Can hedging insulate firms from exchange rate risk?

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If exchange rate risk were a major impediment to trade, a currency union with one or more of our trading partners could facilitate trade with those partners. However, it is often suggested that exchange rate risk should not impede trade, because firms can manage the effect of exchange rate fluctuations by hedging. In this article, we examine whether hedging really can eliminate exchange rate risk. We find that hedging known short-term exposures is relatively simple, but that longer-term hedging is more expensive and has the potential to create risks as well as alleviate them. It is in the latter area that exchange rate risk is likely to have the greatest implications for trade.

1 Introduction

It is an empirical observation that more trade takes place **within** nations than **between** them. This phenomenon, which is sometimes called "home bias," may be caused by many factors, including differences between nations' legal and commercial practices, in regulatory requirements, in language and culture, and as the result of the uncertainties that arise from countries having different currencies.

In this article, we focus on one aspect of the last-mentioned possibility; namely whether currency uncertainty is really an impediment to trade, given the ready availability nowadays of foreign exchange hedging instruments. The background is a voluminous literature on the relationship between currency volatility and trade – a literature which has been unable to show conclusively that any link exists, and which has suggested that one of the possible reasons for the apparent absence of such a link is the ability that exists to hedge exchange rate risk. (Derivative markets, which facilitate hedging, have grown massively during the last 10 to 15 years.[2])

The article proceeds as follows. The first section briefly reviews the literature on the two subjects mentioned: that on the apparent "home bias" in global trade patterns, and that on the extent to which volatile exchange rates inhibit international trade. Section two examines what hedging can achieve, what it costs, and the commercial considerations that influence firms' hedging strategies. In section three, we endeavour to provide some perspective on exchange rate risks and the costs of managing them by putting them alongside the costs international trading firms incur in managing trade-related cross-border payment and credit risks. Section four draws some conclusions.

2 Review of the literature

Home bias in international trade

International evidence suggests countries have a "home bias" in their trade.[3] By home bias, we mean a tendency to trade more within nations than between them. For example, studies have shown Vancouver's trade with Seattle is much less than what one would expect, given the closeness of the two cities. Controlling for the size of each city and the distances between them, it turns out that Vancouver's trade with Toronto is greater than that with Seattle. Studies of home bias have tended to use 'gravity' models, which basically consist of regression equations that relate the trade between cities, and between countries, to their size, and the distance between them. The closer they are to one another (the stronger the pull of the "gravity"), the more cities, and countries, tend to trade. One application of gravity

[1] The authors would like to thank all firms interviewed in preparing this article. A number of other RBNZ staff, particularly Christian Hawkesby, provided useful comments on earlier drafts. Also, thanks to Adrian Orr, who reviewed the article for publication.

[2] See Lucas and Rosborough (1999) for a description of foreign exchange market, including foreign exchange derivative, activity in the New Zealand market. Also see Hawkesby (1999) for a description of the main foreign exchange derivatives.

[3] Relevant papers include McCallum (1992), Wei (1996), and Helliwell (1998). The literature is discussed in Hargreaves and McDermott (1999).

models is to test, as above, whether the existence of a national border between two cities increases or reduces trade between them. These studies invariably find that the national border is an extremely powerful factor in explaining trade patterns. That is, after controlling for the size of the cities and their distance apart, cities on opposite sides of the border trade much less than the gravity models predict. Results from 1988-1990 data for US and Canadian cities suggested the border reduced trade between cross-border cities by a factor of around 20, while studies with more recent data (1993-1996, after the North-American Free Trade Agreement) found a factor of around 12.[4]

A raft of other studies has recently shown that prices also exhibit home bias. The prices of an identical product are much more correlated across cities in the same country than across cities that are in different countries. Coleman and Daglish (1998) show that this is true of New Zealand and Australia. If trade between nations was uninhibited, arbitrage should make these differences disappear. For example, if vegetable prices rise in Sydney, this will tend to push Melbourne prices up as Australian supply is diverted to Sydney. If markets are completely open, Auckland vegetable prices should also rise as some New Zealand supply is diverted across the Tasman.

So while the proportion of world output traded on international markets has risen over the last 50 years, the evidence from the home bias literature indicates that people still tend to trade mostly within national borders: "globalisation" is not yet complete. One possible reason, from a long list of possibilities, for this lack of full international integration is the uncertainty, and hence impediment to trade and investment, caused by exchange rate volatility.

[4] Studies on other OECD countries (eg Wei (1996) and Helliwell (1998)) tend to give milder, but still significant, estimates of home bias (as low as 2.5). The discrepancy between this result and the US/Canadian figure is likely to relate partly to methodology: the OECD-based studies require extrapolation from official data sources, as sub-national output and trade accounts are not available for countries other than the US and Canada.

The relationship between exchange rate volatility and trade

Over the last 30 years, a large number of studies have attempted to determine empirically whether there is a link between currency volatility and trade. These studies have differed in the way in which they measure "volatility," the countries they look at, their sample periods, and their econometric techniques. Overall, the studies[5] generate a fairly inconclusive picture: many studies find no significant effect, some find a *positive* effect of exchange rate volatility on trade, and some find evidence of a small negative effect. But virtually no studies find effects large enough even to begin to explain the substantial "home-bias" discussed above. Why might this be? Some economists have pointed out that flexible firms can actually benefit from exchange rate volatility, by selling their products in markets where currencies are high, and sourcing inputs from countries whose currencies have fallen. Another possibility is that variable exchange rates do not concern exporters and importers because future exchange rates can be 'locked in' using forward markets.

To our knowledge, the proposition that the ability to hedge should mitigate concerns about exchange rate volatility has not been empirically examined, except in one recent study. The results of that study (Wei (1999)) showed that the volatility of exchange rates (from month to month) did not seem to affect trade even for country pairs where hedging instruments were unavailable. This result suggests that the absence of a clear empirical relationship between exchange rate volatility and trade cannot be attributed to the ready availability of hedging instruments.

In summary, the existing **empirical** literature on whether exchange rate uncertainty impedes trade, and if not, whether it is the ability to hedge foreign exchange uncertainty that explains the absence of adverse effects, is rather inconclusive. Given this background, in our own analysis we have adopted essentially a "microeconomic" approach. That is, our focus in this article is on understanding the hedging instruments that are available, on how effective they can be, and on the costs of and impediments to their use in a commercial setting.

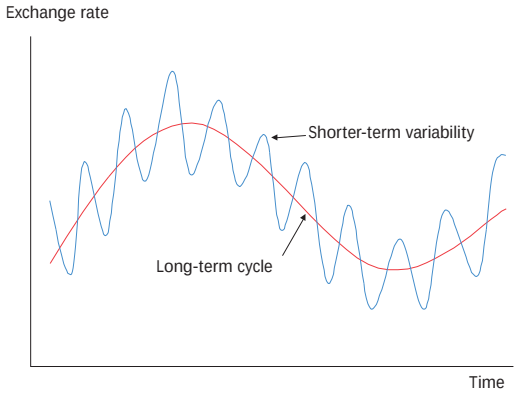
[5] IMF (1984) is a useful reference, while Cote (1994) is an updated survey.

Our analysis has been informed to a significant extent by interviews with commercial bankers, and importing and exporting firms.

3 What is hedging, is it effective, and what is the cost?

A necessary first step is to clarify what we mean by "currency fluctuations." In particular, we need to be clear on whether our concern is with short-term volatility, say, up to an annual frequency, or longer cycles that last a few years or more. (See figure 1). We examine how cost-effectively hedging strategies can counter each form of variability.

Figure 1: Exchange rate fluctuations: short-term and long-term cycles



There are a number of different instruments and approaches that can be used to manage currency risk in international trade transactions:[6]

- forward foreign exchange contracts;
- structural or balance sheet hedges;
- invoicing in local currency; and
- use of foreign exchange option contracts.

Forward contracts

A forward foreign exchange contract involves contracting today to buy or sell a foreign currency at a future date at an exchange rate agreed today. Thus, for example, exporters can contract today to sell the foreign exchange proceeds they expect to receive at a future date, so as to insulate themselves from fluctuations in the exchange rate in the interim.

Generally, the forward exchange rate on a given day will not be the same as the spot rate. The difference stems directly from the interest rate differential between the two currencies (see box 1, overleaf).

Sometimes this difference between the forward and the spot rates (known as "forward points") is interpreted as a "cost" or "benefit" of hedging, but we are not sure this interpretation is strictly correct. As shown in box 1, a forward exchange contract is equivalent to borrowing one currency and investing the proceeds in the other. So, unless the interest rates for the two currencies are identical, there necessarily is an interest "benefit" or "cost" (depending on whether one is selling (borrowing) or buying (lending) the higher or lower interest rate currency).

From our discussions with the firms we interviewed, it is apparent that the "forward points" component of forward exchange rates, influences firms' perceptions of the cost of forward contracts, and hence their willingness to use them. For example, NZD interest rates for most of the 1980s and 1990s were above most trading partner interest rates. That meant that forward selling rates for foreign currencies against the NZD rate were generally below the spot rate. This provided something of an inducement for exporters to hedge, and for importers not to.

However, this forward exchange rate benefit (for exporters) or cost (for importers) is not a **net** benefit or cost. Rather, since interest rate differentials tend to reflect expected movements in exchange rates, they are compensation for

[6] Note that in this article our primary focus is on the hedging of the receipts and payments involved in international trade – that is, export and import transactions. Of course, the hedging of foreign debt and investment is also an important and not entirely unrelated issues. Some firms hedge their import and export foreign currency cash flows with foreign currency balance sheet assets/liabilities and we consider this aspect. But we do not address balance sheet financial stability issues.

Box 1: Borrowing overseas, forward contracts, and "forward points"

In this box we show how a forward exchange rate is equivalent to borrowing in one currency and investing the proceeds in the other. We also show how the forward exchange rate reflects the interest differential between them.

Assume a USD interest rate of 5 percent per annum, a NZD interest rate of 6 percent per annum, and a current (spot) exchange rate of NZD 1 = USD 0.5000. We can demonstrate the equivalence of borrowing and lending the two currencies with a forward exchange contract as follows:

Cash flow	**Now**		**In 1 year**
Borrow USD for one year (at USD interest rate at 5% pa)	+USD	1.00	-USD 1.05
Spot sale of USD for NZD (spot rate = 0.50) (financed by the USD borrowing)	-USD	1.00	
	+NZD	2.00	
Invest NZD for one year (at NZD interest rate at 6% pa)	-NZD	2.00	+NZD 2.12
Resulting one year forward rate	1.05/2.12 = .4953		

The immediate borrowing, investment and spot foreign exchange transactions all cancel out: in other words, there is no initial exchange of one currency for the other. One year into the future, however, the firm is obligated to pay USD 1.05 and receives NZD 2.12. This is effectively a net forward exchange of USD for NZD. The implied forward exchange rate is USD 1.05/ NZD2.12 = 0.4953, ie one percent lower than the current spot rate of 0.5000. In other words, a firm could just as well achieve the same result as produced by the above series of transactions simply by buying a forward contract in which the exchange rate will be the spot rate adjusted for the interest differential between the two currencies.

Also note that the two shaded transactions (the borrowing of one currency and the lending of the other), when combined into a single contract, constitute a foreign exchange swap contract. Thus, a foreign exchange swap contract combined with a spot contract is also equivalent to a forward contract, or put differently, a forward contract can be decomposed into a 'spot' and a 'swap.'[7]

an offsetting expected change in the value of the currency.

Consider, for example, firms that borrowed Swiss francs in the mid-1980s when NZD interest rates were very high. Those firms, by borrowing Swiss francs, obtained an interest cost advantage, but at the same time exposed themselves to the risk that their loan would expand in size if the New Zealand currency fell (as in fact happened). Correspondingly, an exporter who sells foreign exchange forward at a time when NZD interest rates are high, to capture the benefit of forward points, trades off any benefit from subsequent (expected) depreciation of the exchange rate. For this reason, we do not think forward points should be included in the benefit/cost equation when evaluating forward contracts as a hedging instrument, any more than we think one should think of the interest saving from borrowing in a low interest rate currency as a benefit from foreign currency borrowing. At the very least, the interest differential is not something that should be factored into the cost/benefit equation in isolation from the expected change in the value of the currency.[8] Or put differently, we think that the usefulness,

[7] Indeed, the deep foreign exchange markets are the spot and the swap markets. Forward contracts are primarily an "end-user" product (see Hawkesby (1999)).

[8] How well changes in actual exchange rates map to what the forward rate suggested and thus whether forward points can profitably be exploited, is examined in Ha and Reddell (1998).

and costs, of forward contracts should be evaluated in relation to their role and capacity to hedge against **unexpected** exchange rate changes, not expected changes as embodied in interest differentials and in the forward points that are keyed off those interest differentials.

Leaving aside the cost or benefit of forward points — which for the reasons just given, we think should be left aside — forward contracts are virtually cost-less to the user. The banks that provide them generally charge no fees to customers dealing in "wholesale amounts" and the bid-ask spreads (the margin between the rate at which banks buy and the rate at which they sell) are not materially different from those for spot transactions. But are forward contracts effective in hedging foreign exchange risk? If forward contracts are "free," is it also the case that "you get what you pay for"? Here we need to consider separately the issues of hedging against short-term and longer-term exchange rate fluctuations.

We consider first hedging against short-term exchange rate volatility. Take, for example, an exporter who secures an export sale contract with the price denominated in a foreign currency, and with payment due in 180 days time. By immediately entering into a 180-day forward foreign exchange sale contract, the exporter can more or less costlessly "lock in" the contract sale price in local currency terms. It is in this transaction by transaction sense that it is often said that forward contracts can be used to "lock in" the profit margin in an export sale. Analogously, importers can lock in the local currency cost of imports that they have contracted to buy. This provides effective protection against unexpected adverse movements in the exchange rate. However, it also, of course, removes the possibility of benefiting from any favourable movement in the rate.

Hedging for longer-term exchange rate cycles, however, is more problematic. Consider a manufacturer who is planning to invest in plant to expand export production. Though, at the present level of the exchange rate, the expansion might be seen as profitable, there is uncertainty about how the exchange rate will move over the life of the plant — say, 10 years. Hence, the firm faces an exchange rate exposure over the long term: they make local currency outlays, most of which will be incurred up-front in the form of the cost of the plant expansion, but expect to earn a revenue stream that will be received in foreign currency and spread over 10 years. How can the exporter use forward contracts to "lock in" the expected profit from the expansion?

In one sense, the answer here is no different from that required to lock in the profit from a single export sale: take out a forward contract in an amount that covers the export receipt, but in this case 10 years' worth of expected export receipts. However, there are a number of reasons why this strategy might be neither feasible nor sensible.

First, by fixing its exchange rate in respect of a 10-year revenue stream, the firm would be foregoing the potential to benefit from favourable movements in the exchange rate over the 10-year period. Suppose international trading conditions facing New Zealand exporters, and our exporter in particular, were to deteriorate, and this caused the exchange rate to depreciate. Our firm, having fixed its exchange rate, would not pick up any benefit from the currency depreciation. Moreover, in such a circumstance, it may find its export sales fall short of expectations, in which case the amount of forward cover taken out would turn out to be excessive. That is, it will have committed to sell more foreign exchange than it will have available to sell and, instead of having hedged its foreign exchange risk, will have inadvertently taken on a foreign exchange position.

A number of New Zealand export firms suffered this experience in 1997/8, when, because of the Asian crisis, they suffered an unexpected downturn in export sales. Because they had already covered a large portion of expected sales with forward contracts, they did not get the immediate benefit of the depreciation of the NZD that occurred and, in some cases, additionally incurred direct losses on forward contracts that turned out to be in excess of export realisations.[9]

As a general rule, the longer the horizon over which a trade-related foreign currency revenue (or payment) stream is envisaged, the more uncertain that revenue stream will be,

[9] To meet their forward commitment to sell foreign exchange under those contracts, they had to, in effect, buy (now more expensive) foreign exchange in the spot market to make up for the export shortfall. Buying foreign exchange at a high price and selling at the previously fixed lower (forward) price resulted in a loss.

and hence the greater the risk that forward contracts taken out to cover it will generate an exposure instead of a hedge. Indeed, over long horizons, during which trading circumstances can change substantially, a flexible exchange rate itself can be viewed as a "hedge." Again, the Asian crisis experience illustrates the point. It was the "unhedged" export firms that fared best during that period. The lesson from that experience was that hedging anticipated, but not contractually certain cash flows — and hence cash flows that, given a change of circumstance, may not eventuate — is as likely to generate as it is to reduce risk. This is much less an issue where a known export sale, or import order, is subject to a binding contract, and payment is due in a short period.

A second and similar risk that arises from using forward contracts to hedge a long-term foreign currency revenue stream is inflation. If a firm's production costs for an export item rise because of unexpected inflation, its hedged export revenue may no longer be sufficient to cover its expenses. That is, by hedging a distant stream of foreign currency revenues with forward contracts, it may be possible to avoid exchange rate risk, but at the price of taking on inflation risk. This could be particularly damaging for an importer dealing with a high-inflation country: if the foreign currency price of its imports rises with overseas inflation, but the exchange rate has been locked in by the local importer, then any scope for the rising foreign price to be offset by the foreign currency becoming cheaper to buy will have been foregone. In this case, our importer will find it difficult to remain a price-competitive supplier to the New Zealand market.[10]

Thirdly, while forward contracts generally do not involve any direct financial cost (relative to spot contracts), they impose an indirect cost by utilising credit lines. Banks allocate a credit risk amount to the forward contracts they write in recognition of the possibility that the exchange rate will move to give the contract a value to the bank, and that the customer will be unable to perform on the contract on due date (as would be the case if it becomes insolvent). The size of the allocation rises as the length of the forward contract increases.[11]

The general point here is that hedging with forward contracts necessarily involves trade-offs amongst a range of risks: reducing one risk necessarily gives rise to different sets of risks. While forward contracts allow virtually cost-less **management** of foreign exchange risk, they are not a "silver bullet," especially for managing foreign exchange risk over longer horizons. On the contrary, locking in an exchange rate over a long horizon can itself be a risky strategy, since, should circumstances change, what initially was a hedge can turn out to result in a substantial risk exposure.

Structural, or "Balance Sheet" hedges

We showed in box 1 that the hedge provided by a forward contract could also be constructed by borrowing or lending in the relevant foreign currency. Given the equivalence of forward contracts and foreign currency borrowing/lending as ways to hedge foreign exchange risk, we would expect them to exhibit the same basic features, in terms of cost, feasibility of use and hedging effectiveness. In many respects this is the case, and most of the observations already made on forward contracts also apply to foreign currency borrowing/lending hedging strategies.

However, it is also the case that forward contracts are generally favoured for shorter-term hedging of trade flows, while borrowing or lending in foreign currencies is normally seen as a way to establish a long-term structural hedge.

One reason why forward contracts are used to establish shorter-term hedges is their relative flexibility. Contracts can

[10] Another way of explaining this problem is to say it is the *real* (inflation-adjusted) exchange rate that matters, and that fixing your *nominal* exchange rate makes it impossible for the nominal exchange rate to shift in response to inflation and stabilise your real exchange rate.

[11] The longer the term of the forward contract, the greater the potential for the exchange rate to move, and the greater the potential for the firm's creditworthiness to deteriorate in the meantime. It is generally not very difficult for a bank to conclude that a firm that is creditworthy today will be creditworthy in a few months time, but much less easy to reach the same judgement where the credit risk horizon is, say, a decade. An alternative to using long-term contracts that is more efficient in terms of use of credit lines, is to take out short-term contracts but in sufficient amount to cover the aggregate expected cash flow. These short-term contracts can then be "rolled" (or renewed) as they mature, with gains/losses being realised at each rollover. This effectively builds margin payments into the hedge.

readily be rolled forward, or closed out,[12] according to the firm's view of the exchange rate. Also, forward contract maturities can be managed flexibly, through the use of swaps contracts. For example, a common practice is for a firm to enter into a spot contract immediately it sees a favourable opportunity in the market. Later, by executing a swap contract, the spot contract can be turned into a forward contract, with a maturity date that matches the underlying export receipt or import payment date.

The arrangements under which banks will deal with firms in foreign exchange, including in forward contracts, are also more flexible than those under which they will establish debt facilities. The documentation and security that banks require to support a foreign exchange dealing line often are less demanding than those required for debt facilities. And arranging foreign currency debt facilities in offshore (foreign currency) markets tends to be a more rigorous process still, given that New Zealand firms will be less well known in those markets.[13] For these reasons, managing foreign exchange risk by managing the currency composition of the balance sheet through foreign currency borrowing tends to be limited to large corporations with the financial strength and profile to access offshore debt markets, or with offshore operations that can fund themselves directly in the markets in which they operate.

More generally, firms often conduct their business in ways that create 'natural' hedges to exchange rate risk. For example, a New Zealand firm exporting to Australia could source a quantity of its inputs from Australia, in order to balance Australian dollar receipts and obligations. The firm could even locate a portion of its own production in Australia to establish a natural hedge. Or the owners of the firm may recognise that the value of their asset will fluctuate with the value of the Australian dollar and structure the rest of their investment portfolio accordingly, thereby eliminating any need for the firm itself to hedge foreign exchange risk. These possibilities tend to reduce the importance of exchange rate risks for firms (and their owners) that can be flexible enough to take advantage of them.

Invoicing in local currency

Invoicing in local currency is another possible way to manage exchange rate risk by, in effect, passing it to the trading counterparty. However, invoicing in local currency does not, of itself, provide complete protection against exchange rate risk. For example, a large proportion of New Zealand wool is sold at auctions conducted in New Zealand dollars. Yet movements in the NZD exchange rate are generally passed more or less directly through to the NZD wool price.

What matters, therefore, is not just the currency of invoicing, but the ability to negotiate a pricing arrangement, whether in foreign currency or local currency, that leaves the effect of exchange rate changes with the trading counterpart. For example, where a New Zealand exporter has a degree of market power, and can negotiate fixed-price trade contracts in NZD, exchange rate risk is passed to the offshore party, at least for the term of those contracts. In the case of an importer that supplies local industry, the same result can be achieved by establishing fixed-price supply contracts with its overseas suppliers in local currency. Alternatively, it might seek to pass the foreign exchange risk down the supply chain, by on-selling to its local clients in foreign currency. Of course, the ability to secure such arrangements will depend on a range of factors, including relative negotiating strengths, and how well placed the trading counterpart is to absorb or manage the exchange rate risk, for example, whether it can take advantage of a natural hedge.

Traditionally, there has been a presumption that New Zealand exporters and importers have been international price takers rather than price setters, and have had little choice but to accept exchange rate risk as something that is inherent in international trade. But recent anecdotal evidence (including from our discussions with New Zealand exporters and importers) suggests more firms these days are not taking it as a given that they have to be price takers, and some are seeking to negotiate innovative arrangements that involve foreign exchange rate risk being passed to their customers and/or suppliers. In these cases, exchange rate risk itself, in a sense, becomes a traded commodity.

[12] A contract is rolled forward at maturity simply by entering into a new contract for a further period. And a contract can be closed out ahead of maturity by entering into an equal and opposite contract on the date it is desired to achieve the closeout.

[13] While local banks provide foreign currency accounts, these are generally current accounts, so foreign currency debt sourced from them (like debt sourced from any current account) tends to be relatively expensive.

Options

Another hedging possibility available to New Zealand exporters and importers facing foreign exchange risk is foreign exchange options. As the name suggests, an option contract differs from a forward contract in that it gives the holder the right, but not the obligation, to buy (or sell) one currency in exchange for another at a specified exchange rate, and at an agreed point in the future. Under a forward contract the holder **must** buy or sell on the agreed date; with an option, the holder has the **choice**.

Take an exporter due to receive USD 1 million in three months time. It can agree a forward contract to sell these US dollars for, say, NZD 2 million, at a NZ dollar forward rate of USD 0.50. Alternatively, the exporter could buy a 'call' option, which gives it the opportunity to buy NZD 2 million in exchange for USD 1 million in three months time (also at a rate of USD 0.50). But with the option, unlike the forward, the exporter does not have to sell its US dollars at that rate; it may choose instead to sell them in the spot market, depending on the exchange rate at that time. If, in three months time, the NZD/USD spot rate is 0.45, the exporter will sell its US dollars in the spot market, receiving NZD 2.22 million. If the spot rate is NZD 0.55, the exporter will exercise its option, receiving NZD 2 million. In the latter case, without the option, it would have sold its US dollars in the spot market, receiving just NZD 1.82 million (see figure 2).

The option thus protects the exporter against adverse movements in the exchange rate, without removing the benefit of favourable movements. Unsurprisingly, this option would be very attractive to our exporter, if it were free. It is equally unsurprising that such an option is **not** free. Banks are usually the providers of these options. The contract looks very different from their viewpoint, since they carry **all** the risk of the exchange rate moving against the exporter, with none of the upside. Hence the bank charges the exporter a premium for the option contract.

The exporter's option contract thus starts to resemble insurance cover. It protects against the probability of an adverse event, in this case the NZD appreciating, to the detriment of the exporter, in exchange for receipt of a premium. The bank receiving the premium carries the risk, much like an insurance company.

The two mainstream option contracts are calls and puts. The New Zealand exporter in the example above purchased a NZD call option, giving it the right to buy the NZD. A New Zealand importer would typically purchase a NZD put option, giving it the right to sell NZ dollars in exchange for (typically) US dollars.

What premium is likely to be paid for this insurance? Consider the example of the exporter who will receive USD 1 million in three months time who buys a 3-month call

Figure 2: The impact of buying an option on the revenue of a New Zealand exporter

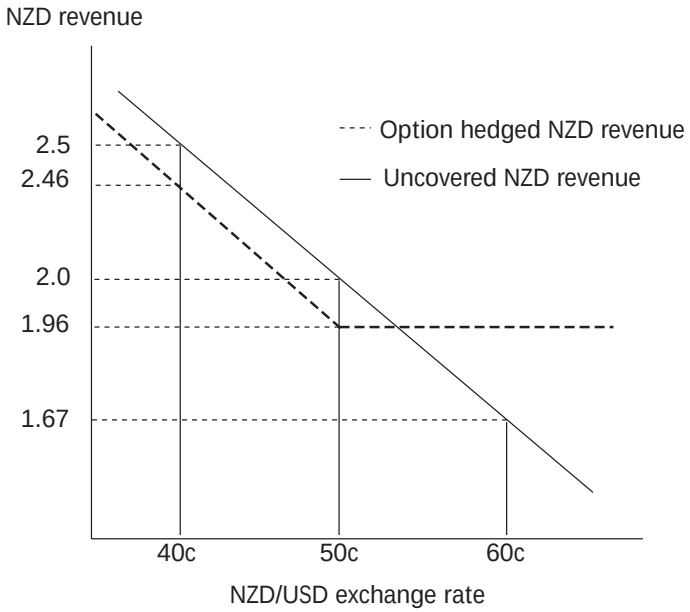


Table 1: The cost of a call option - giving the right to buy NZD in exchange for USD

Assumptions:
- **Option face value = NZD 2 million**
- **Volatility = 10%**
- **NZ Spot rate = Forward rate = 0.5000****

		Premium for option with maturity of:		
Exercise price		**1 week**	**3 months**	**12 months**
0.5500	USD pts*	0	3	48
	NZD	$0	$1,200	$19,200
0.5000	USD pts	28	100	199
	NZD	$11,200	$40,000	$79,600
0.4500	USD pts	500	501	536
	NZD	$200,000	$200,400	$214,400

* An inter-bank dealer will price a NZD/USD call option in terms of USD points, where one point is equivalent to one hundredth of a US cent per NZ dollar of cover. The option price, or premium, is then converted into NZ dollars at the current spot exchange rate.

** For simplicity, we assume a zero interest rate differential between the NZD and USD; hence the spot and forward prices are identical.

option giving the right to sell those USD at the current exchange rate (say 0.50). This is called an "at-the-money" or ATM option, since the option exercise price equals the current forward rate, and provides full insurance to the exporter. The cost would be around NZD 40,000, or 2 percent of the expected revenue.[14] This cost, as discussed in Hawkesby (1999), is determined by a range of factors including the volatility of the currency, the term of the option, and its strike price. Table 1 sets out a range of different indicative premia for different option maturities and different exercise prices.

Table 1 demonstrates that the cost of an option rises as maturity lengthens. Covering twelve months, rather than three months, forward raises the cost from NZD 40,000 (2 percent) to NZD 79,600 (4 percent) of NZ dollar revenue for an at-the-money call. The table also illustrates that the cost of a call option rises as the exercise price falls.[15]

The attitude of New Zealand businesses to the benefit of this insurance varies considerably. One area where companies appear happy to buy options is when submitting a fixed-price tender in foreign currency. Suppose a New Zealand exporter submits a fixed-price tender in US dollars. In doing so, he or she has to assume a NZD/USD exchange rate. However, the rate may move unfavourably between the time the tender is submitted and the time of being advised whether or not the tender has been won. Many firms take out an option for the duration of the tender period, say two weeks, giving them the right to initiate a forward contract at an agreed NZD/USD exchange rate, should they be successful in the tender.[16]

However, this is only a small part of New Zealand companies' foreign exchange exposure. For their established and on-going export revenues or import costs, companies appear to be generally reluctant to pay option premiums to obtain cover against exchange rate risk. This probably reflects the fact that the up-front cost of the option is often a significant proportion of the expected margin on the business which is

[14] The option prices shown have been calculated according to the standard Black-Scholes formula, with a volatility assumption consistent with the recent volatility of the NZD/USD rate. Banks dealing rooms quote on a similar basis. Volatility is essentially the standard deviation of the asset price. For example, implied volatility of 10% pa for the exchange rate suggests that there is a 68% chance that the exchange rate will be within 10% of its starting value at the end of the year.

[15] Prices also rise as the expected volatility of the currency increases. In the table, the exercise prices chosen are deliberately extreme for illustration. The 0.45 call is so far in-the-money for the 1 week and 3-month call options that it is virtually certain to be exercised (given our assumption about volatility). Hence the premium or cost of the option is its intrinsic value (the difference between the forward price and the strike price). The option with the 0.55 exercise price is so unlikely to be exercised that it is virtually free.

[16] This would be done by exercising the option (to create the spot leg of the forward contract) and simultaneously executing a swap contract, to create the forward leg. Refer to Box 1 to see how a spot contract and a swap contract, on being combined, create the equivalent of a forward contract.

being hedged: if the option costs one percent of expected revenue and the expected profit margin is five percent, buying the option cuts out a fifth of the profit. Forward contracts, by contrast, involve no initial outlay.

However, the option premium in a sense exaggerates the cost of option cover. Often, the option will be exercised, and yield a positive return for the purchaser (an ATM option is likely to be exercised around half the time). On averaging these positive returns across a series of repeated purchases, they are likely to amount to a significant proportion of the up-front cost of the cover, so the *net* cost will be much lower than 2 percent on average.[17]

Notwithstanding that option premiums, in net terms, are not as costly as they may initially appear, it remains the case that firms are averse to paying them. This is reflected in special option structures (described in box 2) that have been developed to significantly lower the option premium, in some cases even to zero.

Finally, we explained above that use of forwards typically raised credit issues between the bank and its customer. This is rarely the case with options, since the customer typically pays the premium when the contract is entered into, and has no further obligation. An exception is if the firm is also writing an option (as in a zero cost option structure), since in that case the firm does have a potential obligation to the bank.

Some further general influences on hedging practices

Three further factors that influence firms' hedging behaviour emerged in our interviews. These were the influence of accounting requirements, tax legislation, and the threat of price competition.

Accounting standards require that gains and losses on hedges that cannot be tied to an underlying transaction (as will be the case for longer-term hedges that are put in place to cover envisaged, but not contractually established trade flows) be accounted for as foreign exchange trading income, rather than as an offset to underlying trade revenue/expense. Thus, such hedges do not remove the effect of exchange rate swings from measures of firms' trading performance (such as earnings before interest and tax (EBIT), and net profit before extraordinaries), which tend to be the main focus of management and shareholder attention. This consideration reinforces the tendency for firms to focus mainly on hedging known near-term sales or purchases.

Tax legislation can also be a factor. An example of how tax law influences hedging behaviour is where a firm has cross-border operations, ie a branch or a subsidiary in another country. Some firms hedge the net equity they have invested in those offshore operations, so as to protect their overall balance sheet from being exposed to the effect of exchange rate fluctuations. However, in some circumstances, the underlying gain or loss is not recognised for tax purposes, whereas the gain or loss on the hedge is. This can bias firms against hedging such exposures, or if they do, to "over hedge" so as to generate an after-tax gain or loss to offset the gain or loss on the underlying asset.

In our interviews, a third comment we heard, repeatedly, was that a significant determinant of firms' hedging strategies is the strategies they think their competitors, or potential competitors, are following. A concern of many firms appears to be that if they adopt a strategy that materially differs from "the norm," they expose themselves to the increased risk of price competition from actual or potential competitors. For example, an importer may cover their imports a long way forward, on the basis of a view that the exchange rate is overvalued and over the medium term will depreciate. If they turn out to have made the wrong assessment, they are then exposed to competitors taking the opportunity to undercut their pricing. Adopting a foreign exchange hedging strategy that is outside the norm exposes the firm to competition risk. An analogy is how match-racing yachts (as in the America's Cup regatta), mostly cover each other, rather than set out independently on the course to the finish line they assess to be best. There seems to be a sense that provided "everyone is in the same boat," unexpected changes in the exchange rate are more manageable.

To conclude this section, the clear tendency appears to be

[17] An analogy here is the cost of, say, car insurance. While the insurance premium is an up-front cost, most people sooner or later have an accident and make a claim. In assessing the cost of car insurance, the claim benefits also need to be taken into account.

Box 2: Zero cost option strategies

One way to avoid paying an option premium is to use a so-called "zero-cost" option structure. Take for example an exporter. Instead of buying an ATM call option, it might agree with its bank to buy one call option, and simultaneously **write** one put option in exchange. This put option gives the bank the right to **sell** NZD to the exporter at the agreed rate. The premium received by the exporter for the put offsets that paid for the call.

For example, imagine an exporter has signed a contract such that it will receive USD 1 million export revenue in 3 months time. Suppose the current NZD/USD spot exchange rate is USD 0.50 and that the exporter fears that the NZ dollar might appreciate sharply (to possibly USD 0.55) in the next quarter. They could then purchase a NZD 3-month call option with an exercise price of USD 0.52 (currently "out-of-the-money") to protect against the exchange rate moving above USD 0.52 without giving up the benefits of a potential NZD depreciation. The cost of the call contract would be approximately NZD 6,000.

To offset the cost of the premium from purchasing such a call, the exporter might then be willing to write (sell) an "out-of-the-money" put option with an exercise price of around USD 0.48. By writing such an option, the exporter is exposed to the risk of having to buy NZDs at a rate of USD 0.48 should the exchange rate fall below that level (at a loss equivalent to the difference between the USD 0.48 exercise price and the prevailing spot rate). Such an option structure would allow the exporter to use the premium it receives on writing the put option against the premium it is required to pay on buying the call option. The premia can readily be calibrated to be equal and offsetting, so as to give a "zero cost option" by choosing the respective exercise prices accordingly.

As can be seen from table 2, the payoff schedule for this so-called "zero-cost" option strategy opens up exchange rate risks to the downside (column C). The exporter is insulated against an exchange rate appreciation without having to pay an up-front fee, but will have to pay out a substantial sum if the exchange rate depreciates sharply. However, a depreciation will make their underlying export revenue (column D) higher, offsetting this. Overall (column E) the result is not too different to what would happen if the underlying export revenue was simply sold in the forward market for NZD 2 million.

Other zero-cost option strategies, however, can open up larger exposure to exchange rate shifts. Sometimes, the structure actually involves the firm selling two or three puts for every call they buy: in the example above, the exporter might have written two puts around USD 0.46 instead of one around USD 0.48. For example, when the NZD was appreciating strongly during the mid-1990s, some exporters entered into these "leveraged" zero cost option structures, apparently on the basis of a firmly held view that the exchange rate would not fall very far – and even if it were

Table 2: Payoff schedule at expiry for a zero cost option (NZDm)

NZD/USD spot rate at expiry	**A** Purchase a call (X=52 cents)	**B** Write a put (X=48 cents)	**C** Zero-cost payoff (A+B)	**D** Underlying export revenue at spot exchange rate	**E** Net payoff with zero -cost option (C+D)
	$	$	$	$	$
0.591	225,000	6,000	231,000	1,692,000	1,923,000
0.565	148,000	6,000	154,000	1,769,000	1,923,000
0.542	71,000	6.000	77,000	1,846,000	1,923,000
0.520	-6,000	6,000	$0	1,923,000	1,923,000
0.500	-6,000	6,000	$0	2,000,000	2,000,000
0.481	-6,000	6,000	$0	2,077,000	2,077,000
0.464	-6,000	-71,000	-77,000	2,154,000	2,077,000
0.448	-6,000	-148,000	-154,000	2,231,000	2,077,000
0.433	-6,000	-225,000	-231,000	2,308,000	2,077,000

to, then that would be beneficial for their long-run business. In the event, the exchange rate fell substantially and sharply in 1997/98, and some firms found themselves exposed to the put options they had written. Leveraged option structures of this sort actually increase companies-exposure to 'abnormal' (or tail of the distribution) events.

for firms to limit hedging to relatively short horizons, and to "ride out" longer-term cycles in the exchange rate. Long-term hedging seems to be thought of as risky (if using forwards) or overly expensive (if using options). The additional issues concerning tax and accounting rules and competition risk appear to accentuate, rather than offset, the tendency towards leaving long-term exposures unhedged. The current general pattern appears to be substantial hedging of known trade receipts and payments out to around six months, but with less cover for flows expected between six and twelve months ahead, and a rapid fall-off in the extent of cover for trade expected to occur beyond 12 months.

4 Hedging costs in perspective: how do they compare with other impediments to trade?

The willingness of firms to pay to reduce currency risk – and the amounts they are prepared to pay – provide an indication of how much firms "dislike" that currency risk. The previous section has provided some tentative evidence in that regard. The general picture is one of firms being somewhat reluctant to pay to reduce currency risk. In the broad, this assessment is based on the apparent extent to which firms prefer to use (low-cost) forward contracts in preference to (more expensive) options. Indeed, to "economise" on the cost of hedging foreign exchange risk, firms appear to have been willing to carry significant risks. This is evidenced by past use of forward contracts (rather than options) to lock in exchange rates beyond horizons within which cash flows are at all certain, and use of leveraged, "zero cost," option structures (which involve trading off risk-reduction for lower cost).

Another way we can assess how much exchange rate risk might weigh on firms' willingness to engage in international trade is to compare how much they are prepared to pay to reduce currency risk with how much they are prepared to pay to reduce some of the other risks that are inherent in international trade. For the most part this is very difficult, as there is no simple way to quantify how much it costs to overcome barriers to trade such as language and cultural differences. But one potential impediment to trade that we can quite readily put dollar amounts to is the cross-border credit and payment risks that are inherent in international trade. We can do this by examining the fees that exporters and importers pay their banks for the "trade finance" services that banks provide to exporters and importers. These services mainly involve banks in managing and/or bearing, on behalf of their exporting and importing customers, the cross-border credit risks that are involved in international trade. In other words, the fees that banks charge for providing these services provide a bench-mark against which we can gauge, at least in broad terms, the relative significance of exchange rate risk and cross-border payments risks for exporting and importing firms.

The nature of the payment and credit risks in cross-border trade is, for the most part, no different from those that arise in domestic trade. Whenever a seller extends trade credit to a buyer, a credit and payment risk is present. In international trade these risks, however, tend to be more pronounced. Generally, the seller will not be so familiar with the credit standing of the overseas buyer, and if payment difficulties arise, is much less well placed to take action to collect the account. It likely will face a legal system and commercial cultures and norms that are different from its own, and, of course, the relative lack of proximity is a handicap.

To mitigate these risks, exporters often negotiate with their overseas buyers payment terms that involve their respective

banks in managing the exchange of documents of title (and other related commercial documents) against payment (known as a documentary collection), and sometimes additionally a requirement that the buyer's bank provide a pre-shipment assurance of payment (a letter of credit).[18] Banks are generally well placed to act as intermediaries between exporters and importers in these ways, given their respective customer relationships on the one hand, and their international banking network relationships on the other.

While no data are available on the amount of New Zealand trade covered by trade finance facilities, indications are that about 15-20 percent of merchandise imports and exports is covered by one or more trade finance facility. The fees charged vary according to the service provided, but typically range from about 0.1-0.3 percent of the export/import value for documentary collections, and 0.5-0.75 percent for establishing a letter of credit. Fees for confirmations of letters of credit cover a range, depending very much on the bank and country risk involved, but typically might be about 1.0-2.0 percent of the value of the trade transaction.

In comparing the cost of trade finance services with the cost of hedging, the relevant hedging cost is that for covering shorter-term exchange rate risk, rather than longer-term hedging. (Trade finance services are provided very much on a transaction by transaction basis). On this basis, it appears that short-term exchange rate risk is covered more extensively than are the cross-border payment and settlement risks, but that where cover for the latter is required, it is significantly more expensive.[19] So a proportion of firms are prepared to pay considerably more to cover trade finance risks than they pay to cover currency volatility. This suggests that, for these firms at least, the risk of not getting paid at all is more pertinent than the risk of a gain or loss from currency shifts.

On the other hand, where the trading partner is a culturally and legally similar economy, of good credit standing, as in the case of Australia and the United States, use of trade finance facilities tends to be less prevalent than where the trade is with emerging economies.[20] So in considering trade across the Tasman or with the United States, the relative importance of payment and credit risks relative to exchange rate risks may be more finely balanced.

5 Conclusions

Do exchange rate fluctuations impede trade, or does the ability to hedge exchange rate fluctuations largely counter any impediments that might arise from this source?

It seems reasonably clear that short-term fluctuations in the exchange rate can be hedged with little difficulty and at little cost. This should allow firms to insulate themselves from short-horizon exchange rate volatility and reduce the effect of that volatility on trade. So longer horizon volatility — that is cycles over 5 to 10 years — are likely to be the more serious exchange rate issues for firms.

At longer horizons the proportion of trade flows that are hedged drops away sharply. Longer-term hedging strategies that commit a firm to a forward trade, though low-cost, may actually accentuate risk. Long-term option contracts, which more effectively reduce risk, are widely regarded as expensive. Though this is partly a matter of perception, since the cost is much lower once the expected pay-offs from options are taken into account, if that perception deters firms from hedging, then it is significant nevertheless. In other words there does not appear to be much evidence that the availability and use of hedging instruments mitigates possible concerns about the adverse effect that these longer-term exchange rate cycles might have on trade.

There remains however, a question about how material any adverse effect of long-term exchange rate cycles on trade might be, or in other words, how strong the policy case for moving to a fixed exchange rate regime, as in a currency union arrangement, might be. We have not in this article

[18] A documentary collection involves the importer's bank retaining the documents the importer requires to take possession of the goods until the importer has accepted other legal documents which establish their obligation to pay the exporter. A documentary letter of credit is similar, but in this case the importer's bank assumes final liability for payment (with recourse on the importer). If the exporter is uncertain that the importer's bank is creditworthy, they may ask their bank to confirm this letter of credit.

[19] As discussed above, trade-finance costs average around one percent of revenues. In contrast, forward hedging is virtually cost-less, since the only cost (the bid-ask spread) is also incurred trading foreign exchange in the spot market.

[20] Though importing firms in a small country like New Zealand, when sourcing from large international suppliers, are more likely to find that payment under documentary collection or letter of credit terms is still required.

attempted to answer this question directly but we can make a number of points:

- First, currency uncertainty is only one of a long list of uncertainties and impediments to trade that firms face, and it may not be a dominant one. Our analysis suggests that firms focus at least as much on the need to manage the threat of price competition from competitors as they do on the uncertainties caused by exchange rate cycles. Also, it appears that for some firms, the credit and payment risks involved in cross-border trade may rate as a risk at least as much as does exchange rate risk.
- Secondly, while a currency union with a major trading partner like Australia or the United States would provide cost-less hedging of the nominal exchange rate with that trading partner. But if that bilateral exchange rate is an important absorber of shocks, then nominal exchange rate certainty could actually be undesirable. The next article in this *Bulletin* sheds some light on whether there is a major need for shock-absorbers across the Tasman (between Australia and New Zealand) and the Pacific (between the United States and New Zealand).
- Thirdly, even a currency union would only stabilise our exchange rate against that of our union partner, so New Zealand firms will always be exposed to some exchange rate uncertainty. So firms that operate in the tradables sector would still be faced with the need to manage currency risk. The analysis in this article has shown that while well-managed hedging strategies can assist in that regard, they are no "silver bullet." Other risk absorption capacities are clearly also required, such as that provided by a debt/equity structure that can buffer longer-term fluctuations in the exchange rate, as well as the other uncertainties all firms face. Policymakers can also help, by avoiding, to the extent possible, policy settings that cause exchange rate swings beyond those needed to maintain macro-economic stability over the medium-term.

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