

# Polymer bank notes – the New Zealand experience

Brian Lang, Head of Currency and Building Services

In May 1999 the Reserve Bank issued its first polymer bank notes into circulation. By March 2000 all denominations had been converted from paper to polymer. By the end of 2001 approximately 110 million polymer notes had been issued into circulation. This article assesses the performance of polymer notes compared with our expectations at the time they were introduced.<sup>1</sup>

## 1 Introduction

When the Reserve Bank introduced polymer notes, in May 1999, it indicated that polymer notes have a number of advantages relative to paper currency. In particular, it noted that polymer notes have security features that reduce the risk of counterfeit, are more durable than paper notes and more cost effective. Now that polymer notes have been in circulation for some time, it is timely to assess whether they have lived up to the Bank's expectations of them. This article discusses the performance of polymer notes, taking into account their security features, durability and cost. It also discusses recent developments in the Bank's currency processing operations.

## 2 The benefits of polymer notes

### Security

The risk of counterfeiting a nation's currency is always a potential concern for a central bank and motivates the need for currency to be designed with security features to minimise the risk of counterfeit. With the advent of desktop publishing software and colour printers, the technology to make reasonably accurate copies of bank notes is available to a much wider section of the population than was once the case.

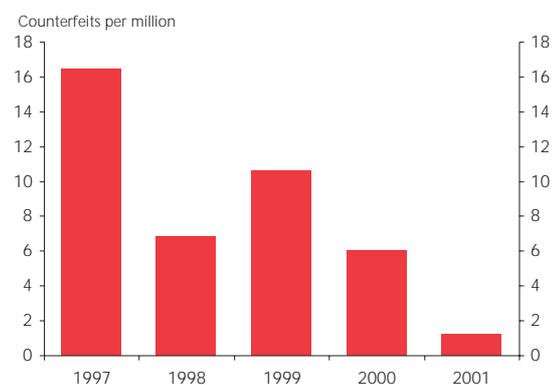
One of the prime motivations for the Bank's change to polymer notes was to take advantage of new technology to enhance the security features of notes, including the use of a transparent part of a note, known as a 'window'. Our new

bank notes have two clear windows which are designed to be easily seen by the general public without the need to hold the note up to the light. This is important, because in this country, the holding of a note to the light can be considered insulting in some circumstances. The clear areas also retain their effectiveness regardless of wear and tear on the note, unlike some of the security features used in paper notes.

The polymer substrate itself also provides a barrier to forgery, as it is difficult to produce a copy on plastic. Attempts to date at counterfeiting the polymer note design in New Zealand have all been produced on ordinary paper.

There has been a very significant reduction in counterfeits detected by the processing machines at the Bank since the introduction of polymer notes. In calendar year 2001, the number of detected forgeries totaled 114, compared with 501 in 2000, 758 in 1999, and 1,100 in 1997. Figure 1 illustrates the trend:

Figure 1  
Counterfeits detected  
(per million notes in circulation)



<sup>1</sup> See *Reserve Bank of New Zealand Bulletin* (1999), vol 62, no 2.

Table 1  
Total number of notes destroyed as a percentage of notes in circulation

	\$5	\$10	\$20	\$50	\$100
Paper notes 1998	65.8	103.3	52.3	26.0	17.1
Polymer notes 2001	5.1	6.4	5.1	1.7	1.3

Most of the forgeries detected in recent times have been of the former paper note design. Attempts to counterfeit the polymer design have been negligible. In recent years the note most often counterfeited was the high usage \$20 denomination. In 1998, when all notes in circulation were of paper, 61 per cent of all detected forgeries were \$20 notes. There was a dramatic shift in 1999 after the introduction of the polymer \$20 note, with forgeries of this denomination declining to only around 3 per cent of the total detected in 2000.

The New Zealand Police have also seen a decline in reported forgeries. The trends in the reporting of counterfeit notes to the Police follow very closely the trends experienced by the Bank. Between September last year and January this year the Police saw only two counterfeit notes - one a paper simulation of a polymer \$100 note (with just one fake window), and the other a paper \$50 note. In January this year, the Bank machine-processed 10 million notes (one tenth of the total in circulation) and discovered only one paper forgery and no polymer-based forgeries.

The Reserve Bank of Australia has also seen similar reductions in counterfeit notes since the introduction of polymer notes in Australia in 1992. Most counterfeits detected in Australia are for the most part low grade, on a paper substrate that could easily be identified by the different feel compared with a genuine note. Only a very small number of counterfeits have been printed on a plastic material.<sup>2</sup>

## Durability

Early indications suggest that the polymer notes are living up to the expectations the Bank had of them in terms of their durability. Fewer polymer notes need to be destroyed

than was the case with paper notes, and the estimated life of a polymer note is considerably longer than in the case of paper currency.

The Reserve Bank maintains sophisticated processing machines at its site in Wellington. All notes returned to the Bank are processed through these machines. The numbers of notes destroyed as 'unfit' for circulation in 2001 (when most notes in circulation were polymer) for each denomination when compared with calendar 1998 (when all notes were paper), as a percentage of total notes in circulation, are set out in table 1.

While it is still early days in assessing the likely life of polymer notes in New Zealand, we can get some indication by analysing the figures for the \$20 note. This note is the most popular in New Zealand, making up 52 per cent of all notes on issue by volume, and is the default denomination in virtually all ATM machines. The polymer \$20 note has been in circulation since May 1999 (31 months to date), with relatively few notes needing to be replaced. The average life of a paper \$20 note was just under 24 months. On current indications, the polymer \$20 note will last about 20 years. However, it is not expected that, in reality, the notes will last that long. Nevertheless, we will achieve significantly longer life with polymer notes than with the paper version.

Overall, we have seen little physical damage to polymer notes in circulation, apart from the \$5 note, which is showing some signs of ink wear damage. As is the case in a number of countries, this is probably due to the tendency for the \$5 notes to be kept with coins in a purse or pocket. Also, they are inclined to remain in circulation for long periods, as retailers use them as part of their cash 'float' and do not bank them on a regular basis. This increases the wear and tear on \$5 notes compared with the higher denomination currency.

<sup>2</sup> See the Reserve Bank of Australia Annual Report 2001, page 46.

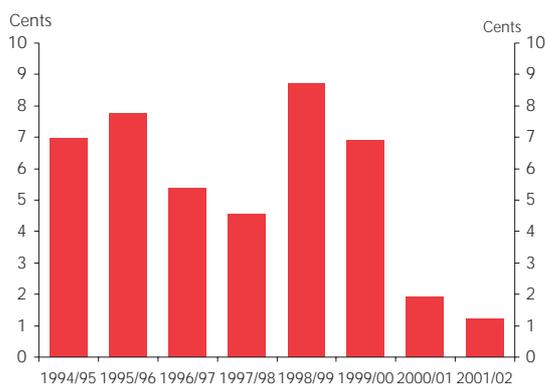
Feedback from the users of currency also suggests that polymer notes are proving to be more durable than paper notes. For example, a survey of public opinion taken in November 2000,<sup>3</sup> showed that 93 per cent of the public and 100 per cent of retailers agreed that polymer notes retain their quality longer than paper notes.

### Cost effectiveness

In changing to polymer notes the Bank expected to make some cost savings. The longer life of polymer notes was expected to offset the higher production costs over a relatively short period.

Figure 2 shows the trend in the issue of currency cost (production, transportation and local taxes), divided by the average number of notes in circulation over recent years. The figures show that the annual cost per paper note in circulation declined between 1994/95 and 1997/98, when the Bank reaped the benefits of lower production costs due to competitive tendering. In 1998/99 and 1999/00 the unit cost was influenced by Year 2000 contingencies and the issue of new polymer notes to replace all existing paper notes. In 2000/01 and 2001/02 to date, the longer life of polymer notes is reflected in the very significant drop in the unit cost per note in circulation.

**Figure 2**  
Unit issue cost per note in circulation



Actual note issue expenses averaged \$3.8 million in the years 1995/96 to 1997/98, compared with \$1.9 million in the financial year 2000/01 and an estimated \$1.3 million for

<sup>3</sup> The full survey results can be found on the Bank's internet site:

<http://www.rbnz.govt.nz/news/2000/0099099.html>

2001/02. Thus, the additional cost of approximately \$6 million for the change-over to polymer notes is expected to be recouped within three years. The issue cost per note in circulation has decreased by 58 per cent between 1997/98 (when all notes issued were paper) and 2000/01 (when all notes issued were polymer).

The significant reduction in notes detected as unfit for circulation is also providing some cost savings in the destruction of notes.

### Functionality

For the change from paper to polymer notes in New Zealand, we continued with the same basic design, colour and size of the existing paper notes and had few problems during the transition. The polymer notes were well received by people working in the banking and cash handling industry and there has been a very positive response to the new technology from the public. Because we retained the same size notes, the country's entire ATM network was converted to dispense the polymer notes in a very short period (about a month), as the change-over only required a software adjustment, which was completed by branch staff in most banks.

Experience to date by one of the main ATM servicing companies has seen an average decline of 50 per cent in fault call-outs. With paper notes the average was approximately 5 call-outs per ATM each month. With polymer notes the number of call-outs is averaging just 2.5 per ATM per month.

The Bank's own processing machines have coped with the change to polymer very well. A relatively simple and inexpensive software upgrade enabled our machines to identify paper notes for destruction and to band polymer notes ready for re-issue. The same machine-readable covert features that were incorporated in the paper notes were successfully implanted into our polymer design.

Much had been made of the fact that the handling differences of polymer would cause difficulties for bank tellers, money handlers and the public. However, this did not eventuate, and people appeared to adapt to the slight differences very quickly. The November 2000 survey showed that, although more than half of the general public and retailers thought that polymer notes were more difficult to

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handle than paper, 77 per cent of the public and 80 per cent of retailers still gave positive ratings for ease of handling of the new notes.

### Environmental considerations

Polymer notes are more environmentally friendly than paper notes because the polymer substrate is less polluting than paper and the waste polymer can be recycled into useful products rather than being disposed of. With the very low numbers of unfit polymer notes being returned to the Bank, most waste still takes the form of old paper notes. Therefore, it has not been possible as yet to accumulate enough waste polymer to interest recycling companies.

The November 2000 survey revealed that 90 per cent of the public and 100 per cent of retailers consider that polymer notes are cleaner than paper.

## 3 Implications for note processing

Most central banks are heavily involved in the cash distribution process. Depending on the customer base of commercial banks, some banks finish the working day with excess stocks of cash, while others have a deficiency of cash. The excess cash is deposited at the central bank, where it is processed by machines and then re-issued on demand. The machines check that the notes are genuine and fit for re-issue.

Providing facilities, such as branch offices, machinery and staff (including security), in order to process bank notes is very expensive for a central bank. The introduction of polymer notes provided us with a catalyst to review our role, as the new notes were expected to be harder to counterfeit and would retain their quality much longer than paper notes.

An examination of cash flows between commercial banks and the Bank revealed that the maximum net flow on any particular day, apart from around the peak retail periods of Christmas and Easter, was never greater than 10 per cent of the total cash holdings of all commercial banks. In calendar year 1998 (when Year 2000 contingencies or changes in note design did not influence cash flows), we received 540 million

notes from banks and issued 544 million to them. There were only 66 million notes in circulation in New Zealand at any time during that year. Therefore, on average, each note was processed by the Bank over eight times.

Because we provided this convenient service to banks there was little incentive on the banking industry to seek efficiencies. Some bank branches even returned to the Bank and ordered from the Bank the same denomination notes on the same working day, apparently regardless of the costs and risks of transportation. There was also little or no attempt by the banks to buy or sell notes between themselves.

During 2000 we initiated a change of role from retail processor and distributor of notes to mainly wholesale supplier. We provide an avenue for the return of unfit notes (including old paper notes) and facilitate the issue and return of notes at the seasonal peak times of Christmas and Easter.

We have also provided some direct funding support to banks in compensation for their need to hold more cash while they adjust to our new procedures. Initially we considered introducing a 'notes held to order' system which involves the central bank retaining ownership of excess notes deposited into secure cash centres owned by the commercial banks. However, this is considered to be a cumbersome and potentially risky way of financing excess stocks.

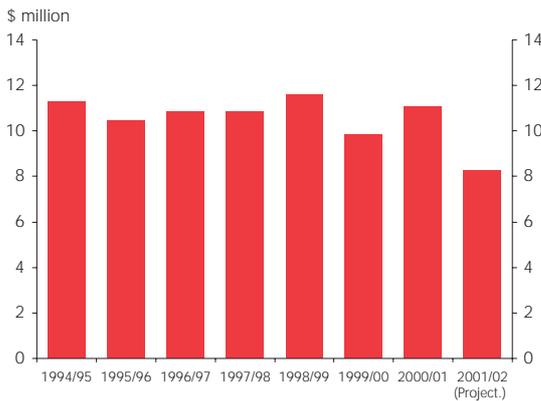
We agreed to finance 10 per cent of the total value of banks' cash holdings by way of a compensatory interest payment. This involves the banks advising us of their daily cash balances each month, with the compensatory payment being based on the OCR rate prevailing at the time. The compensatory payment to the banks totaled \$2.9 million in 2000/01 and a projected \$3.1 million in 2001/02. Of course this is the gross amount of the payments; the net effect is zero because the bank gains seigniorage income from the higher note holdings of the commercial banks.

The changes in our note processing procedures will provide significant cost savings for the Bank. Our two branch offices have closed and we now operate only out of Wellington, with reduced staffing levels. Reflecting this, currency operating expenses (excluding new note and coin issues), is expected to fall from an average of around \$11 million per annum in recent years to a projected \$8.3 million (which

includes the compensatory payment) in the current financial year to June 2002.

Figure 3 illustrates the recent downward trend in currency operating expenses (excluding note and coin issue, but including the compensatory payment):

**Figure 3**  
**Currency operating expenses**



If the reduced cost of note issue and the change to wholesale supplier are combined, the Bank's unit cost per note in circulation has declined by 53 per cent, from 20.7 cents per note in 1997/98 to a projected 9.7 cents per note in the year to June 2002.

The withdrawal of the Reserve Bank from the daily distribution cycle has resulted in higher cash balances for the commercial banks as they come to grips with the change. However, it is believed that the banks now accept that the management of cash should be a market-driven issue. They are taking initiatives to improve the efficiency of cash distribution throughout the country.

### The future

In August 2000, the Bank issued a limited number of a special commemorative \$10 bank notes into circulation. The key objective was to test some new design and security features that had been specifically developed for the polymer substrate. A survey of public opinion found that, although 60 per cent of respondents indicated a preference or strong preference for the new note over the normal note, the special security features were less well known.

It is unlikely that the Bank will consider a design or denomination change to our current bank note series within the near future.

However, we monitor developments in currency security features in other countries and will continue to assess, on an ongoing basis, whether further security enhancements to New Zealand currency should be made.

## 4 Conclusion

For the Bank, the key advantages for New Zealand in issuing polymer notes are now apparent. Lower issue costs, a significant reduction in forgeries and a very positive public reaction to the 'cleaner' note indicate that the shift to polymer notes has been beneficial. The notes are also proving to be very efficient in processing through all types of machines.

To date, the introduction of polymer notes has had no significant negative implications. Reflecting this, the November 2000 opinion survey showed that 74 per cent of the general public and 90 per cent of retailers prefer or strongly prefer polymer notes over paper. We can therefore regard the introduction of polymer notes as a success.