

The Next Generation Banknote Project

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A core function of the Reserve Bank is to maintain public confidence in the nation's banknotes so that they remain an effective means of payment and a secure store of wealth. This article discusses the Bank's counterfeit deterrence strategy and the central role that the Next Generation Banknote (NGB) project will play in this strategy by enhancing the security of Australia's banknotes.

Introduction

The Reserve Bank dedicates substantial resources to counterfeit deterrence consistent with its responsibility under the *Reserve Bank Act 1959* to preserve confidence in Australia's banknotes. The Bank approaches its responsibilities in this regard in two ways. First, the Bank monitors counterfeiting activities and develops improved security measures to counter potential counterfeiting threats. Second, the Bank engages with the community on counterfeit detection techniques.

Efforts by the Reserve Bank have ensured that Australia has experienced low levels of counterfeiting for many years. However, the growing availability of more advanced technologies that allow reproduction of images to be made more easily and more cheaply means that, in the future, the security features on Australia's current banknotes may no longer adequately guard against counterfeiting. Reflecting this, the Bank announced in 2012 that it had initiated the NGB project to upgrade the security of the current series of banknotes.

Another concern for the Bank relates to an inaccurate perception within the community that a counterfeiting problem exists, despite the low levels of counterfeiting actually being experienced. The Bank is addressing this through increased engagement with a variety of groups to improve community understanding about the security embodied in Australia's current series of banknotes

and is developing communication channels in preparation for the launch of the new banknotes.

This article discusses the important role that the Bank's counterfeit deterrence strategies play in maintaining confidence in Australia's banknotes. It then discusses some of the key elements of the NGB project.

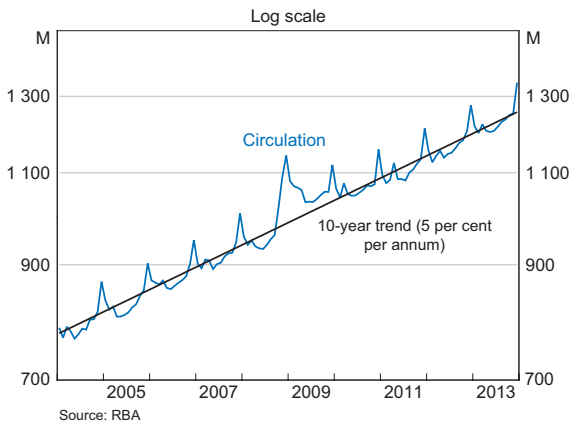
Banknote Use and Confidence

Despite strong growth in the use of electronic payment methods in Australia, demand for cash continues to grow, totalling around 1.3 billion banknotes in circulation as at the beginning of 2014. The number of banknotes on issue has grown at a rate of around 5 per cent per annum over the past decade, peaking seasonally during the high-volume demand periods around Christmas and Easter (Graph 1). Furthermore, towards the end of 2008 the number of banknotes on issue increased rapidly for a time, reflecting a temporary increase in demand for cash during the global financial crisis (Cusbert and Rohling 2013).

The Bank's Consumer Payments Use Study conducted in 2010 indicates that cash still accounts for the greatest share of the number of consumer payments (Bagnall and Flood 2011, p 58). The study showed that cash was used for 62 per cent of all transactions and around 80 per cent of transactions under \$25. The study also showed that cash was the dominant means of payment for take-away stores, hotels, bars and small food stores where transactions

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Graph 1
Banknotes in Circulation



are typically of low value and are made in person, where quick turnaround times are preferred and where accepting alternative methods of payment may be less efficient.

Given the continued importance of banknotes as a payment mechanism, a loss of confidence in Australia’s banknotes could have a substantial impact on the community (Cowling 2011, pp 65–66). For instance, transaction costs may increase as businesses spend additional resources on counterfeit detection, or consumers may switch from cash to alternative, more costly means of payment.

In view of these potential costs, it is important that the Bank continues to allocate resources to ensure ongoing public confidence in Australia’s banknotes. The Bank works to preserve confidence in Australia’s banknotes by:

- having banknotes with robust and effective security features; and
- ensuring that the community is well informed about Australia’s banknotes.

Efforts in these two key areas help to deter potential counterfeiters by making counterfeiting difficult, time-consuming and costly, and by making it more difficult to pass counterfeits undetected. To the extent that these initiatives are effective, less reliance

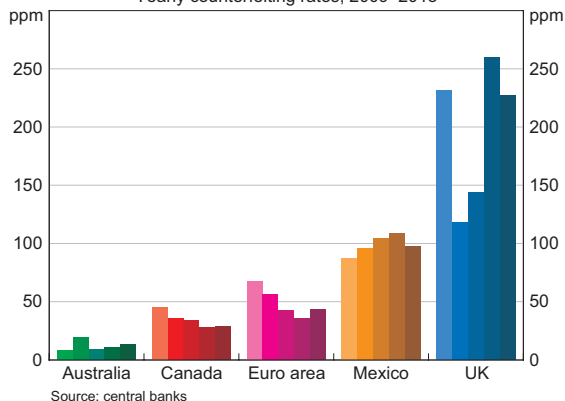
is needed on policing and judicial activities, thereby enabling law-enforcement agencies to focus on other priorities.

Banknote Security

In the 1980s, a process was developed that allowed intricate layers of print to be applied to polymer (or ‘plastic’). In addition to enabling a durable banknote to be printed, it meant banknotes could incorporate a clear window on which an embossed feature could be impressed. When polymer banknotes were first introduced in Australia in 1992, these features were difficult for counterfeiters to replicate and it placed Australia’s banknotes at the global forefront of banknote security (see ‘Box A: Australian Banknote Security Features’ for more information on the security features on Australia’s current banknotes).

Since its introduction, the current series of banknotes has experienced low rates of counterfeiting. On average, in the past five years, only around 12 counterfeits have been detected for every million genuine banknotes in circulation (i.e. around 12 parts per million).¹ This is low when compared with the experience of a number of other countries (Graph 2).

Graph 2
Counterfeits Detected
Yearly counterfeiting rates, 2009–2013



¹ The yearly parts per million (ppm) rate is calculated as the number of counterfeits detected in a year divided by the average of genuine banknotes in circulation for that year, scaled by a million. The five-year average was calculated on the rates for 2009 to 2013.

The impact of counterfeiting, however, acquires greater relevance when it is expressed in value terms. In Australia, direct losses from counterfeiting in 2013 amounted to around \$900 000.² While this is relatively low, the financial impact on the consumer as a result of a counterfeiting incident is significant because the recipient of a counterfeit directly and immediately bears the loss. Further, the victims of counterfeiting in Australia are frequently small retailers and members of the public who can less easily afford to bear either the direct cost relating to the face value of the counterfeit passed, or the more expensive indirect cost associated with installing and using banknote authentication equipment. Even low levels of counterfeiting activity can lead to diminished confidence in the counterfeited denomination, resulting in consumers rejecting cash payments altogether. A more likely scenario though is that consumers resort to less convenient denominations. This was the case in 2002, where in some regions of Canada around one-tenth of retailers refused to accept C\$100 banknotes, forcing the Bank of Canada to make a concerted effort to upgrade the security of its banknotes (Spencer 2011, p 2).

Community Liaison

In addition to ensuring that banknotes are as difficult as possible to counterfeit, it is important that the public is well informed about the security features on Australia's banknotes and how they function. For example, it is useful for the public to know that there is a pattern in the clear window of a genuine banknote, but it is much better still for them to know what that unique pattern is in each denomination.³

In 2010 and 2012, the Bank conducted online surveys to gauge the public's perception and knowledge of the current banknote series, and to assess public confidence in Australia's banknotes. Despite the low

levels of counterfeiting in Australia, 12 per cent of participants in 2010 and 19 per cent of participants in 2012 believed that it was more likely than not that they would receive a counterfeit in the next year. Moreover, additional questions in the 2012 survey indicated that 6 per cent of participants did not feel that Australia's banknotes were secure against counterfeiting, while 7 per cent of participants believed that there was a significant counterfeiting problem in Australia.

These perceptions of counterfeiting risk were higher than expected given Australia's actual counterfeiting experience. While the surveys did not examine why participants may have lacked full confidence in Australia's banknotes, it may in part reflect a low level of public awareness of how to check properly for the authenticity of banknotes. Misinformation can exacerbate this problem. For example, the Bank observed heightened concern about counterfeiting in late 2010 when misinformation was circulated stating that a counterfeit could be recognised by the absence of portrait names on a banknote.⁴

In light of the impact that misinformation or insufficient information can have on how the public perceives banknotes, the Bank identified that further work was needed to engage with stakeholders and that additional resources needed to be allocated to banknote education. As part of this effort, in August 2012 the Bank launched its dedicated banknotes website (banknotes.rba.gov.au) as a comprehensive resource designed to provide the public with information on Australia's banknotes and how to authenticate them. More recently, with assistance from the NSW Department of Education and Communities, a banknote education resource for early primary school children is in the final stages of development. This resource will help teachers integrate banknote-related material into their mathematics and history curriculums.

The Bank has also increased its engagement with retailers, financial institutions, law enforcement agencies and armoured car companies, all of whom

² The majority of Australian counterfeits belong to the \$50 denomination because of its higher value and widespread use (Cowling 2011, p 65).

³ A gumnut in the \$5, a windmill in the \$10, a compass in the \$20, the Southern Cross in the \$50 and a lyrebird in the \$100.

⁴ See Cowling (2011, p 67) for details.

perform a vital role in the counterfeit detection, prevention and management process. One initiative in this respect is a series of Counterfeit Deterrence Workshops run by the Bank in partnership with the Australian Federal Police. These workshops provide an opportunity for key stakeholders in the banknote community to acquire in-depth knowledge about Australia's banknotes and discuss collaborative counterfeit prevention strategies. Two workshops have been held to date, with a third planned for March 2014.

In addition, the Bank distributes educational material to various organisations and regularly gives presentations to audiences including school groups, the vision-impaired community, police, banknote equipment manufacturers, retailers, financial institutions and other central banks.

Emerging Threats

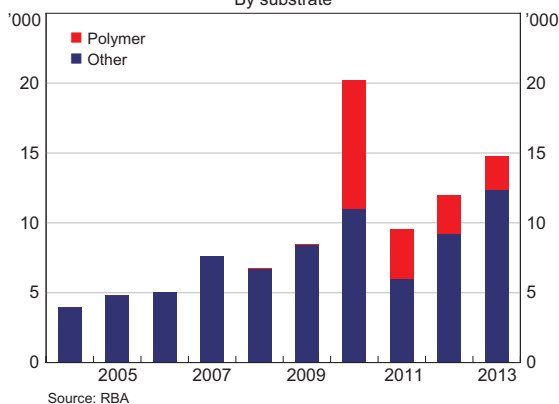
The vast majority of counterfeits detected in circulation have, to date, been poor-quality reproductions on paper, made using standard commercial copying devices. In fact, prior to 2010, counterfeits on polymer were virtually non-existent. More recently, however, counterfeiters have not only been increasingly attempting to reproduce many of the security features used on our banknotes, but using polymer as well (Graph 3).

A counterfeiting incident in 2010, where increased volumes of high-quality polymer \$50 counterfeits entered into circulation over a short period, illustrates the emerging threat to the current banknote series and how quickly a concerted attack can develop. Of particular concern was the fact that the counterfeits contained high-quality and consistent replications of the clear window, embossing and the white Southern Cross pattern within the clear window, and were therefore more difficult for the public to detect than most other counterfeits.⁵ Notwithstanding the fact that the cost of manufacturing the counterfeits was significant, this incident highlighted the challenges posed by technological innovation and the access that smaller counterfeiting operations increasingly have to more sophisticated printing and scanning equipment.

While counterfeiting of banknotes from the current series has arisen mostly through domestic channels, threats to the security of Australian banknotes can also be observed through two significant international incidents. The first was in 2006 and related to a criminal network in Colombia attempting to counterfeit Australian \$100 banknotes (RBA 2006). The partially completed counterfeits had a face value in excess of \$5 million, were printed on plastic film, and contained high-quality reproductions of the design, clear window, white pattern within the clear window and shadow image.

The second incident occurred more recently in Mexico, where the 50 peso banknote, which is produced on the same polymer substrate as Australian banknotes, was counterfeited in large numbers until the Mexican federal police made arrests in November 2012 (Bank of Mexico 2013). By the time the Bank of Mexico had upgraded the 50 peso polymer banknote with improved security and released the banknote into circulation in May 2013, 220 000 counterfeits of the original polymer 50 peso banknote had been seized. In addition to the direct costs that were incurred by victims, this

Graph 3
Counterfeits Detected
By substrate



⁵ This counterfeiting operation was shut down in late 2010 following the arrests of members of the manufacturing and distribution ring and the seizure of three large commercial printing machines (AFP 2010).

incident highlighted the substantial indirect cost to the taxpayer resulting from the need by the Bank of Mexico to design, produce and issue an upgraded 50 peso banknote in a short space of time.

These examples of large-scale, high-quality counterfeiting incidents are a cause for concern for the Bank. They show that sole reliance on the polymer substrate and the security features presently in use is no longer enough to ensure long-term confidence in Australia's banknotes. It is a testament, however, to the success of the original series of polymer banknotes that the Bank has been able to delay introducing a new banknote series for over 20 years. This is in comparison with other countries that, on average, have to replace their series every 7 to 10 years.

The Next Generation Banknote (NGB) Project

Mindful of the increasing threat posed by counterfeiters – particularly to banknotes printed on polymer – the Bank has for a number of years been undertaking research into new anti-counterfeiting technologies. This work was formalised in the NGB project that was established in 2007, publicly announced in 2012 and will culminate in a new, more secure banknote series being introduced in coming years.

There are many aspects to the NGB project that make it an undertaking of considerable complexity. In addition to production and design, a number of key stakeholders have had to be engaged and there are significant logistical issues that need to be addressed.

Banknote production and design

The production of the current banknotes involves many complex processes and the application of multiple layers of inks and security features (see 'Box B: The Banknote Production Process'). The NGB project brings further complexity to the production cycle with the addition of new security features and changes in design.

To determine which security features would be appropriate for the next generation of Australian banknotes, over 200 features were assessed based on the criteria of resilience to counterfeiting, functionality, durability, production-readiness and cost of production. Further, to take full advantage of the opportunities that polymer substrate offers, the new banknotes will incorporate state-of-the-art security printing technologies as well as multiple windows with designs that are significantly more complex than those on the current series. The new banknotes will also feature up-to-date intaglio and offset printing techniques, which will achieve greater fidelity in the print quality.

As part of the design process, the Bank is consulting with designers, artists and historians to ensure that the new banknotes reflect Australia's cultural identity while remaining functional and recognisable. Accordingly, a decision was made to retain many of the salient characteristics of the current series including the people portrayed on the banknotes, size, general colour palette and denominational structure. An important driver in this decision was the Bank's continued commitment to assist the vision-impaired community, who rely on the size differentials, the distinct colours of our banknotes and the bold numerals to distinguish between different denominations. The Bank was also conscious of the multitude of machines that accept banknotes and the benefits to manufacturers and users of these machines of retaining the size and denominational structure.

In the process of finalising the design, the Bank is conducting rigorous production trials with its banknote printer, Note Printing Australia. The purpose of these trials is to identify and resolve any production complications and ensure that the new banknotes are ready for full-scale manufacture. The banknotes produced in these trials will provide the Bank with material to assess the aesthetics, machine readability and the durability of the banknotes and will allow the Bank to engage in a very tangible way with the public and banknote equipment manufacturers.

Stakeholder engagement

The issuance of the new banknote series will affect both the general public and a broad range of groups.

To ensure public recognition and acceptance of the new banknotes, the Bank will invest in national public awareness and education campaigns, and is working with experts in the areas of media and public relations to ensure that all target audiences are reached in the appropriate manner.

The Bank has also consulted extensively with a number of key users of banknotes including banknote equipment manufacturers, retail organisations, financial institutions and the vision-impaired community. These ongoing consultations provide an opportunity to ensure that the new banknotes meet the various needs of the whole community.

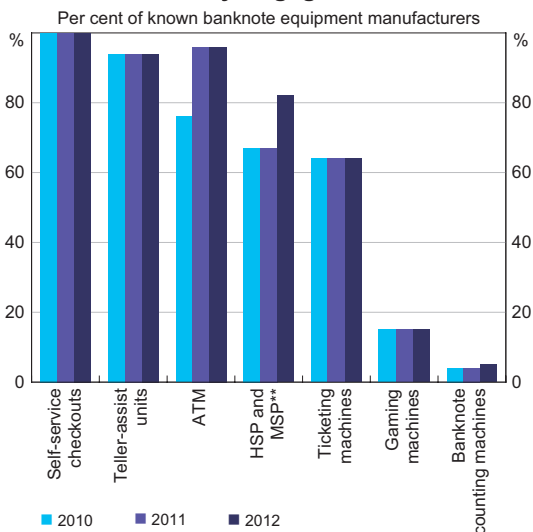
For example, it is estimated that there are more than 35 000 automatic teller machines (ATMs), 8 000 self-service checkouts, 200 000 gaming machines and over 250 000 vending machines in Australia that will need to be upgraded and reconfigured to ensure that they can accept and dispense the new banknotes. In recognition of this, the Bank began engaging with the banknote equipment manufacturers in 2009, providing test notes with similar security features and designs to those intended for the new banknotes. Technical feedback was sought from the equipment manufacturers on the capabilities of their machines to process the banknotes. This engagement was expanded in 2010 and again in 2011.

To date, more than 90 per cent of manufacturers of self-service checkouts, teller-assist units and ATMs that are known to the Bank have been involved with NGB testing. In addition, key suppliers of banknote processing machines and a provider of validators to the ticketing and gaming industries have also been consulted (Graph 4).

The Bank has presented to over 130 organisations in the past year, and will continue to present NGB project information in person to equipment

manufacturers, banknote equipment users and industry representative associations. In addition to providing background information to the Bank's program, the Bank is encouraging machine users and machine suppliers to engage with each other to develop strategies to ensure their readiness for the new banknote series.

Graph 4
Industry Engagement*



* There was no engagement conducted in 2013
 ** 'High-speed processing' and 'medium-speed processing' manufacturers
 Source: RBA

Logistical preparations

When the Bank last introduced a new banknote series in 1992, it had secure storage and processing facilities in every capital city in Australia and the number of banknotes in circulation was less than half what it is currently. Since then, rationalisation of the Bank's operations and improvements in banknote distribution arrangements have reduced the Bank's secure banknote storage facilities in Australia to three, with just one banknote processing site.

The introduction of the new series of banknotes will, however, require significantly more storage and processing capacity, and the Bank is therefore planning to upgrade its processing and storage facilities over the next few years (Campbell 2014).

There are two parts to this project. First, the Bank is embarking on a program to upgrade the logistics infrastructure at its existing sites. This will result in a substantial improvement in material handling capabilities and a reduction in manual handling. It will also deliver improvements in security and work health and safety. Second, it is proposed that a new purpose-built automated banknote storage and processing facility will be built in Victoria. The National Banknote Site will provide additional storage and processing capacity, and will ensure that the Bank's holdings of banknotes are appropriately and securely stored and managed for many years into the future. Construction of the new site remains subject to Parliamentary approval.

Conclusion

Although counterfeit rates in Australia continue to be very low, a banknote series with ageing security features, combined with the threats faced from improvements in technology and materials, underline the importance of the NGB project as a means to ensure that confidence in Australia's banknotes is preserved. ✎

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Box A

Australian Banknote Security Features

1. Plastic Banknote

Australian banknotes are printed on polymer (plastic), which means they have a distinct feel and it is difficult to start a tear along the edge. A plastic banknote 'scrunched' in the hand should return to its original form.

2. The Clear Window

The clear window should be part of the banknote and the white image printed on the window should not be easily rubbed off. The window should also contain a clear embossed image – a wave pattern on \$10 banknotes, and the value of the banknote on \$20, \$50 and \$100 banknotes.

3. The Coat of Arms

When the banknote is held up to the light, the Australian Coat of Arms should be visible.

4. The Federation Star

Diamond-shaped patterns are printed inside a circle on both sides of the banknote. When the banknote is held up to the light, the patterns should line up perfectly to form the seven-pointed Federation star.

5. The Distinct Feel of the Printing

A special raised ink gives the banknote a distinctive feel.

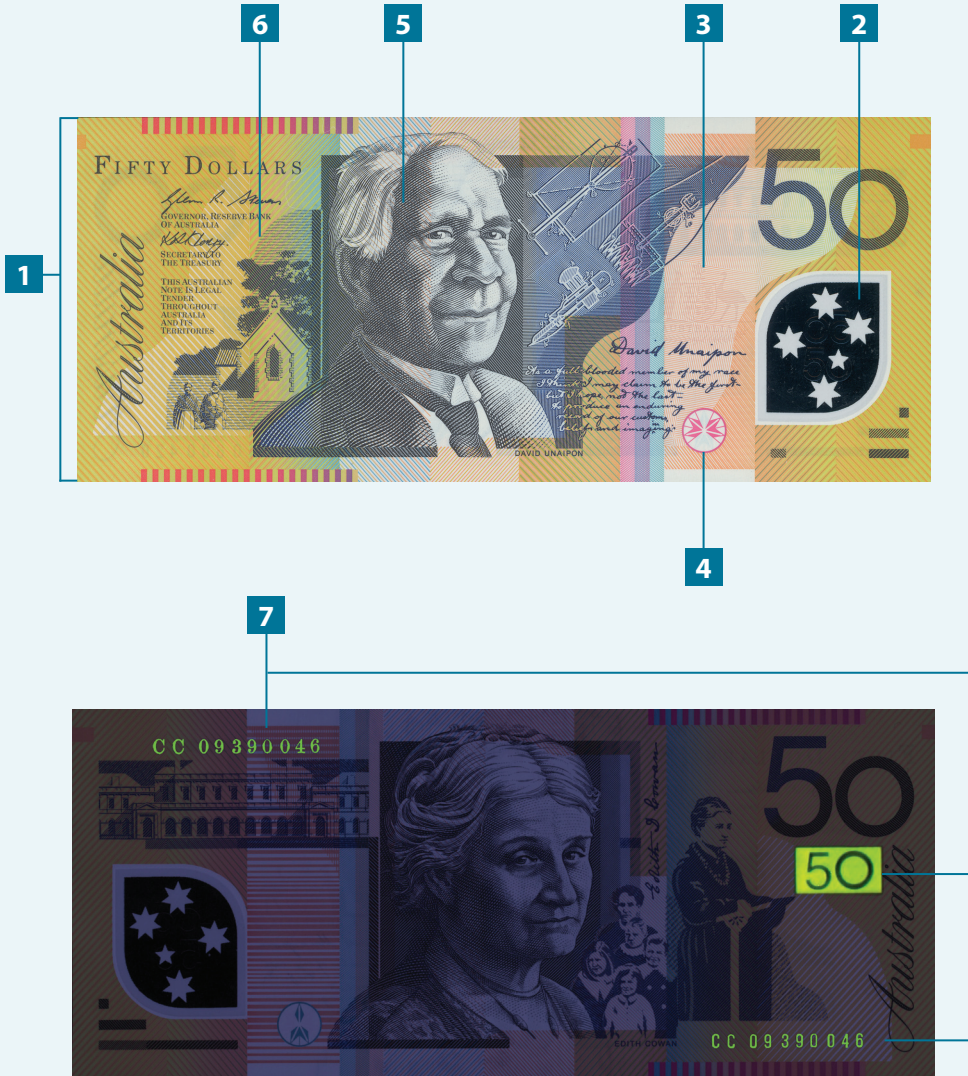
6. Print Quality/Microprinting

The background printing should be sharp. In particular, microprinted text should be clearly visible under a magnifying glass.

7. Fluorescent Properties

With the exception of the serial numbers and designated UV patches, the banknote should not fluoresce under a UV light.

Additional information about the security features on Australian banknotes can be found at banknotes.rba.gov.au/securityfeatures.html. 🗨



Source: Reproduced from Cowling (2011, pp 68–69)

Box B

The Banknote Production Process

There are many stages to the production of a banknote.

1. *Opacifying.* Starting with sheets of a specially manufactured clear polymer (plastic) film, a layer of ink called gravure is applied. This helps other inks adhere to the polymer. At this stage, the clear window, vignette (white pattern within the clear window) and shadow image of the Australian coat of arms are also formed.
2. *Offset printing.* Sheets are then processed through an offset printing press that applies coloured inks to both sides of the sheets simultaneously. This way, the images on both sides of the banknote are aligned. This process allows the production of one of the key security features on Australia's banknotes – the see-through registration device. When the banknote is held up to the light, diamond-shaped patterns printed on each side of the banknote combine to form an image of the seven-pointed Federation star inside a circle.
3. *Intaglio printing.* Raised printing called intaglio is then applied. The portraits, the numerals and some key images on the banknotes are printed using this process. Intaglio gives the banknotes their distinctive feel. Two important security features are also applied at this stage. One is the microprint, which is very small text that appears in various places on different banknotes and cannot be read by most people without the aid of a magnifying glass. The other is the embossed feature that is applied to the clear window of all banknotes except the \$5 denomination.
4. *Numbering.* Unique serial numbers are then printed onto the banknotes using ink that fluoresces under UV light.
5. *Overcoating.* Before banknote sheets are cut into separate banknotes, a protective coating is applied for durability and to help the banknotes remain clean. A fluorescent patch is also incorporated at this stage.
6. *Final banknotes.* Individual banknotes are checked to make sure they were printed without error. The banknotes are then wrapped and packed ready for issue into circulation. ✖

