hoarded in the German border regions directly affected by the war, making coinage scarce and necessitating a number of towns and municipalities to issue emergency money on their own initiative. This gave the young Arnold Keller the original idea for the collection that he would put together. He went on to collect the issues of the subsequent periods of German emergency money, painstakingly cataloguing all the notes that were known to him. In terms of their coverage of all the periods of emergency money issuance, his catalogues remain unsurpassed to this day. Keller's catalogue of inflationary money issued in 1923 provides the only comprehensive overview of that time.

In the early 1920s, Keller moved to Berlin, where he was both a banknote dealer with his own shop and a mink breeder. Starting in 1934, he provided the *Reichsbank* with expert advice on organising and enlarging its collection, receiving duplicates for his services. The ravages of war took their toll on the *Reichsbank*'s coins and banknotes. The banknotes and the library of the *Reichsbank* collection disappeared, while the remaining banknotes went to the *Münzkabinett* in Berlin, where Keller was again assigned the task of examining and organising the coins and notes.

After buying his collection, the *Bundesbank* allowed Keller to continue the task of expanding the Bank's holdings and to complete his catalogues, although eye complaints rendered his work more difficult. Work on the *Bundesbank*'s holdings of emergency money continues to this day, and the paper money collection has been enlarged continuously and in all areas of collecting.

## II. The numismatic collection

The present-day numismatic collection consists of 260,000 notes and 90,000 coins, and is supplemented by 3,000 monetary artefacts, such as – to mention but a few – printing plates, minting dies, coin scales, cash processing machines, money boxes, curiosities and pre-monetary objects.

As with all the large German numismatic collections, German emergency and inflation money makes up by far the largest part of the *Bundesbank*'s collection, accounting for half of a total of just over 353,000 items. The other half comprises, in equal parts, coins and banknotes from around the world.

The numismatic library, which is linked to the collection, was also set up entirely from scratch after the war. Its collection contains works from as long ago as the 16th century and comprises approximately 23,000 items. These include international specialist journals, a comprehensive collection of excerpts from periodicals and anthologies, pamphlets, newspaper clippings and leaflets as well as the catalogues of more than 100 auction houses in Germany and other countries going back to the late 19th century and documents from Arnold Keller's estate.



One of the oldest preserved banknotes in the world: China, Ming dynasty, cash note from 1375 with a denomination of 300 / DBB

## Coins

The approach of universal collecting has led to a wide variety of coins both from a historical and geographical perspective. The collection includes the first electrum coins from Lydia, coins from Greek and Roman antiquity, coins from the European Middle ages as well as coins from modern times, where the focus is on Saxony, Prussia and the German Empire, as well as the peripheral regions of America and Africa, medals and the current euro currency.

## Banknotes

Due to the *Bundesbank*'s former tasks as a banknote issuing institution and Arnold Keller's collecting focus, the bulk of the collection is constituted by German banknotes and their production materials such as printing plates and tests, banknote designs as well as emergency money. One of the most important parts of the collection is the paper money of German territories before 1871. As the collection expanded, the focus of attention shifted to all kinds of international banknotes, official state issues as well as historical private-bank issues and, of course, the oldest paper money from countries around the world.

## III. Services from the collection

The *Bundesbank* attaches great importance to digitally recording the collection using the FAUST database management system. So far, more than 60% of the coin collection and 26% of the paper money collection has been recorded in digital form. Digital copies include all German banknotes, banknotes of all German federal states, German emergency money from 1914, prisoner of war camp money from 1914-18, French prisoner of war camp money and Portuguese and Hungarian emergency money. Preparations are underway to publish an online catalogue of the collection's objects.

The database is helpful in answering queries from within and outside the *Bundesbank*, and in providing collectors, researchers and press representatives with images. Researchers with a specific request can – following registration – view items from the collection in the study room between 8.00 and 15.00 on working days. Visitors can be given unlimited access to the numismatic library, again following registration.



# Banknotes and Coins

The numismatic collection of the *Deutsche Bundesbank*



Original handmade steel plate for the 50 Mark banknote from the reserve series in West Germany called the "Bittrof series" (top) and a finished 50 Mark banknote from 1960 (bottom) / DBB

Publications, mostly from the 1960s and 1970s, on selected holdings of coins and paper money are available in pdf format for free download from the internet. Additionally, the *Bundesbank* offers numismatics enthusiasts publications from its collection free of charge: Lectures on the history of money in the Money Museum (*Vorträge zur Geldgeschichte im Geldmuseum*), 2010 to 2014, and Special pieces from the numismatic collection 2013 (*Glanzstücke aus der Numismatischen Sammlung 2013*), both in German only. A different highlight from the collection is showcased on the Bank's website each month under "Special pieces from the collection". And finally, high-resolution images of German money since 1945 are available for free download.

## IV. Money Museum

Until 1999, the collection was semi-public. After registration it was possible for groups to visit the collection in the Central Office. The presentation of coins was an equally innovative and interactive solution: glass cylinders, hanging from ceiling, contained panels with coins which could be moved up and down from the outside. The concept was adopted for the new museum building completed in 1999.



View of the first exhibition in the Money Museum, which runs until 31 August 2014 / DBB

The new building in Wilhelm-Epstein-Strasse was constructed with an exhibition area on the ground floor as well as a library and press archive on the upper floors. The numismatic collection is not housed at the museum building, but about 3,000 of its items are on display in the historical part of the museum.

Pre-coin money, the first electrum coins from Lydia in the 7th century BC and earliest Roman pieces provide an overview of the initial developments of coin systems. The historical manifestation of coins around the world can be viewed in the museum's treasury. An oval-shaped room with a gold exterior and darkened interior, the treasury houses the collection's highlights: a gold coin of Caesar's murderer, Brutus, two gold bars weighing one kilo and twelve kilos respectively and several banknotes such as the earliest surviving Chinese banknote from the 14th century, the first European banknote from Sweden (1666) and selected notes from around the world.

The Money Museum is located at the *Bundesbank's* Central Office, Wilhelm-Epstein-Strasse 14 in Frankfurt am Main, and is currently displaying selected German banknotes as well as modern equipment used for the production of euros. This exhibition runs until 31 August 2014. The museum will be closed from 1 September, when extensive redesign and renovation work is due to begin.

### Useful information

Deutsche Bundesbank

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E-mail: [numismatik@bundesbank.de](mailto:numismatik@bundesbank.de)

The collection's website:

[www.bundesbank.de](http://www.bundesbank.de)



# The Historical and Numismatic Museum of the *Banco Central de la República Argentina*

■ Diego J. P. Aufiero and Silvia M. Fernández *Banco Central de la República Argentina*

The “Dr. José E. Uriburu (H)” Historical and Numismatic Museum, belonging to the *Banco Central de la República Argentina*, collects, safeguards, and displays the series of Argentine and Hispano-American coins that have circulated in the country since the mid 16th century, along with national, provincial and private banknotes, technical elements used in the manufacture of monetary items from various ages, and an archive of historical documents. Its collections form part of the national heritage.

The Museum is currently housed in one of the oldest bank buildings in Buenos Aires, declared a “national historical monument” in 2005. It was originally built in 1862 by the European architects Henry Hunt and Hans Schröder, and was the first seat of the Buenos Aires stock exchange. It was subsequently acquired by the State to house the *Caja de Conversión* and other official bodies.



Façade of the Historical and Numismatic Museum of the *Banco Central de la República Argentina* / BCRA

## I. History of the Museum

The Central Bank Museum's collections and archives have their origins in the historical heritage of its predecessor institution, the *Caja de Conversión*<sup>1</sup>, and the *Oficina del Crédito Público Nacional* (National Office of Public Credit)<sup>2</sup>. In the first decade of the 20th century the *Caja de Conversión* formed its first collections with specimens of Argentine banknotes that were kept as old issues were renewed. In 1908 the executive branch<sup>3</sup> created the archive and museum of the *Caja de Conversión*, which was in effect until the central bank was established on 28 May 1935. Once the central bank had been created, the collections came to form part of its assets.

On 30 May 1941 the Central Bank Museum was created, at the behest of Dr. José Evaristo Uriburu jr.<sup>4</sup>, the institution's first Vice-president and associated with various personalities of the Buenos Aires elite, in particular with intellectuals and academy members involved in historical studies.

Appointed member of the National Academy of History in 1944, his links and social circle formed a network of relations tied in with the development and evolution of both the technical aspects of the Museum and definition of its collections.

The preliminary work on creating the museum began in 1938, by means of a study on monetary museums locally and abroad, with the aim of taking models for the cataloguing of items, installing exhibitions and conserving the collections. As Dr. Uriburu had been Argentina's ambassador to the United Kingdom, the museographic approach of the British Museum in London was taken as the model.

In the early years the Museum's management concentrated on acquiring items from private individuals, and specialist numismatics and antique dealers. The items acquired were mostly related to Argentina's monetary history, from the colonial period and independence, along with provincial issues, down to the peso, the national coin in circulation at the time. The initial donations were made by personalities associated with the Bank's authorities and linked to the Buenos Aires elite. Exchanges of banknotes and coins were another mode of acquisition.

1. *Caja de Conversión* (1980-1935): its role was to organise national currency issues, monitor circulation, regulate the Exchange rate and safeguard the country's gold reserves, so as to ensure the backing of the currency in circulation.

2. *Oficina del Crédito Público Nacional*: founded by Law No 79 of 16 November 1863, it began operating in 1864 and continued until 1935, when the Central Bank was founded. Its main function was to administer the debts and loans contracted by the State.

3. Archive of the Central Bank Museum (referred to here as the AMBC), Decree of the National Executive branch No 2087, Article No 123, Ministry of Finance, 12.12.1908, p.102.

4. José Evaristo Uriburu (1880-1956): Lawyer, diplomat, historian, and numismatist. First Vice-president of the Banco Central de la República Argentina (1935-1945). Son of the National President. José E. Uriburu (1895 and 1898).



Obverse of the 100 Argentine peso banknote / BCRA



Obverse (left) and reverse (right) of one Argentine peso from 1881 / BCRA

During the first few years detailed studies were made of the items needed to complete the collection. The main objective was to put together a complete national collection of Argentina's currency, which could tell the country's story right from its origins through its banknotes and coins.

The Central Bank Museum is currently under the aegis of the Central Services and Administration Deputy General Management, which in turn reports to the institution's General Management.

## II. Collections and historical document archive

The Museum's assets are catalogued under various headings. By way of summary: a) 60 % of its assets are numismatic items such as coins, test pieces, medals, and Argentine and foreign banknotes; b) 20 % are documents in the archive of material on Argentine monetary and financial institutions, and documentation on the activities of the Central Bank; and c) the remaining 20 % comprises historical objects, such as items used in the manufacture of banknotes and coins<sup>5</sup>.

The Museum built up its collections with the aim of covering the various different periods of the history of Argentina's currency. A series of items used for bartering, the economic system prior to the Spanish conquest, were added, comprising cocoa beans, coca leaves, copper hatchets (found in grave urns in Mexico and Peru), and cowry shells used by African slaves. Some of these items were termed "indigenous currency" and related to the modes of exchange used by cultures in the Andean region.

The collections of colonial coinage are extensive in both number and diversity. They include coins minted in the *Real Casa de Moneda de Potosí* founded in 1573, in the Villa Imperial near Cerro Rico, today in the Republic of Bolivia. The coins produced at the mint from 1573 to 1825 circulated throughout the Viceroyalty of Peru and the River Plate. These are mostly silver coins, with some gold coins, classified as: Macuquinas de Escudo Coronado, Macuquinas Plus Ultra, Columnarias and Busto coins.

A small part of the collection comprises coins minted in 1813 and 1815 in Potosí under occupation by the revolutionary army during the war of independence. These coins represent the "First national coins" and were mostly minted in silver, with just a few in gold.

The coins from the post-independence period are catalogued as "provincial issues", the main mints being in La Rioja, Córdoba, and Buenos Aires. Alongside coin minting is the issue of the first banknotes by the *Banco de la Provincia de Buenos Aires* in 1822. The Museum's collections also include coins minted and banknotes issued by the Argentine Confederation (1854-1862), including those of the provincial issuing banks.

The collection includes items considered rare, such as the "Monedas de Pretensión" from 1874, which are coins produced by the French adven-

turer Orélie Antoine de Tounens, who declared himself "King of Araucanía and Patagonia" and called his kingdom "New France." Tounens minted coins in silver and copper that never came into circulation. Among the private issues, of particular interest is the minting of 1 and 5 gram gold coins by the Rumanian mining engineer Julio Popper who discovered gold reserves on the Isla Grande de Tierra de Fuego in the late 19th century.

Tokens and vouchers, as alternative means of payment in the commercial circuits, have been included in the Museum's collection since the outset, forming a special area in numismatic collecting.

The acquisitions of the *Caja de Conversión* and later the Central Bank sought to include all the lines of banknotes and coins issued since 1881, i.e. since monetary unification, in the collection. The Museum has in its collection, the National Peso (1881-1969), Law No. 18,188 Peso (1970-1983), Argentine Peso (1983-1985), Austral (1985-1992), Convertible Peso (1992-2002) and the Pesos currently in circulation. There are also special commemorative issues in various metals including silver and proof gold coins.

The history of the design of banknotes and coins in the Argentine Republic involved a number of significant European designers. The issue of the National Peso (Law 1130 of 1881), as a unified currency series, made it necessary to undertake a specific design, which was developed by the French engraver, sculptor and medal designer Eugène André Oudiné.

In the mid-20th century Italian engravers and sculptors arrived in the country, including Mario Baiardi, Renato Garrasi, Giorgio and Pietro Nicastro. These artists worked at the *Casa de Moneda* and brought unique excellence to the design of banknotes, coins and stamps, leaving behind an important legacy in the training of engravers and artists involved in currency issues. The mint's prestigious designers also included the Spanish artist Carlos Ochagavía Illaraza from Logroño (La Rioja) who designed various of the notes in the National Peso series.

Items used in the minting of coins and banknote printing, such as coin dies, printing plates, blanks, dies, date stamps, lithographic plates and stones, etc. allow the different techniques used over the years to be explored.

In terms of research into numismatics and economic history, the Museum has various documentary sources linked to banking history, such as those related to the *Oficina del Crédito Público Nacional* (1864-1935), the *Caja de Conversión* (1890-1935) and the General Bank Secretariat (1935-1955). The historical documentation also includes sources relating to the creation of cash in the 19th and 20th centuries.

## III. Activities

The Museum has a permanent exhibition covering six rooms. The first four rooms explore the history of currency in Argentina and the coin minting and banknote printing processes. These rooms are: 1) *Original peoples and the colonial era*; 2) *Independence and national organisation*; 3) *Con-*

5. AMBC, Inventory of the assets of the "Dr. José E Uriburu (H) Numismatic and Historical Museum", 2013.





Room 3 of the Museum of the *Banco Central de la República Argentina* / BCRA

*servative republic, and 20th century; and 4) Argentine currency today. The last two rooms present the history of the institution and special issues: 5) Precursor financial institutions to the Banco Central de la República Argentina; and 6) Banco Central de la República Argentina.*

Temporary exhibitions on various topics are also put on in the Museum's main hall throughout the year.

Through the Federal Exhibition Plan which is run each year, the Museum puts on numismatic displays on the history of the currency at other venues outside the capital. These exhibitions have been declared to be of cultural interest by the country's provincial and municipal legislatures. Since 2004 the Museum has taken part in the "Night of the Museums" where museum in Buenos Aires open their doors as part of a unique event, which Buenos Aires was the first capital in the Americas to stage. An exhibition on a specific topic is usually run alongside the permanent exhibition.

The Museum has an auditorium for adults and another for children. The educational calendar includes guided tours for school parties, tailored to their educational stage. Initial level is offered: a) showing of a cartoon entitled *La moneda argentina nos cuenta su historia* (Argentina's currency tells its story), and b) interactive games relating to the economic-financial circuit. For secondary and university students, classes on the history of Argentina's currency are available on audio-visual media. The history class involves student participation and, according to their stage of education, aims for students to recognise the Central Bank's remit and tasks, and the various monetary lines, in the context of each epoch's political and social processes. The visit is completed with a tour of the Museum's rooms. These activities are provided free of charge by the Museum's specialist guides.

Moreover the Museum has the possibility of showing the movie or the monetary history class in educational establishments or social centres with limited resources that are unable to visit the Museum so to bring it to the largest possible number of students.

One key aspect is accessibility for visits by the differently-abled. Visits for the sight impaired involve an educational talk accompanied by the handling of replicas of the most emblematic items in our heritage. People with

hearing difficulties can receive the class in the Museum's auditorium, which is specially equipped with a magnetic loop system enabling the sound to be amplified to be picked up by hearing aids. For the deaf, audio-visual media is used for the presentation, assisted by guides familiar with Argentine sign language (LSA). The Museum also has ramps, lifts, and toilets for people with motor disabilities.

The Museum also carries out research and produces publications, mainly on numismatic topics, and in many instances these form part of the materials making up the museographic guides of some of the exhibitions. Additionally it runs academic activities at both the Museum's headquarters and other spaces related to historical and numismatic studies.

The Museum has a specialised library with specific material on Latin-American and international numismatics, the history of banking and finance, museology, and Argentine and universal art and history.

#### IV. Closing remarks

The Central Bank Museum assumes its missions and functions as the custodian of a numismatic heritage of great value for historical studies. Since the beginning, over the course of the decades, efforts have centred on enriching its collections so that present and future generations can have the chance to look at history from a different perspective, this time through the history of Argentina's currency.

#### Useful information

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Website: [www.bcra.gob.ar](http://www.bcra.gob.ar)

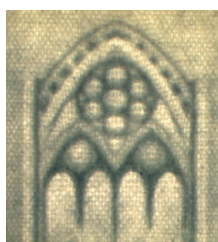


# Banknote security features

■ 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

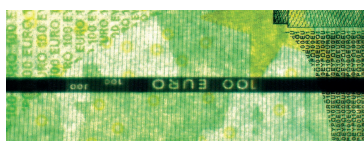
Image incorporated into the paper which is visible when the banknote is held against the light. It is created during the paper making process by varying the thickness of the paper. The resulting variations in opacity give rise to an image with bright and dark areas.



### 2. Electrotone watermark

A filigree visible when held up 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



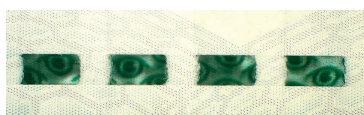
### 3. Embedded security thread

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



### 4. Window thread

This band is made of a thread, which is slightly wider than the security thread, 3-4mm, weaves in and out of the paper. The uncovered sections are visible and could contain an optically variable element such as 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.

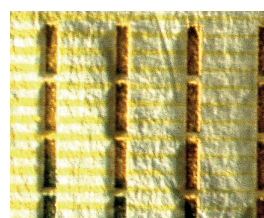
## INTAGLIO FEATURES

### 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

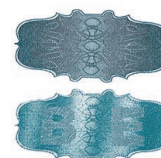
These tactile marks are detectable by touch. They are printed in intaglio and are usually located near the borders of a banknote to facilitate its recognition by the visually impaired.

### Visual



### 8. Colour gradation in intaglio

Gradual superimposition of colours printed in intaglio, which 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 produced 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 inkless intaglio printing.

## 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 display an image.

**12. OVI ink**

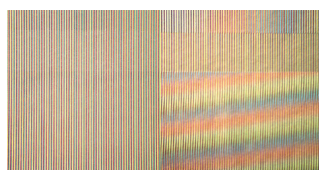
Printing with optically variable ink (OVI), implies it will change colour when the banknote is tilted. Its effect is increased when the whole surface is covered by a layer of this ink applied in silkscreen printing.

**13. Spark ink**

A particular type of OVI ink which changes colour. It contains 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 on 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. Variable colour moiré**

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

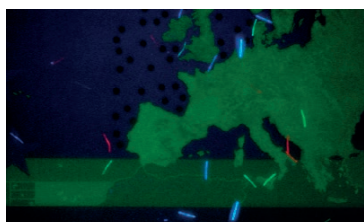
**16. Microprinting**

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 are more striking when 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.

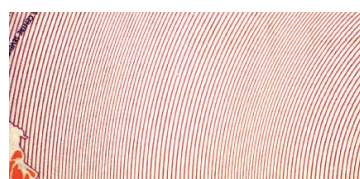
**19. IR properties**

These are incorporated into the pigments of the inks. The inks used behave differently under IR light due to different absorptions in the IR spectrum. The IR characteristics are usually achieved by combining transparent inks with inks opaque to IR.

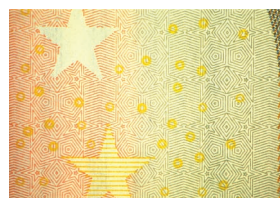
## OTHER FEATURES

**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, called the moiré effect, when reproduced by copiers.

**22. Rainbow printing**

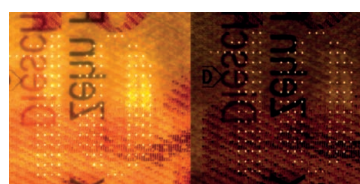
Offset printing that creates in the banknote an area with different colours that are gradually mixed together to create a rainbow effect.

**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 punched by laser.





Suma de Cosmographia. Pedro de Medina. Seville, 1550.  
National Library, Madrid

# BILLETARIA

YEAR VIII

ISSUE 16

OCTOBER 2014

**BANCODE ESPAÑA**

Eurosistema

## BILLETARIA

October 2014

### Publisher

Banco de España / Cash and Issue Department  
[www.bde.es](http://www.bde.es)

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Legal deposit: M-45.124-2010  
Printed in Spain, by Artes Gráficas Palermo, S.L.