

# Currency trends and developments

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*This article outlines changes to New Zealand's currency structure (ie both notes and coins), since the introduction of decimal currency in 1967. It is then shown how a mathematical model (the D-Metric Model) can be used to explain recent changes to our currency structure and to predict how and when further changes should occur.*

*The article also looks at the rise of alternative means of payment to cash, from the traditional cheque clearing facilities to the highly elaborate electronic fund transfer cards now being used.*

## Introduction

Historically, currency in the form of banknotes and coins has been the main means of payment in society. Up until midway through the last century, all financial transactions in New Zealand were carried out using cash. Then came the introduction of cheque clearing facilities and much more recently the advent of automatic payments, credit cards and electronic fund transfer cards. Despite the presence of new technology, cash remains the primary means of carrying out financial transactions. Overseas statistics reveal that in developed countries, approximately 70% of all transactions by volume are paid for in cash.<sup>1</sup> While detailed statistics of this kind are not available for New Zealand, we have no reason to believe that these percentages would vary significantly in our own country.

## I. Recent currency developments

Since the introduction of decimal currency in 1967, New Zealanders have used a combination of notes and coins which has changed very little. Decimal currency took the form of a six coin, six note scenario with 1c, 2c, 5c, 10c, 20c and 50c coins and \$1, \$2, \$5, \$10, \$20 and \$100 notes. This denomination combination lasted until 1983 when it was deemed necessary to introduce a \$50 note denomination. Further adjustments to the currency structure occurred in 1990 when the one and two cent coins were demonetised and in 1991 when the one and two dollar notes were withdrawn from circulation and replaced with coins of the same value.

The \$50 note was introduced to fill a sizeable gap in the note series between the \$20 and \$100 denominations, with the advent of double digit inflation in the 1970s creating more demand for a second higher denomination banknote.

<sup>1</sup> In developing countries this percentage is closer to 90%, partly due to a lack of computer technology to develop more advanced payment mechanisms.

Inflationary effects were also the reason for the demise of the one and two cent coins, which had become practically worthless by this stage. The one and two dollar coins were introduced for cost-effectiveness reasons, with the new coins only marginally more expensive than the notes they replaced and expected to last in excess of twenty years, in sharp contrast to the short life expectancy of the notes (in most cases less than six months).

## II. Predicting currency trends

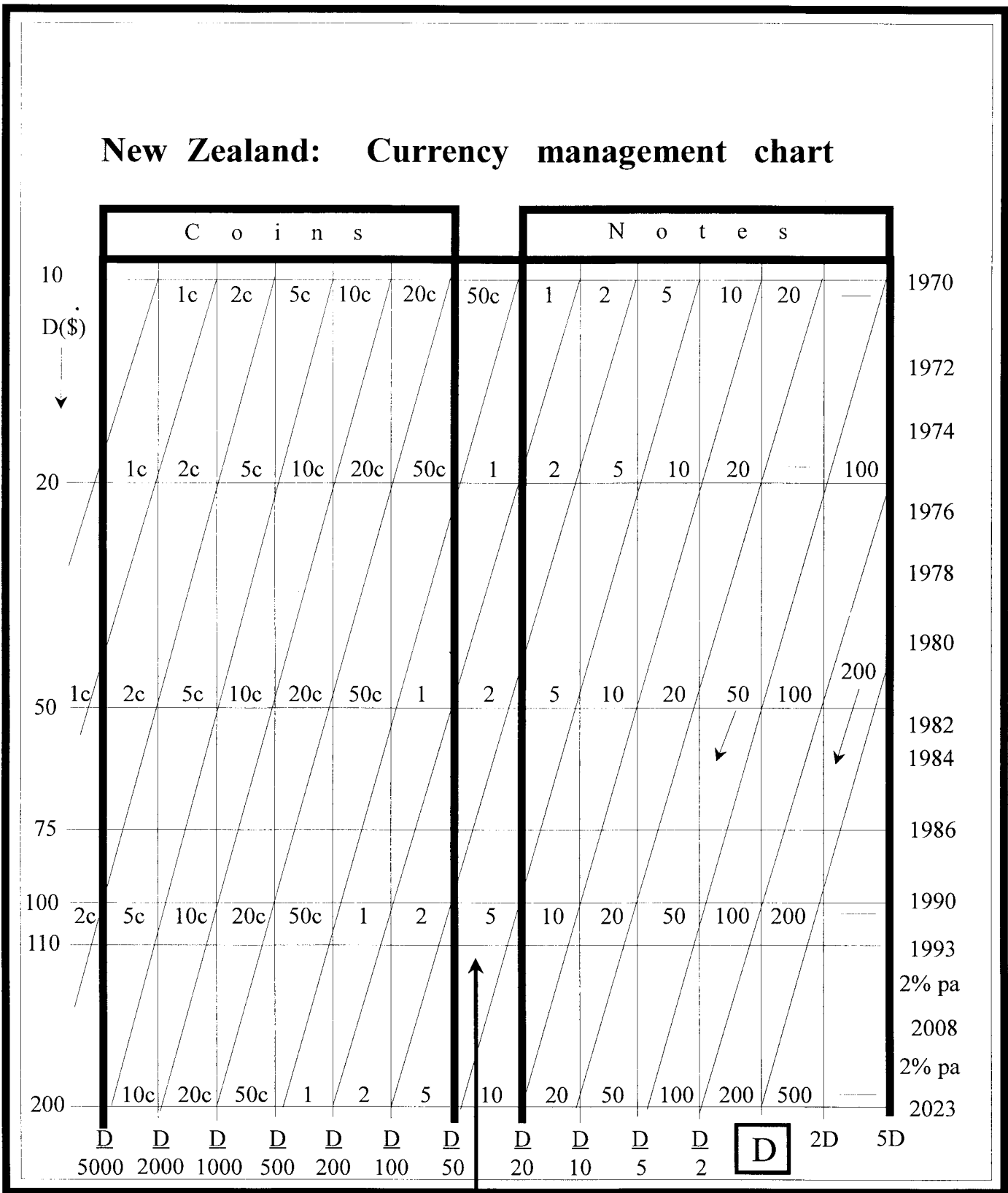
Traditionally, management of the currency denominational structure (ie the optimum combination of notes and coins to best serve the community), has tended to be an ad-hoc process, because there has never existed any coherent rationale of currency structure.

With the advent of the D-Metric methodology in the late 1980s this has changed. Dr L C Payne of Thomas De La Rue and Company developed the D-Metric system following years of research into currency statistics, supplied by over sixty issuing authorities throughout the world.

The concept relates the average daily wage level (this is D in Figure 1) to the denominations of currency and proceeds to monitor the progression of inflation erosion, to demonstrate a fall-out point for particular coins at the lower scale, the "cross-over" points for converting notes to coins of equivalent value, and the timing for the introduction of higher denomination banknotes at the top end of the scale.

Analysis of the denominational structures of a wide range of countries and the average wage prevailing in these countries, reveals a remarkably consistent pattern between the average day's pay (D) and denominational structure. It was found that the top note denomination in most countries is around 5 D, the boundary between notes and coins is between D/50 and D/20 and the lowest useful coin is around D/5000.

Figure 1



Source: THOMAS DE LA RUE AND CO LTD

note - coin boundary

**D** = average day's pay

closely with this concept. While our top note denomination was \$100 (higher than the conventional 5 D), the split between notes and coins fell within the calculated parameters, whilst our lowest coin was one cent.

As we move through the years to 1982 the average daily wage had increased to \$50. As shown in Figure 1 the \$50 bill was introduced, while the \$1 and \$2 notes began to drift from the note boundary into the coin boundary. The one cent coin by this stage could have been abandoned as it falls off the chart.

In Figure 1, the vertical columns for each denomination are adjusted diagonally in line with the rate of increase of D. The diagonal lines show the steady decline of all note and coin denominations over time towards lower purchasing-power units. To set the diagonal, a point on the right hand side of the \$10 column (for example) in 1970, is connected by a straight line to the right hand side of the "original" \$2 column in 1982. All other diagonals are drawn parallel to this line. If we look at the diagonal line which starts at the right hand side of the 5 cent column in 1970 we can see that in 1982 it lies to the right hand side of the "original" 1 cent column, which confirms the consistency of this approach.

As we move through the years, the average daily wage reached \$100 in 1990, while projecting further forward using an estimated annual increase in the average daily wage of 2.0% it is not anticipated that the average daily wage will reach \$200 until the year 2023.<sup>2</sup> By this stage Payne's model predicts the lowest coin denomination will be the 10 cent coin, the \$5 denomination will be coined and two new high value denomination banknotes will be introduced, the \$200 and \$500 notes.

Fortunately, the New Zealand economy is firmly entrenched in a low inflationary environment. If this were not the case and an estimated annual increase rate of say 6.0% in daily wage rates was forecast then we can see that the \$200 average daily wage would be reached by approximately 2003. This would result in earlier adjustments to our currency structure and additional cost to the Bank and hence to the country as a whole, as the Reserve Bank's surplus accrues to the Crown. Consequently with a lower anticipated annual increase in the average daily wage (ie 2%), it is possible to maintain a stable currency structure for longer, surely one of the great unheralded indirect cost savings of living in a low inflationary environment.

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<sup>2</sup> It should be stressed that this is not the Reserve Bank's long term forecast of nominal wage inflation but a simple illustration. With productivity continuing to increase at 1.5 -2% p.a. and inflation between zero and 2.0% p.a. at present, it is probably slightly conservative.

#### IV. Features of the current currency in circulation

Undoubtedly the main feature of New Zealand's current circulating currency is the newly introduced designs and security features on the banknotes. This project began in 1991 when overseas banknote printers were invited to tender for our banknote contract. The contract was awarded to Thomas De La Rue and Company Limited, with the average unit cost of the new notes being one third less than what we paid previously. A feature of the contract was that the Reserve Bank retained control of the working tools (eg engraved dies, plates etc...) for the new notes which traditionally were owned by the supplier. Ownership of the working tools enables us to transfer the tools to a third party at the conclusion of the contract, if desired. In this manner it is possible to go out to tender more frequently to ensure a competitive price is being obtained.

The new series of banknotes was introduced progressively through 1992 and 1993, with the \$5 note, (featuring Sir Edmund Hillary), being the first note released on 10 July 1992, the 25th anniversary of the introduction of decimal currency in New Zealand. It was followed by the release of the new \$20 note (featuring Her Majesty, Queen Elizabeth II) on 1 September. The new \$50 (featuring Sir Apirana Ngata) and \$100 (featuring Lord Ernest Rutherford) notes were issued on 3 November 1992. The final note in the series, the \$10 note, became legal tender on 18 May 1993, during the centennial year of women's suffrage in New Zealand. Our choice of the portrait of Kate Sheppard for the \$10 note was, therefore, very appropriate. The change-over to the new banknotes proceeded smoothly with the notes being generally well accepted by the public. We have however, received some complaints in relation to the durability of the new \$5 note. This note is now the lowest denomination banknote and as such is handled in much the same casual manner as the old \$1 and \$2 notes were (eg often folded in amongst coins in pockets as opposed to being placed neatly away in a wallet, as is the case with higher denomination banknotes). It is also more difficult for us to withdraw \$5 notes from circulation, as they are returned less frequently to banks by retail outlets, instead being used by retailers to provide change. In an effort to increase the notes' durability, this note is now printed on slightly stronger paper, while we are also investigating the option of having this note printed on alternative substrates (eg plastic).

Figures 2 to 5 show notes and coin in circulation, broken down by denomination. The make up of these quantities being determined by demand from the public, not by the Reserve Bank. It is clear from Figure 3 that the \$20 denomination is the most widely used circulating note, while

Figure 2

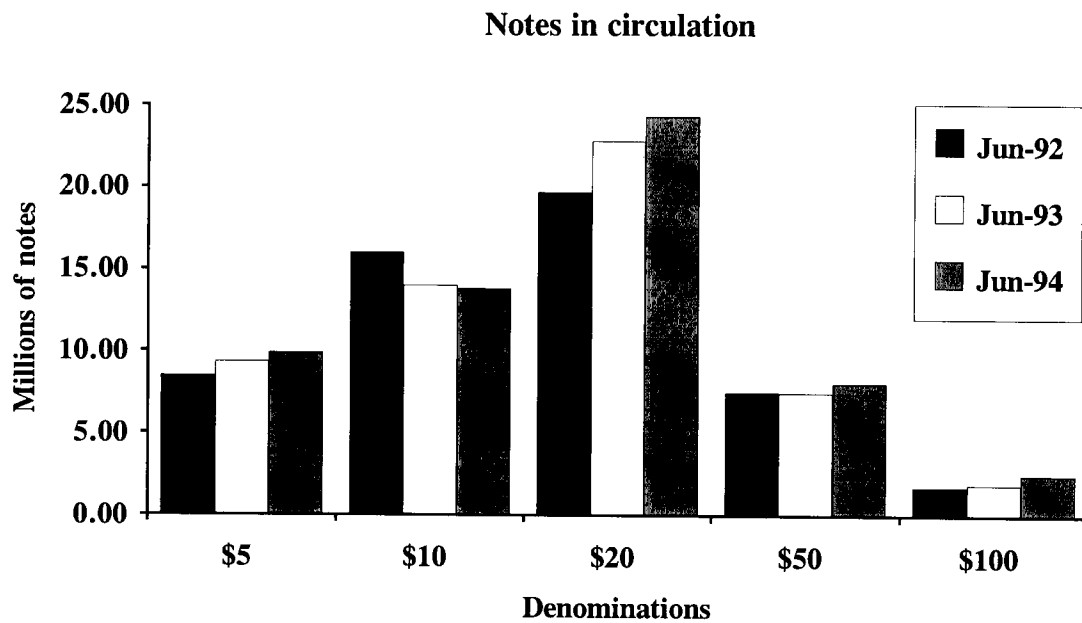


Figure 3

**Denomination breakdown of notes in circulation by volume, 30 June 1994**

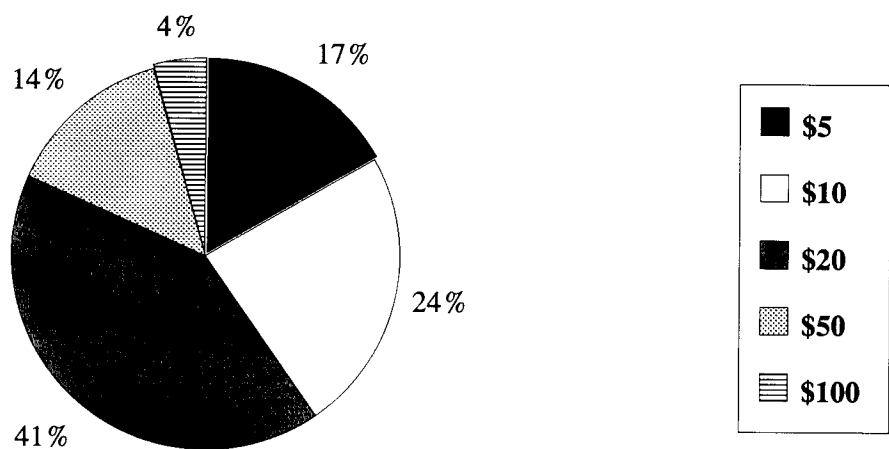


Figure 2 reveals that use of the \$10 note has declined in the last 3 years. The growth in usage of the \$20 note over the years is linked with the increased usage by the public of automatic teller machines (ATMs), which dispense mainly \$20 notes.

Figure 3 also reveals relatively little demand for the highest value denomination, the \$100 note. Analysis of Payne's model would suggest that a \$200 note is required in the New Zealand economy, however while Figure 2 shows demand for the \$100 note is on the increase, it is hard to justify inclusion of the extra note denomination at this stage.<sup>3</sup>

Figure 4 reveals increased usage of 5 cent coins, which is attributable primarily to the demonetisation of the one and two cent coins. This increase was anticipated, with overseas central bank authorities who had previously demonetised low value coin, forewarning us that there would be an increase in demand for the "new" lowest denomination coin (i.e. the 5 cent coin). While Figure 4 also shows vast quantities of 5 cent coin in circulation compared with

<sup>3</sup> Traditionally, New Zealanders are not big users of high denomination banknotes (unlike their Asian and European counterparts), preferring to use cheques and credit cards for higher value payments.

Figure 4

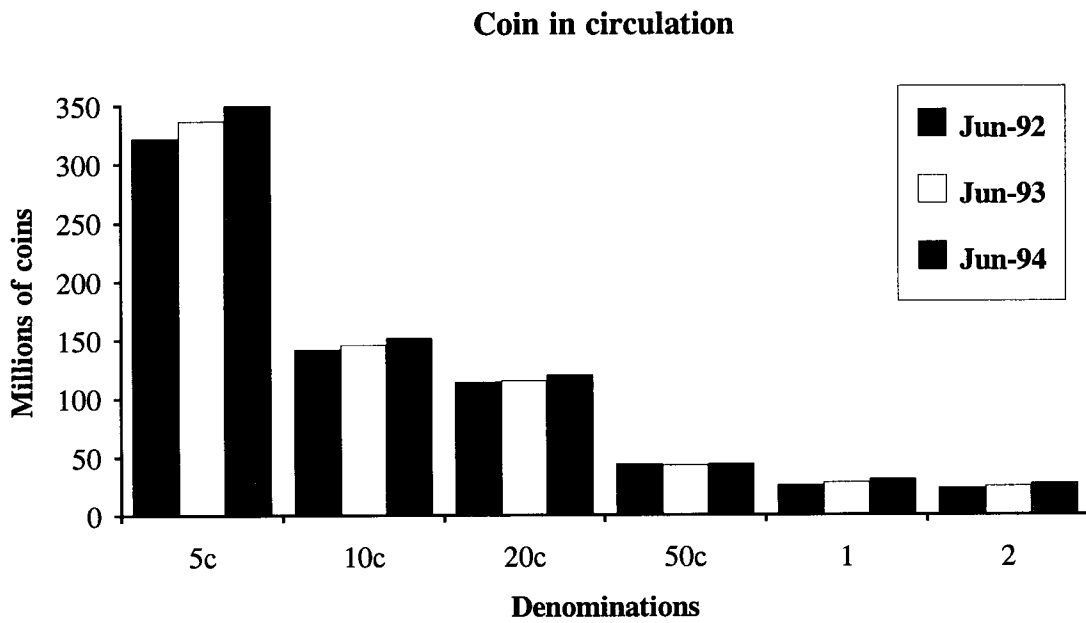
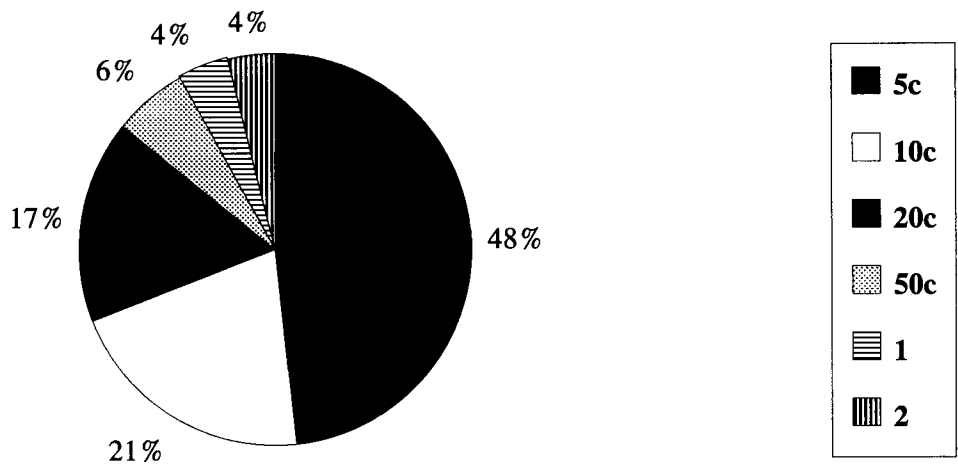


Figure 5

**Denomination breakdown of coin in circulation by volume, 30 June 1994**



the other coin denominations, it should be noted that many of these coins are in reality either temporarily or permanently “lost to the system”, either being hoarded in money jars or having gone astray (eg down the side of chairs or down drains).

Figures 2 and 4 show growth in note and coin in circulation by volume for all denominations in the year to 30 June 1994 except the \$10 denomination. In dollar terms currency in circulation has risen from \$1.3 billion at 30 June 1992 to \$1.36 billion at 30 June 1993 and more dramatically to \$1.49 billion at 30 June 1994. This growth is attributable to increases in retail activity due to the rela-

tively buoyant state of the economy. With economic growth in the year to June 1994 of 6.0% and predicted to stay between 3.0% and 4.0% in the next couple of years, we believe a further increase in currency in circulation figures is inevitable.

#### IV. Rise of alternative means of payments

As mentioned earlier, approximately 70% of financial transactions by volume are paid for in cash. However,

Table 1

## Financial payments by type

Year	Cheques		Automatic Payments		Credit Cards		Electronic Fund Transfer Cards		Total	
	No. of Items (m)	%	No. of Items (m)	%	No. of Items (m)	%	No. of Items (m)	%	No. of Items (m)	%
1992	395.0	64.1	136.0	22.1	31.0	5.0	54.0	8.8	616.0	100
1993	377.2	53.5	197.4	28.0	38.8	5.5	91.6	13.0	705.0	100

Source: New Zealand Bankers' Association Annual Banknotes Publication

these cash transactions account for only about 30% of the value of financial transactions. This is because most cash transactions are for goods and services with small dollar values. It is estimated that over 90% of all cash transactions in New Zealand are for less than \$10.

The remaining 70% of financial transactions by value (and 30% by volume) are split between cheques, automatic payments, credit cards and electronic fund transfer cards, as shown in Table 1:

The New Zealand Bankers Association have only been recording financial payments data in this format for the last two years. While we have to be wary of making too many assumptions on the basis of two years of historical data, there remain some observations that can be made.

Although the statistics in Table 1 show a decrease in the use of cheques as a payment medium in favour of electronic transfers, New Zealanders are still among the highest users of cheques in the world, writing about 108 cheques per person per year.

The next most popular form of payment is automatic payments into and out of bank accounts, with the majority of income earners now being paid their salaries in this manner. Together with increased use of automatic payments from bank accounts to pay for regular expenses like insurance, power bills, rates, etc, it is easy to comprehend the increase in this form of payment mechanism.

Table 1 also reveals a strong increase in the use of electronic fund transfer cards. The principal cards used being EFTPOS (electronic fund transfers at the point of sale)

cards and ATM (automatic teller machine) cards. While the majority of cash transactions in the community are for less than \$10, electronic fund transfer cards transaction average \$67 each while credit card transactions average \$100 each.

The increase in the use of electronic fund transfer cards is expected to continue with the development of pre-paid cards expected to fuel the rise. To-date most of these pre-paid cards have been pretty narrowly restricted in terms of what they can be used for (e.g. Telecom phone cards). However, it is inevitable that as these cards evolve, they will be able to be used for a variety of purposes and will play a greater role in future payment systems<sup>4</sup>.

## V. Conclusion

Despite the presence of a low inflation environment and the "bedding-in" of a new series of banknotes, the future direction for currency remains as variable now as it has ever been. The speed of technological change (e.g. the emergence of plastic technology for banknote printing and the proliferation of pre-paid cards), makes it necessary to keep ourselves well informed of latest developments in the currency arena both locally and internationally. Careful and informed currency management and forecasting remains an essential requirement for a central bank in today's rapidly changing environment.

<sup>4</sup> Further information on the development of pre-paid cards is available in the article by P. Ledingham in this edition of the *Bulletin*.