

Trends in foreign exchange trading

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In this article, Lauren Rosborough discusses how global and domestic foreign exchange markets have changed in recent years. These trends are illustrated using the latest Bank for International Settlements triennial foreign exchange and derivatives market survey and other indicators of foreign exchange market liquidity. The size and structure of the New Zealand foreign exchange market has altered in recent years. Trading in the New Zealand dollar now occurs predominately in Australia. There is some evidence to suggest that New Zealand dollar spot market liquidity has fallen but the New Zealand dollar remains quite liquid considering the small size of the New Zealand economy.

1 Introduction

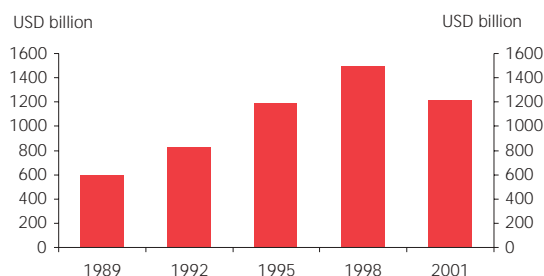
Over recent years the structure of the global foreign exchange market has altered significantly, reflecting a number of events such as the introduction of the common currency in Europe and changes in the way that market participants have chosen to manage their foreign exchange exposures. Significant changes have also occurred in the New Zealand dollar and the way that it is traded. A particularly important development has been the tendency of banks to shift their wholesale trading operations to Australia. Market participants and commentators have also noted that the New Zealand dollar seems less active and liquid than it has been in the past. An often-cited factor for the decline in activity has been a generally reduced presence of offshore investors in New Zealand's most actively traded asset markets and hence in the New Zealand dollar. The recent release of the latest BIS global survey of global foreign exchange market turnover provides a good opportunity to explore some of these issues.

The article proceeds as follows. Section two describes and explains recent changes in the structure of the global foreign exchange market and shows how trends in the structure of the New Zealand market fit into that context. Section three looks into trends in the domestic market more closely. Section four introduces the concept of foreign exchange market liquidity and examines the evidence there is to hand on the liquidity of the New Zealand dollar. Section five concludes the article and summarises the main findings.

2 Global trends in foreign exchange markets

During April 2001, 48 countries participated in the Bank for International Settlements' (BIS) triennial central bank survey of foreign exchange and derivatives market activity.² Each central bank reports to the BIS on a number of aspects of the trading activities occurring in their own countries. The BIS then aggregates the results. Many central banks also release their national results.

Figure 1
Global foreign exchange market turnover
(daily averages for April of each year)



The size of foreign exchange markets

Total global foreign exchange activity was USD 1, 210 billion on average per day in April 2001 – a fall of 19 per cent between 1998 and 2001.³ While the decline in traded volumes is large, it comes after a decade of significant growth (see chart above). Over half (56 per cent) of global foreign exchange turnover occurred in the United Kingdom, the

¹ The author would like to thank Kelly Eckhold and Michael Reddell for their significant contributions to this paper.

² Bank for International Settlements, Central bank survey of foreign exchange and derivatives market activity in April 2001: preliminary global data, 9 October 2001, www.bis.org/publ/rpfx01.htm. A more detailed report from the BIS will be available in 2002.

³ At constant exchange rates, this fall was 14 per cent.

Table 1
Global foreign exchange market turnover in April 2001
Average daily turnover by country for the five largest markets

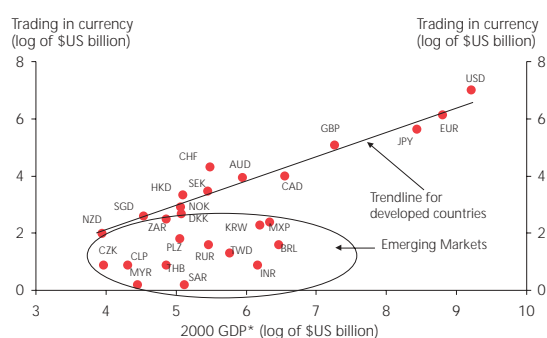
Ranking 2001	Ranking 1998	Country	USD billion	%
1	1	United Kingdom	504	31.1
2	2	United States	252	15.7
3	4	Japan	147	9.1
4	3	Singapore	101	6.2
5	5	Germany	88	5.4

United States and Japan (with London the pre-eminent global centre for foreign exchange trading) – see table 1. Since the first BIS survey in 1989, these three countries have usually been the three largest trading centres, traditionally capturing around 55 per cent of global turnover. While the proportion of total turnover that occurred in these main markets held steady during 2001 relative to 1998, there have been some interesting changes in the shares of the individual markets and in the shares of many other smaller markets. Box 1 (at the end of section 2) discusses this issue and shows that there has been a tendency for trading to gravitate towards regional hubs, which has resulted in some trading centres gaining significant market share at the expense of others.

Perhaps more interesting is which currencies are traded. As figure 2 illustrates, it is no surprise that larger economies typically have more heavily traded currencies. New Zealand seems to fit well in the mainstream group of developed economies, which includes, for example, Singapore, Australia, Norway, Canada and the UK. The currencies of a group of emerging markets (for example, Russia, Poland, Thailand and the Czech republic) tend to be less actively traded as compared to the size of their economies. Trading volumes in the New Zealand dollar are roughly similar to that seen in a number of other emerging market countries, which are much larger in GDP terms than New Zealand.⁴

The US dollar is the most frequently traded currency. In April

Figure 2
Currency turnover relative to GDP



* Source: OECD Economic Outlook

2001 the US dollar accounted for 45 per cent of total global turnover; a very high ratio given that trading in any one currency cannot exceed 50 per cent (since every trade involves two currencies). In other words, ninety per cent of the value of all trades included the US dollar. That is unsurprising, since the US dollar is the standard that most other currencies are traded against – that is, it is the most common numeraire in foreign exchange. For example, to exchange New Zealand dollars for euros a trader would usually need to exchange New Zealand dollars for US dollars and then exchange US dollars for euros. A common numeraire exists because having only one or two currency pairs that are actively traded in each currency tends to concentrate trading activities in those few pairs, leading to a more liquid market. In terms of currency pairs, trading in the euro against the US dollar is the most active (30 per cent of all trades are EUR/USD trades), with the US dollar against the Japanese yen and the British pound at 20 per cent and 11 per cent respectively.

Trades that involved the New Zealand dollar accounted for

⁴ Note that the chart's currency mnemonics can be found in the appendix to this article.

Table 2
Global foreign exchange turnover by currency and currency pairs in April 2001

Ranking	Currency ¹	%	Currency pair	%
1	US dollar	90.4	EUR/USD	30.0
2	Euro	37.6	USD/JPY	20.0
3	Japanese yen	22.7	USD/other	17.0
4	Pound sterling	13.2	GBP/USD	11.0
5	Swiss franc	6.1	USD/CHF	5.0
..				
7	Australian dollar	4.2	USD/CAD	4.0
..				
16	New Zealand dollar	0.6	AUD/USD	4.0
..				
22	Czech koruna	0.2	EUR/JPY	3.0
23	Indian rupee	0.2	EUR/GBP	2.0
24	Thai baht	0.2	EUR/other	2.0
25	Malaysian ringgit	0.1	EUR/CHF	1.0
26 ²	Saudi riyal	0.1		
	TOTAL	200.0	TOTAL	100.0

¹ As there are two currencies in every exchange rate transaction, the total of all currency shares adds to 200 per cent.

² Even though there were 48 countries surveyed, only the 28 largest currencies were reported in the preliminary results.

0.6 per cent of global turnover, making the New Zealand dollar the 16th most traded global currency.⁵

Types of trading activity

A number of different types of trading activities occur in the foreign exchange market. The BIS survey captures the main types and segregates turnover into four broad categories: spot, forward, swaps, and derivative market activity. All of these types of trades involve exchanging one currency for another (at least in principle) even though in many respects the nature of the different types of trades are quite different.

Spot market transactions are the simplest instrument for transacting foreign exchange and are often considered the market standard. A *spot foreign exchange transaction* is the exchange of one currency for another, at the spot (or today's) exchange rate. Although the exchange rate is agreed at the time of the transaction, market convention dictates that the exchange of funds (*settlement*) will occur two business days later (*the spot date*). The lag between the day of the transaction and the ultimate exchange of currencies gives the parties time to arrange to have the transaction processed

through clearing systems.

But sometimes market participants do not want to exchange currencies in two business days' time. For example, let's say that an exporter is expecting to receive payments for their goods in one month's time. Those receipts will be in US dollars, but the exporter wishes to receive New Zealand dollars. In addition, this exporter wishes to fix today the amount of New Zealand dollars they will receive. The requirements of this exporter cannot be satisfied with a spot transaction (a spot transaction would be settled in two days but the exporter isn't going to receive their US dollars for another month), but they can be satisfied via an *outright forward transaction*. An *outright forward transaction* is identical to a spot transaction, except that the settlement date (and the exchange of currencies) is more than two business days ahead.⁶ Hence spot and forward transactions are usually analysed as one type of instrument since the only difference is the date on which the exchange of funds occurs.

In general, the spot exchange rate will not be same as the forward exchange rate. The difference between these two rates largely reflects the differences in short-term interest

⁵ The survey has only this year required each country to report on the extent of trading in a number of smaller currencies, including the New Zealand dollar, hence this number cannot be directly compared to the 1998 figure of 0.3 per cent (which included results compiled from the survey of New Zealand banks alone).

⁶ It is possible to have a forward transaction that settles sooner than a spot transaction. These are called value today and value tomorrow outright forwards, and settlement is either the current day or the next day respectively.

rates between the two countries in question. To explain, let's use an example when interest rates are higher in New Zealand than in the United States. An exporter would expect to get a few more New Zealand dollars by waiting for the forward date, as the alternative would have been to undertake a spot transaction when the export contract was agreed, borrowing the US dollars required to settle the spot transaction (at a lower interest rate than available in New Zealand) and investing the New Zealand dollars received from the spot transaction at the higher New Zealand interest rate. Thus, the spot exchange rate will be higher than the forward exchange rate. The difference between the spot and the forward exchange rate is known as the *forward premium*.

Outright forwards are used predominately by customers to hedge their future trade receipts.⁷ Banks typically only transact outright forwards with their customers at their customers' request, and to maturity dates that suit the customer. Banks will not typically trade outright forwards with other banks. There isn't a liquid inter-bank market in outright forwards, largely because each outright forward settles on a different date, depending on customer needs. Instead, banks will tend to use a combination of spot foreign exchange and interest rate markets (both of which have liquid inter-bank markets) to satisfy their own hedging needs. When banks hedge their transactions with their customers in the spot market, they often cause others to transact as well – boosting spot market volumes relative to underlying forward volumes. In addition, large wholesale capital flows usually occur in the spot market. As the value of capital flows typically dwarfs those transactions related to trade flows (estimates generally suggest a 5:1 to a 10:1 ratio), market trading volumes are usually large relative to that of outright forward transactions.

Lastly, a *foreign exchange swap* is an agreement to exchange two currencies at the current spot date and to reverse the transaction at a specified future date. In fact, a swap is equivalent to a spot transaction and an offsetting outright forward transaction rolled into one. Given that the exchange rate on the spot date and at the future settlement date is

fixed at the time of the foreign exchange swap transaction (FX swap), movements in the exchange rate after the deal is entered into will have no impact on the value of a swap. Instead, the value of a FX swap is given by the forward premium which is largely determined by the interest rate differential between the two countries. Hence, the value of a FX swap is exposed to changes in interest rate differentials after the deal is entered into. Market participants use swaps to manage mismatches in their holdings of currencies (that is, if a trader holds one currency, but owes in another, a swap can be used to offset the mismatch by exchanging one for the other for a set period of time).⁸

Globally, FX swaps continue to be the most heavily traded product. A significant reason for this is due to market players' preference to repeatedly transact short-term FX swaps rather than transacting one longer maturity swap. For example, perhaps overseas investors without established credit lines locally want to establish a position in the New Zealand dollar for two months and finance it using the swaps market. It would be quite normal to do this using a succession of one week swaps. Over two months there would be eight swaps to finance the single underlying position initially transacted in the spot market. The result is very high turnover and volumes.

Activity in the FX swaps market is largely a demand derived from activity in other markets. An active inter-bank market operates to help clear banks' own and their customers' funding and hedging requirements, but the traders do not themselves typically take large risk positions (on the difference between the forward points and the actual interest rate differential). Another factor is that the value of the average FX swap is inherently less volatile than a corresponding spot or outright forward transaction of the same face value (because interest rate differentials are much more stable than spot exchange rates). Thus from a trader's perspective, one can trade a much larger volume of FX swaps and be exposed to the same amount of risk (and potentially make the same return), hence the larger FX swap volumes.

In New Zealand, FX swaps are a greater part of our total

⁷ See Brookes, A, D Hargreaves, C Lucas, and B White, (2000), "Can hedging insulate firms from exchange rate risk?" *Reserve Bank of New Zealand Bulletin*, vol 63, no 1, 21-34, for a more in-depth analysis of the use of outright forwards by customers.

⁸ Hawkesby, C (1999), "A primer on derivative markets", *Reserve Bank of New Zealand Bulletin*, vol 62, no 2, 24-43 describes the dynamics of the swap market in greater detail.

Table 3**Transaction type by country – absolute value (USD billion) and shares of total turnover**

Country			April 2001				April 1998					
	Spot	%	Swap	%	Forward	%	Spot	%	Swap	%	Forward	%
United Kingdom	151.2	30	302.4	60	50.4	10	223.1	35	369.6	58	44.6	7
United States	103.3	41	113.4	45	35.3	14	147.4	42	164.9	47	38.6	11
Japan	36.8	25	91.1	62	19.1	13	61.2	45	68.0 ¹	50 ¹	6.8 ¹	5 ¹
Australia	13.0	25	35.4	68	3.6	7	19.6	42	24.7	53	2.3	5
New Zealand	1.0	25	2.8	70	0.2	5	2.1	30	4.5	65	0.3	5
All Countries	399.3	33	677.6	56	133.1	11	560.0	40	714.0	51	126.0	9

¹ All transactions are in US dollar billion.

² Estimated.

turnover than in many countries. This reflects New Zealand's high reliance on foreign capital to finance domestic lending. New Zealand banks and companies use foreign currency borrowing extensively and use the FX swaps method to convert the foreign currencies they have borrowed into the New Zealand dollars they need for a period of time. The article by Ian Woolford, Michael Reddell and Sean Comber in this volume of the *Bulletin* examines this issue in more depth.

As can be seen in table 3, in the 2001 BIS survey, global FX swap market activity rose to 56 per cent of global foreign exchange market volumes (from 51 per cent in 1998), while the share of spot activity to total turnover fell from 40 per cent to 33 per cent. The share of outright forward market activity was unchanged at around 10 per cent. In absolute terms, swap market activity fell by six per cent, but this decline is smaller than that seen in the spot market (a decline of 32 per cent in US dollar terms). Most countries, including New Zealand, tended to follow a similar trend to that seen in the global figures.

Factors behind the global trends

Three significant factors have been cited by many commentators as being responsible for the decline in overall foreign exchange market activity and the changes in the relative importance of the various instruments. These factors are the introduction of the euro; an increase in electronic broker trading; and a tendency for institutions and trading centres to consolidate.

The BIS survey results note that trading in the eurocurrencies in 1998 accounted for 52 per cent of all foreign exchange

transactions, while in 2001 the common currency of the euro accounted for just 38 per cent of global trading. Part of that drop can be attributed to the introduction of the euro, as some currency pairs simply no longer exist, and for example any previous trading between Italian and German firms involving the lira and the deutschemark that was previously a foreign exchange transaction is now just a domestic euro payment. Exactly how much of the drop reflects the introduction of the euro, as opposed to the decline in foreign exchange trading in general over the past three years, is more difficult to discern. The BIS survey results show that turnover in non-euro-affected currencies fell by 2.5 per cent between 1998 and 2001. Given that the total decline in turnover in the euro is 40 per cent, and assuming that the underlying reduction in trading in the euro followed the global trend, then a significant part of the decline in global turnover simply reflects the introduction of the euro.⁹ Note also that the value of the euro has depreciated significantly against the US dollar since 1998, which also helps to explain a large part of the 40 per cent decline in turnover in the euro-area currencies (in US dollar terms).

The rapid growth in trading via electronic-based systems has also been a significant factor behind the fall in global turnover in the 2001 survey. An electronic broker is a screen-based exchange where buyers and sellers can place the amounts they wish to buy or sell of a particular currency, and at what price they wish to trade at. In electronic-based systems, trades

⁹ A research piece from Lehman Brothers Inc. estimated that the introduction of the euro reduced global turnover by around 13 per cent in 1999. Committee on Gold and Foreign Exchange publication, 'Structural change in foreign exchange markets', Discussion Note No 1, July 2001.

occur only when both parties to the trade actually want to trade. One party will place an order with the electronic broker, and other traders will then choose whether to trade (or not) by placing an offsetting order. The technology brings together the interests of buyers and sellers. By contrast, the heart of the foreign exchange market has typically been inter-bank “market makers”. Under that sort of arrangement banks are typically requested to *make a market* (quote a buying and selling price on an exchange rate if asked by

another bank) and can often be “forced” to trade even if they have no immediate need to. (This is one of the unwritten rules between participants in the foreign exchange market. The market functions in this manner to ensure that a market will exist at all times.) If a bank trades when it doesn’t need to, then it will trade with other banks in the inter-bank market to clear that position, which will, in turn, prompt other traders to trade and so forth until eventually someone who actually needs to trade, does so. To the extent that the use of

Box 1 Recent movement in trading centres

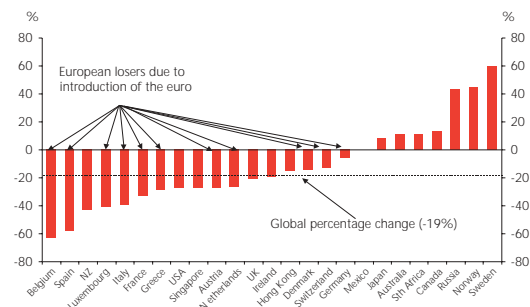
The 1998 BIS survey showed a tendency for financial institutions to consolidate their trading operations globally.¹ The 2001 survey results suggest that this trend has continued further. This has meant that, whereas ten years ago financial institutions may have had various offices in many of the middle-sized or larger financial centres of the world, now they tend to focus on the larger financial centres, especially for trading the major currencies.

There is a variety of reasons for this trend. Better technology, such as electronic broking and communications systems, has lowered geographical barriers, meaning that banks find it less necessary to be physically located in a country to participate effectively in its foreign exchange market. A reduction in hedge funds’ and other large investment funds’ participation in foreign exchange markets following the Asian and Long-Term Capital Management crises in 1997/98 has also reduced the need for an extensive network of institutions in different countries. In addition, institutions have tended to manage their risk by ‘pooling’ divisions in an attempt at cost control. Finally, there has been a tendency of financial institutions to merge in recent years (for example the Deutsche Bank/Bankers Trust merger in 1999 and the J P Morgan/Chase merger in 2000), reducing the number of offices around the world.

The effects of this consolidation have been seen in most countries. For example, Japan’s market share has risen to

¹ Lucas, C and L Rosborough, (1999), “The foreign exchange market and derivatives survey,” *Reserve Bank of New Zealand Bulletin*, vol 62, no 1, 79-86.

Figure 3
Change in foreign exchange market turnover 1998 – 2001



the detriment of Singapore, while trading in Europe has increased in Germany at the expense of other centres in Europe. The evidence suggests that some banks have consolidated their operations in the Asian time zone in Australia as well (which may also explain why turnover in Australia has increased, seemingly against the global trend). To an extent, the rise in market share in Australia has come at the expense of New Zealand’s share of global turnover, given that a number of banks’ core treasury functions have migrated from New Zealand to Australia. This shift in trading of the New Zealand dollar from New Zealand to Australia has had a significant effect on the turnover trends in our own survey in the last few years.

There is also some evidence that financial institutions have tended to consolidate their activities within countries. For example, trading of the Swedish krona in Sweden, and the New Zealand dollar in New Zealand, now constitute a larger proportion of turnover. A number of central banks have noted that a smaller number of trading institutions now capture a larger share of turnover in their own market.

electronic broking systems decreases this 'pass-the-parcel' type activity, then turnover will decline. Electronic broking systems are used much more extensively in spot markets. Therefore, the increase in electronic broking has had a larger impact on spot market activity than on outright forwards or FX swaps. Accordingly, the ratio of spot transaction volumes to total volumes has declined globally, while the ratio of FX swaps and outright forwards transactions has tended to increase. Further to this, the BIS survey reports that trading between reporting dealers (inter-bank trading) has fallen from 64 to 59 per cent of total turnover, most likely as a result of electronic broking.

Electronic broking systems have been very successful, especially in a simple product like spot foreign exchange, as they are cheaper and faster than traditional trading techniques. Screen-based systems allow for direct processing of trades into clearing and settlement systems and are more transparent than traditional 'dealer' markets. Their popularity has grown rapidly since the mid-1990s. The Federal Reserve of New York notes that automatic order-matching systems accounted for 54 per cent of spot turnover, while the Bank of England estimates that two-thirds of spot market activity now occurs via electronic broking systems.¹⁰ So far, electronic brokers have been less successful in establishing a presence in the New Zealand dollar. Hard numbers are not available, but the impression from market participants is that only around 30 per cent of total New Zealand dollar spot volumes are transacted via electronic brokers.

Finally, industry consolidation appears to have played a role in the fall in global turnover. There has been a continued consolidation of trading centres and institutions back to their home countries, while large bank mergers have tended to consolidate trading within countries (see box 1 for further discussion of these issues). In addition, as institutions have merged, there is now more netting of individual customer transactions within institutions, as opposed to trading

between institutions in the foreign exchange market.

3 Changes to the New Zealand foreign exchange market

Currency pairs traded

The foreign exchange market physically located in New Zealand has also seen some significant changes in recent years. Nearly three quarters of trades in 2001 directly involved the New Zealand dollar, while 86 per cent of currency pairs traded involved the antipodean currencies, down from 80 per cent in 1998. The NZD/USD currency pair is the most frequently traded, accounting for two-thirds of total New Zealand turnover. Another 7 per cent of turnover involves the New Zealand dollar against other currency pairs, while 11 per cent of transactions involved the AUD/USD. The changes to currency pair trading in the last three years are less significant than those that occurred between 1995 and 1998, when the New Zealand and Australian dollar shares of total turnover transacted in New Zealand rose significantly, from 68 to 80 per cent.

Part of the explanation for increased trading of the home currency reflects the fact that there has been a tendency for banks operating in peripheral financial centres to specialise in the currencies (and customers) that they know well – their own. In the case of New Zealand, banks have tended either to stop quoting prices in the major currencies altogether, or to shift those activities to the larger financial centres in the region.

Trends in total turnover

Average daily turnover in April 2001 in New Zealand was USD 4.0 billion, down from USD 7.0 billion in April 1998; a fall of 46 per cent.¹¹ On the face of it, this is a significant drop in activity, and much greater than the 19 per cent global fall. So what has caused this fall in activity? Electronic broking systems are not as heavily used in New Zealand, so the fall in

¹⁰ Federal Reserve Bank of New York, *The foreign exchange and interest rate derivatives markets survey: Turnover in the United States*, 9 October 2001. www.newyorkfed.org/pihome/triennial/fx_survey.pdf, Bank of England: *The UK foreign exchange market and over-the-counter derivatives markets in April 2001 – results summary*, www.bankofengland.co.uk/statistics/bis-survey/foxotcsum01.pdf

¹¹ In April 1998 there were 20 business days, while in April 2001 there were only 18.

Table 4
New Zealand foreign exchange market turnover
(average daily total market turnover by currency pair)

	April 2001		April 1998		April 1995	
	USD billion	%	USD billion	%	USD billion	%
NZD/USD	2,630	65.5	4,741	67.7	3,740	51.9
NZD/Other	291	7.2	235	3.4	284	3.9
EUR/USD ¹	229	5.7	208	3.0	934	13.0
AUD/USD	498	12.4	665	9.3	881	12.2
USD/JPY	190	4.7	695	9.9	852	11.8
GBP/USD	137	3.4	154	2.2	239	3.3
USD/Other	23	0.6	246	3.5	184	2.6
All Other	20	0.5	72	1.0	87	1.2
TOTAL	4,018	100.0	7,006	100.0	7,201	100.0

¹ In the 1998 and 1995 surveys this is USD/DEM.

activity cannot be attributed to that. Similarly, it is hard to see how the introduction of the euro could have reduced turnover in New Zealand, as there were never material trading volumes in non-deutschemark euro-area currencies.

However, there are two New Zealand specific factors that explain some of the decline in turnover. First, the exchange rate has depreciated by 26 per cent since 1998, which explains around half the fall in turnover in US dollar terms.¹² Probably at least as importantly, the trading bases of a number of wholesale banks have shifted to Australia since 1998 (HSBC and much of Deutsche Bank, for example), while some

banks that still operate in New Zealand have shifted their main functions to their parent banks in Australia. This means that New Zealand dollar trading by these institutions is included in the Reserve Bank of Australia's component of the survey.¹³ Fortunately, the Reserve Bank of Australia has been collecting information on the volume of New Zealand dollars traded in Australia in each of the last three surveys.¹⁴ Putting this information together with our own gives us a better sense of the trends in overall New Zealand dollar trading.¹⁵

Table 5 shows that the amount of New Zealand dollars traded

Table 5
Total NZD/USD turnover in Australia and New Zealand¹
(USD million)

Country	April 2001		April 1998		April 1995 Turnover
	Turnover	% change	Turnover	% change	
New Zealand	2,630	-44.5	4,741	26.8	3,740
Australia ²	4,412	41.8	3,111	105.1	1,517
TOTAL	7,042	-10.3	7,852	49.4	5,257

¹ Traded volumes are daily averages over the month.

² Source: Reserve Bank of Australia

¹³ The 2001 survey includes the ANZ, BNZ, Deutsche Bank, NBNZ and Westpac.

¹⁴ For clarification, the figures added here are NZD/USD trading only. Unfortunately, the Reserve Bank of Australia's data do not enable a time series breakdown of trading of New Zealand dollars against other currencies.

¹⁵ The New Zealand dollar is also extensively traded in New York and London in their respective time zones. The Federal Reserve's survey indicated that US 1 billion was traded daily, on average, in New York in April 2001. Unfortunately, the Bank of England did not disaggregate their figures for the New Zealand dollar.

¹² From an average of 0.5531 in April 1998 to an average of 0.4066 in April 2001.

Table 6
NZD/USD spot and outright forward market turnover in Australia and New Zealand¹
(USD million)

Country	April 2001		April 1998		April 1995 Turnover
	Turnover	% change	Turnover	% change	
New Zealand	597	-61.1	1,533	10.1	1,392
Australia ²	609	-35.7	948	128.5	415
TOTAL	1,206	-51.4	2,481	37.3	1,807

¹ Traded volumes are daily averages over the month.

² Source: Reserve Bank of Australia

in Australia is 42 per cent higher than in 1998. As a result, total turnover in New Zealand dollars in New Zealand and Australia has only fallen by around 10 per cent since 1998. Relative to the fall in turnover reported from other central banks around the world, this fall in turnover is less than the global average (see table 3), and is around the global median. Table 5 also shows that more trading in New Zealand dollars occurs in Australia than in New Zealand. This observation is not that unusual these days; for example, the euro is more highly traded in London than in Frankfurt, while a significant proportion of turnover in the Swedish krona occurs in London.

The drop-off in turnover since 1998 comes after a period of strong growth in volumes over the decade before. Total Australian turnover in the New Zealand dollar is 34 per cent higher than it was in 1995 and the fall in the value of the New Zealand dollar since then, if anything, understates this total growth in turnover.

New Zealand spot and outright forward market activity

As can be seen from table 6, turnover in New Zealand dollar spot and outright forwards in New Zealand and Australia fell by 51 per cent between 1998 and 2001 in US dollar terms. This fall is larger than the 26 per cent fall in trading in spot and outright forwards seen globally since 1998. Note, however, that the New Zealand dollar exchange rate has been weaker than most currencies over this period, which explains some of the larger fall noted here. The fall from 1995 to 2001 is not as marked as that seen from 1998 to 2001 - a fall of 33 per cent (much of which can be explained by the percent fall in the NZD/USD exchange rate over the period).

New Zealand swap market activity

Daily average turnover in New Zealand dollar foreign exchange swaps was USD 5.5 billion in April 2001, down only slightly from 1998 – see table 7. As expected, turnover

Table 7
NZD/USD foreign exchange swap market turnover in Australia and New Zealand¹
(USD million)

Country	April 2001		April 1998		April 1995 Turnover
	Turnover	% change	Turnover	% change	
New Zealand	1,920	-48.0	3,691	61.7	2,283
Australia	3,803	75.8	2,163	96.3	1,102
TOTAL	5,523	-2.2	5,854	72.9	3,385

¹ Traded volumes are daily averages over the month.

² Source: Reserve Bank of Australia

Box 2

New Zealand derivative market activity

The triennial survey also covers foreign exchange and interest rate derivatives activity. Derivatives are not the focus of this article, but some results are reported briefly here.

In New Zealand, the over-the-counter options market (options written specifically to fit the needs of a particular client) has grown substantially since 1998. Average turnover in currency options has risen from USD 62 million, to USD 495 million, a five-fold increase. Despite this seemingly large increase, options turnover still accounts for less than one per cent of total turnover in New Zealand.

Turnover in interest rate derivatives has increased since the mid-1990s, reflected in greater trading in forward rate agreements and interest rate swaps. A forward rate agreement (FRA) is similar to a bank deposit which begins at some time in the future, whereas an interest rate swap transforms a series of fixed rate obligations into a series of floating rate obligations, or vice versa.¹⁶ Interest rate swaps have become more actively traded since 1998, reflecting an increased need by banks to manage the

interest rate risks on their much larger fixed mortgage portfolios. (Total lending, of which fixed rate mortgages account for around 60 per cent has increased by around 30 per cent since 1998). In addition, there has been a tendency for some banks and investors to invest using interest rate swaps as an alternative to holding New Zealand government bonds.

The growth in interest rate swaps in New Zealand is part of a global trend. In some markets, interest rate swaps have become the 'benchmark' trading instrument, reflecting the declining size of government bond markets.¹⁷ The increased tendency for banks to securitise mortgages and other credit receivables in recent years may also have contributed to increased activity in the interest rate and currency swap markets.

Interest rate option activity has fallen since 1998, possibly due to the change to the OCR in 1999. Short-term interest rates are now not as volatile, and hence offer fewer short-term trading opportunities. In addition, lower interest rate volatility has led to a reduced need for companies to hedge movements in interest rates. This is a similar trend to that seen in the interest rate futures market.

Table 8
New Zealand interest rate derivatives market turnover*
(Including exchange traded futures)

Instrument	April 2001		April 1998		April 1995
	NZD million	% change	NZD million	% change	NZD million
Forward Rate Agreements	1,052	77.4	593	390.1	121
Swaps	375	86.6	201	235.0	60
OTC options	9	-90.7	97	79.6	54
TOTAL	1,436	61.1	891	279.1	235

* Traded volumes are daily averages over the month.

¹⁶ Hawkesby, (1999) describes interest rate swaps and their uses in greater detail

¹⁷ See (2000), "The changing shape of fixed income markets", *BIS Working Paper* no 104, for a review of the growth of global interest rate swap markets.

in New Zealand fell significantly. This was countered, however, by a dramatic rise in swap market activity in Australia.

This substantial rise in New Zealand dollar swap market activity as a proportion of total foreign exchange turnover in New Zealand and Australia is consistent with the global trend towards a greater emphasis on swap market activity. In New Zealand, an important driving factor has been the fact that wholesale banks have increasingly used the FX swaps market to help convert their short-term borrowings in overseas countries (such as in the US commercial paper market or US dollars borrowed directly from parent banks) into the New Zealand dollars that they require. Since their commercial paper is issued in US dollars, they hedge against movements in the US and New Zealand interest rates by engaging in foreign exchange swap transactions.

The BIS survey also covers derivative market activity. An overview of the main results is available in box 2.

4 The liquidity of the New Zealand dollar

The fall in New Zealand dollar trading volumes has led some market commentators to suggest that the New Zealand dollar has become less liquid since the mid-1990s. This section examines this issue and compares New Zealand's experience to that of other countries. We analyse trading volumes in spot and outright forwards when considering the liquidity of the spot exchange rate, since it is spot and outright forward transactions that determine, and are determined by, the spot exchange rate.

What is liquidity and why is it important?

Foreign exchange liquidity is best thought of as the ability to transact in the foreign exchange market without significantly affecting the exchange rate. The liquidity of the market is important, given that liquid markets more easily facilitate large capital flows. Furthermore, a less liquid foreign exchange market will generally be associated with more volatility in the exchange rate, all else being equal (see box 3). Increased exchange rate volatility can potentially result in higher risk premia, and hence higher interest rates, as

investors seek compensation for the greater uncertainty, or 'liquidity risk', associated with transacting in the currency.

Foreign exchange trading does not generally respect geographic barriers when capital markets are open, given that communications and trading systems enable investors to easily trade with each other in different countries. Because of this element to trading, what is important is whether investors are prepared to trade with each other, rather than the exact physical location of individual traders. In Australasia, financial institutions can easily transact with each other, as the Australian and New Zealand markets are open at around the same time. Therefore, it is the size of the market for New Zealand dollars in Australasia that is of prime importance for the liquidity of the New Zealand dollar.

The various facets of foreign exchange market liquidity

We define three main facets to foreign exchange market liquidity, these being: the *depth* of the market (most commonly measured by trading volumes); the *tightness* of the market (often defined as the width of the bid/ask spread); and the *immediacy* of the market (or the speed at which traders will quote prices to other traders).

The BIS survey provides us with a rich database to assess the depth of the market. The 51 per cent fall in New Zealand dollar spot and outright forward foreign exchange turnover in US dollar terms in Australia and New Zealand since 1998 (table 6 above) suggests a fall in the depth of the New Zealand dollar. However, as noted earlier, this seemingly large fall needs to be taken in context with the substantial fall in the NZD/USD exchange rate of 26 per cent since 1998. That is, trading volumes in New Zealand dollar terms have fallen by half of that indicated by the US dollar figures. In addition, the fall in New Zealand dollar turnover is in the range of global averages – albeit a little larger than seen in many other currencies.

There are some reasons to believe that focusing on the 1998-2001 period overstates the drop off in the depth of the market. New Zealand capital markets developed rapidly following deregulation in the 1980s and the early 1990s,

which resulted in large capital inflows and an increase in the liquidity of the New Zealand dollar. The mid-1990s was a period of especially strong growth of the markets, reflected in a significant rise in offshore investment in New Zealand dollar products via the New Zealand dollar denominated eurobond market and in the government bond market.¹⁸ Furthermore, 1998 was an unusually active period in many global markets (New Zealand included), reflecting an increased interest in trading and investing by hedge funds and other large investors. In addition, the Bank's monetary policy implementation approach during the mid/late 1990s may have also generated increased foreign exchange trading.¹⁹ Hence, it is likely that turnover in the foreign exchange market was temporarily inflated during 1997/1998 relative to both the size of the New Zealand economy and its asset markets, and relative to the trend level of liquidity and turnover. A better indication of the underlying trend in the depth of the New Zealand dollar is obtained by comparing the level of spot and forward market activity in 2001 relative to that in 1995. This comparison shows that turnover fell by 20 per cent between 1995 and 2001 in US dollar terms, and grew by around 25 per cent in New Zealand dollar terms.

Another way of assessing the depth of the market is to examine the *first-line liquidity* of the inter-bank foreign exchange market. The inter-bank market consists of a group of banks that agree to quote each other bid and ask prices (the buy and sell price) at a prescribed spread (the *bid/ask spread*) in a prescribed amount of foreign exchange (the *standard market parcel* – of NZD 5 million). *First-line liquidity* is the combination of the standard market parcel size and the number of traders in the market – that is, the amount of foreign exchange that one price-making bank can definitely trade with all other banks immediately at any one time. To

an inter-bank market participant who has a relatively short-term focus, first-line liquidity is the relevant measure of the depth of the market. The total number of inter-bank price makers in the New Zealand dollar has remained broadly stable in recent years. Although HSBC withdrew from the New Zealand market in July 2000, the Commonwealth Bank of Australia entered in March 2001.²⁰ Because banks still quote prices on an unchanged standard parcel size of NZD 5 million, the first-line liquidity of the inter-bank market has remained largely unchanged at NZD 30 million over the last few years.

The next main facet of market liquidity is the *tightness* of the market, or the width of the bid/ask spread. The academic literature tends to concentrate on *tightness* as the measure of market liquidity. The wider the bid/ask spread is, the less liquid a currency is considered to be, as transaction costs are higher. Around 1998, bid/ask spreads on the NZD/USD widened from five basis points to seven basis points on a standard parcel of NZD 5 million. This widening in the spread was an informal consensus among the wholesale trading banks – reportedly as a result of greater risk aversion and exchange rate volatility during the Asian crisis period. In October 2000, one major market participant explicitly began to quote a 10 point spread to other inter-bank participants, although the other market participants continued to quote a seven point bid/ask spread to each other. Overall, this suggests that the tightness of the New Zealand dollar has remained broadly stable since 1998, but that tightness has decreased since the mid-1990s, as quoted spreads have widened. (The widening of spreads is larger in effective terms, given that the level of the exchange rate is now lower when compared to the mid-1990s).²¹

Another aspect of liquidity is the *immediacy* of the market. This is the speed at which traders will quote prices to each other. The longer it takes to receive a quoted price, the less liquid the market is considered to be (because the longer you have to wait, the greater is the chance that the exchange

¹⁸ See Eckhold, K (1998), "Developments in the Eurokiwi bond market," *Reserve Bank of New Zealand Bulletin*, vol 61 no 2, 112-121 for a review of the development of the Eurokiwi market. The proportion of offshore currency of New Zealand government securities rose significantly over the mid-1990s – see statistical tables D6 and D7, www.rbnz.govt.nz for details.

¹⁹ The Bank acted to manage overall monetary conditions, which comprised both the exchange rate and short-term interest rates, by making statements to push conditions back to within the desired range. The relative frequency of comments resulted in some 'noise' traders or short-term traders trading more often when monetary conditions moved closer to the edge of the perceived ranges.

²⁰ CBA was not included in the BIS survey results for New Zealand as their trading base is in Sydney.

²¹ The apparent fall in depth of the market is not unique to New Zealand, and, although not discussed here at length, the tendency for bid/ask spreads to widen at the margin has also been seen in other offshore foreign exchange markets. See BIS, "Structural Aspects of Market Liquidity from a Financial Stability Perspective," June 2001 for more detail.

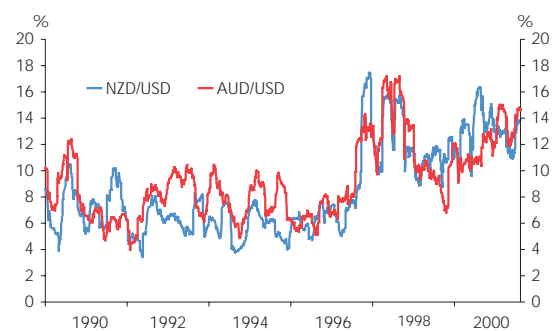
rate will change). Market immediacy is inherently difficult to measure, given the need for high frequency time series data on actual quoted prices. Typically, the evidence on the immediacy of the market comes from discussions with market participants. At times this anecdotal evidence has suggested that some inter-bank participants have become slower at quoting prices in recent years. Quoting reputedly becomes noticeably slower when there is greater uncertainty around the true 'level' of the exchange rate, for example when trading conditions are *thin* (when trading volumes are low). In addition, some market participants have commented that the move of some banks away from New Zealand may have coincided with their reduced commitment to quote prices quickly when asked. Therefore, in this sense, the substantial shift in New Zealand dollar trading to Australia may have resulted in a drop in the immediacy of the market. Since these comments are sporadic, it is difficult to draw strong conclusions. However, it is reasonable to expect that any decline in the immediacy of the market will become more apparent when markets are under stress and trading conditions are thin.

The implications of lower liquidity

One implication of lower liquidity will generally be higher exchange rate volatility. Therefore, trends in the volatility of the exchange rate help us glean some evidence on trends in the currency's liquidity. However, factors other than changes in market liquidity affect exchange rate volatility, making the relationship between volumes and volatility complex and uncertain. Research often shows that trading volumes are positively correlated with exchange rate volatility, while other work finds the opposite to be true. Exchange rates often become more volatile when trading activity picks up, because short-term mismatches between buyers and sellers of foreign exchange are more likely to occur. However, in general, trading volumes are positively correlated with exchange rate volatility. A more liquid market will be one where the rise in volatility is relatively modest as volumes increase because there is always a relatively large number of traders with opposing transactions to complete, resulting in fewer short-term mismatches. A negative relationship between exchange rate volatility and trading volumes can occur when higher exchange rate volatility actually deters market participants

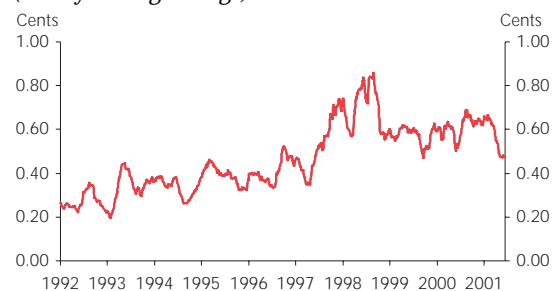
from trading. In these cases, exchange rate volatility doesn't increase initially, because volumes have increased, but because of something else, such as an increase in the volatility of a related exchange rate. Box 3 looks at the relationship between trading volumes and volatility in the New Zealand dollar, drawing on some high frequency data on trading volumes and the exchange rate.

Figure 4
New Zealand and Australian annualised historical volatilities against the US dollar 1990 to 2001



* Volatility is defined as the standard deviation of the exchange rate's daily percentage change. Working days only. The series is a moving average of 60 days.

Figure 5
New Zealand dollar daily trading ranges 1992 to 2001 (60 day moving average)



There are a number of different ways to measure volatility of the exchange rate, including: the standard deviation of daily changes of the exchange rate (known as actual or historical volatility); the level of volatility implied by FX options prices (known as implied volatility); or the daily trading range of the exchange rate.

Figure 5 shows that the actual volatility of the NZ dollar has increased since 1998. It appears that there has been a distinctive shift in the average level of volatility in the NZD/USD following the Asian and Russian debt crises of 1997/1998. The actual average daily volatility has increased from

Table 9
Average annualised historical volatility¹

	Jan 1992 to Sep 1997	Oct 1997 to Aug 2001	Change
<i>Against the US dollar</i>			
New Zealand dollar	6.10	12.50	+6.4
Australian dollar	7.50	12.00	+4.5
South African rand	6.30	9.90	+3.6
Canadian dollar	4.40	5.50	+1.1
Japanese yen	10.40	13.00	+2.6
Euro ²	10.20	10.20	0.0
Swedish krona	11.00	10.60	-0.4

¹ Volatility is defined as the annualised standard deviation of the exchange rate's daily per cent change.

² Prior to 1999, the euro is proxied with the Deutschemark.

0.40 per cent (1990 to 1998) to 0.75 per cent (1998 to 2001). This distinctive rise in exchange rate volatility has occurred in many other currencies against the US dollar, such as the South African rand and the Australian dollar, although the increase in the volatility of the New Zealand and Australian dollars has been larger than most. Despite this increase, the volatility of the New Zealand dollar is now only slightly higher than the volatility of most other traded currencies. Thus, the recent rise underscores the extent to which New Zealand dollar (and to a lesser extent Australian dollar) volatility was relatively low prior to the Asian crisis period. The increased volatility of the exchange rate has also been reflected in the wider average daily trading range observed in recent years – ranges that are even wider in per cent terms given the much lower level of the exchange rate.

However, the rise in exchange rate volatility may have reflected factors other than a reduction in the liquidity of the market. The chart above shows that the volatility of the Australian and New Zealand dollars has moved in tandem over most of the last decade. Since 1998, the volatility of the New Zealand and Australian dollars has increased by around the same amount, despite the depth of the Australian dollar falling by less than the depth of the New Zealand dollar.²² These observations suggest that something apart from the depth, and hence turnover in the market, has likely driven trends in the volatility of both currencies in recent years.

In summary, by analysing the depth, tightness and immediacy

aspects of New Zealand dollar liquidity, there is some evidence to suggest that liquidity had fallen since 1998. The increased presence of large investors and hedge funds in New Zealand's main asset markets around that time may have artificially increased the apparent liquidity of the market then. The discussion above also shows that there has been a rise in the volatility of the New Zealand dollar exchange rate and a fall in the resiliency of the currency over the period. However, these trends are not unique to the New Zealand dollar. The New Zealand dollar may have become relatively less liquid, but the evidence suggests that there is still sufficient liquidity to satisfy amply the amount of capital flows in our market. To the extent that liquidity has fallen, it has not so far resulted in any significant problems for those who need to use the market.

5 Summary and conclusions

Foreign exchange markets have undergone some significant changes in recent years. Total global foreign exchange turnover has fallen, primarily due to the introduction of the euro, increased trading via electronic-based trading systems and consolidation of trading centres. Trading volumes in New Zealand have fallen. However, the movement of financial institutions' trading operations from New Zealand to Australia has meant that the Bank's survey has substantially overstated the true fall in New Zealand dollar turnover. Total Australasian turnover in the New Zealand dollar has fallen moderately over the past three years, and only slightly since 1995, and the New Zealand dollar trading volumes appear to be around what one would expect given the size of our economy.

²² Total spot and outright forward turnover in the Australian dollar has declined by around half as much as for the New Zealand dollar.

The liquidity of the New Zealand dollar has declined since the mid-1990s. But the deterioration is overstated when simple comparisons against 1998 are made. A longer run of data still suggests a decline in liquidity, but by less of an extent than in 1998. However, there are few signs of a loss of market efficiency or of particular problems resulting from the fall in liquidity. The market still seems capable of dealing with large transaction volumes without substantially increasing volatility in the exchange rate, and the economy still appears able to attract (and hedge) the foreign capital needed to sustain our high external indebtedness.

There are a range of ways to analyse the data we have presented in this article. By giving the reader a number of different data, we hope to illustrate the general trends that represent the changes in the global and New Zealand foreign exchange markets this decade. If the past is any gauge to predict the future, further changes in the nature of foreign exchange markets are likely. The increased use of electronic trading systems has had a huge impact on the structure of offshore markets. To date, their impact on the New Zealand dollar has been muted. It remains to be seen how the market will change when the next BIS survey is done in 2004.

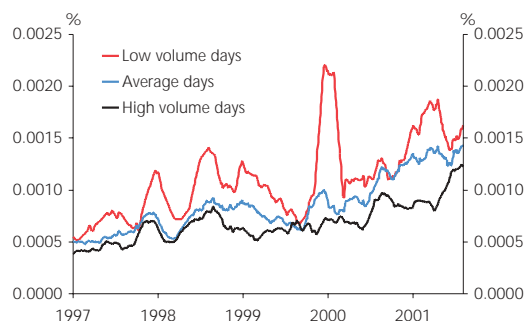
Box 3: Volume and volatility

An alternative measure of the liquidity of the market is how far the exchange rate moves per unit of foreign exchange transacted. The market can be considered relatively liquid if the exchange rate does not tend to move by very much when large volumes are transacted. However, if volatility picks up considerably, then the opposite may be true. This concept of liquidity is known as the *resiliency* of the market. In conjunction with first-line liquidity, resiliency is an important aspect of liquidity for market traders.

Figure 6 shows a measure of the resiliency of the New Zealand dollar calculated by dividing the trading range of the NZD/USD by the volume traded in the market for each day since 1997.²³ We use daily data on traded volumes from the Bank's foreign exchange turnover survey. Only a subset of the total traded volumes in the New Zealand dollar are included, as we only survey banks that are based in New Zealand. The survey has been adjusted for changes in survey participation over the years.

Interestingly, the exchange rate tends to be less volatile on days when trading volumes are high. This is consistent with the idea that the New Zealand dollar market is liquid and that trading volumes encourage stability rather than instability in the exchange rate. Market participants explain this phenomenon by noting that, on days when participants have particularly large parcels to transact, it is typical for banks to work together to find offsetting interest, from say, large customers such as the major exporters or other investors. Therefore, more often than not, the entrance of a large buyer or seller of foreign exchange will attract offsetting sellers and buyers to the market, enabling large volumes to be transacted without significantly affecting the exchange rate. On the other hand, a moderately large transaction on a quieter trading day can result in a relatively large movement in the exchange rate. This is because smaller transactions are

Figure 6
Movement in NZD/USD per NZD 1 million traded



Source: Bloomberg and RBNZ foreign exchange turnover survey.

NB: Data is a 60-day moving average.

often not large enough to attract larger participants into the market, leaving the smaller participants to absorb the flows, often resulting in more exchange rate volatility.

In general, the daily trading range of the currency has widened since late 2000, while daily traded volumes have decreased. From this we can tentatively conclude that the resiliency of the New Zealand dollar has declined. Resiliency has declined on both relatively heavily traded and lightly traded days.

²³ This analysis is similar to that of Adams, R, R Williams, and E Acar, (2001). 'Empirical measures of liquidity – a new approach', *Journal of Asset Management*, 2 (1), 75-83.

Appendix: Currency mnemonics

These symbols for national currencies are those routinely used by foreign exchange traders

AUD	Australian dollar
BRL	Brazilian real
CAD	Canadian dollar
CHF	Swiss franc
CLP	Chilean peso
CZK	Czech koruna
DKK	Danish krone
EUR	Euro
GBP	Great Britain pound
HKD	Hong Kong dollar
INR	Indian rupee
JPY	Japanese yen
KRW	Korean won
MXP	Mexican peso
MYR	Malaysian ringgit
NOK	Norwegian krone
NZD	New Zealand dollar
PLZ	Polish zloty
RUR	Russian ruble
SAR	Saudi Arabian riyal
SEK	Swedish krona
SGD	Singaporean dollar
THB	Thai baht
TWD	Taiwanese dollar
USD	United States dollar
ZAR	South African rand