



Reserve Bank of Australia

RESEARCH  
DISCUSSION  
PAPER

---

**Limiting Foreign  
Exchange Exposure  
through Hedging: The  
Australian Experience**

*Chris Becker and  
Daniel Fabbro*

RDP 2006-09

---

# **LIMITING FOREIGN EXCHANGE EXPOSURE THROUGH HEDGING: THE AUSTRALIAN EXPERIENCE**

Chris Becker and Daniel Fabbro

Research Discussion Paper  
2006-09

August 2006

International Department  
Reserve Bank of Australia

We acknowledge the research assistance of Bronwyn Kenna and are grateful to Guy Debelle, Christopher Kent, Michael Sinclair, Jonathan Kearns, Tim Hampton, and other colleagues at the Reserve Bank of Australia for their helpful comments. Any remaining errors are our own. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Reserve Bank of Australia.

Authors: [beckerc@rba.gov.au](mailto:beckerc@rba.gov.au), [fabbrod@rba.gov.au](mailto:fabbrod@rba.gov.au)

Economic Publications: [ecpubs@rba.gov.au](mailto:ecpubs@rba.gov.au)

## **Abstract**

The Australian economy has proven resilient to sizable exchange rate fluctuations over the post-float period. In part this can be attributed to financial institutions and non-financial firms learning to adapt to swings in the Australian dollar. This has included the increased use of financial derivative contracts to hedge their foreign exchange exposures. This paper examines the available evidence on the nature and extent of this hedging behaviour. Related to this, Australia's net foreign liability position is often cited as a vulnerability of the Australian economy to exchange rate depreciation. We show this not to be the case because much of the liability position is denominated in local currency terms. In fact, the amount of liabilities denominated in foreign currency is less than the amount of foreign currency assets held by residents.

JEL Classification Numbers: F21, F31, F41

Keywords: hedging, foreign currency exposure, derivatives

## Table of Contents

1.	Introduction	1
2.	Hedging Instruments	3
2.1	Natural Hedging	4
2.2	Foreign Exchange Derivatives	6
2.2.1	Outright foreign exchange forward contracts	6
2.2.2	Cross-currency interest rate swaps	8
2.2.3	Foreign exchange options	10
3.	Hedging Practices in Australia	11
3.1	Adapting to Exchange Rate Fluctuations	12
3.2	What Hedges are in Place?	14
3.3	Time Horizon of Firms' Hedging	16
3.4	Foreign Currency Exposure is Predominantly to the US Dollar	17
4.	Measuring Foreign Currency Exposure	18
4.1	Gross Foreign Assets and Liabilities	19
4.2	International Adjustment Augmented for Hedging Practices	22
4.3	Residual Risks to Consider	24
5.	Conclusion	26
	Appendix A: Foreign Currency Exposure of the United States	28
	A.1 Gross Foreign Assets and Liabilities	28
	References	30

# LIMITING FOREIGN EXCHANGE EXPOSURE THROUGH HEDGING: THE AUSTRALIAN EXPERIENCE

Chris Becker and Daniel Fabbro

## 1. Introduction

Exchange rate variations over time are a potential source of risk to cross-border financial obligations and trade-related transactions. Concern about the potentially disruptive financial and real consequences of such variations are reflected in the policy of some countries to explicitly limit the nominal variability of their currency *vis-à-vis* that of others. While this ‘fear of floating’ is the result of a complicated array of competing considerations, it nonetheless illustrates that limiting exchange rate variability ranks well ahead of other policy objectives in some countries.<sup>1</sup>

Since the Australian dollar was floated in December 1983, the economy has proven to be resilient to substantial exchange rate fluctuations. Arguably, this resilience has strengthened over time, as firms have learned to adapt to exchange rate variability, including through the development of the hedging practices of financial institutions and non-financial firms.

This paper examines foreign exchange hedging of direct balance sheet and transaction exposures and assesses their broader implications for the Australian economy. We draw on the quantitative results of Australian Bureau of Statistics (ABS) surveys in 2001 and 2005.<sup>2</sup> These surveys provide comprehensive data on foreign currency exposures and hedging practices and indicate that both financial and non-financial firms use derivatives markets extensively to hedge their foreign exchange exposures back into Australian dollars.

---

<sup>1</sup> Hausmann, Panizza and Stein (2002) provide a detailed discussion of the fear of floating among emerging economies.

<sup>2</sup> See ABS (2002, 2005).

A substantial body of literature deals with estimating the usual linkages between the exchange rate and the macroeconomy over time.<sup>3</sup> However, here we focus on the more readily quantifiable and direct financial gains or losses due to exchange rate changes, often referred to as transaction and balance sheet exposures.<sup>4</sup>

Transaction exposures typically arise for non-financial firms as a result of international trade. Since receipts and payments are often denominated in foreign currencies, the local currency value of these amounts varies with exchange rate movements. This type of exposure may pose an array of potential problems for firms. Take, for example, an exporter whose costs are largely denominated in local currency terms, but who sells output into world markets in foreign currencies. Exchange rate fluctuations directly affect revenue streams and profit margins as a result of lags between production and sales. Many firms in the Australian resources sector are in such a position. Importers face a similar transaction exposure, albeit for different reasons, since costs are typically denominated in foreign currency and revenues in Australian dollars.

For financial firms, balance sheet (or translation) exposure that arises from holding assets and liabilities denominated in foreign currencies is likely to be more important than transaction exposure. In addition to the financial sector, non-financial firms such as multinationals with offshore operations may acquire an exposure to valuation effects through the translation of foreign currency assets or liabilities held on their balance sheet into Australian dollar terms. A substantial portion of this paper is devoted to examining balance sheet exposures where much of the perceived vulnerabilities appear to lie.

The remainder of the paper is arranged as follows. Section 2 discusses methods and instruments used to hedge exchange rate risk. Section 3 tracks the evolution of hedging and risk management practices since the floating of the Australian dollar,

---

<sup>3</sup> Exchange rate pass-through in a broader Australian macroeconomic framework is addressed in a recent paper by Stone, Wheatley and Wilkinson (2005).

<sup>4</sup> A common way of estimating the total impact of exchange rate movements on firms is to model individual share prices using the exchange rate as an explanatory variable. However, these models generally perform poorly. A number of past studies have estimated the impact of exchange rates on share prices as a proxy for the degree of foreign exchange exposure. See, for example, Bartov, Bodnar and Kaul (1995), Allayannis and Ofek (2001), Dominguez and Tesar (2001), and Nguyen and Faff (2003).

and provides quantitative evidence on resident firms' current hedging practices. Section 4 provides a detailed examination of foreign currency exposure underlying the overall net foreign liability position. It discusses why often-cited vulnerabilities are overstated, and how hedging contributes to a transfer of wealth from the rest of the world to Australian residents in the event of an exchange rate depreciation. Appendix A provides a useful benchmark by doing a similar exercise for the United States. Finally, Section 5 offers some concluding remarks.

## 2. Hedging Instruments

In the context of this paper, hedging refers to those activities employed by residents to reduce or eliminate their exposure to exchange rate changes arising from transactions or existing assets and liabilities denominated in foreign currencies. Since residents are ultimately concerned with values in local currency terms, they often wish to remove the risk associated with uncertain future movements in the Australian dollar. Hedging activities can vary substantially depending on the core business of firms and the nature of their foreign exchange risk.<sup>5</sup> However, they normally involve some combination of restructuring business activities so as to create a 'natural' hedge and using some type of financial derivative to offset underlying foreign currency exposures.<sup>6</sup>

Firms generally develop their hedging strategy to account for 'net' foreign currency exposure either carried on their balance sheet, as a result of trade, or a combination of both. It rarely makes sense for a single firm to purchase insurance

---

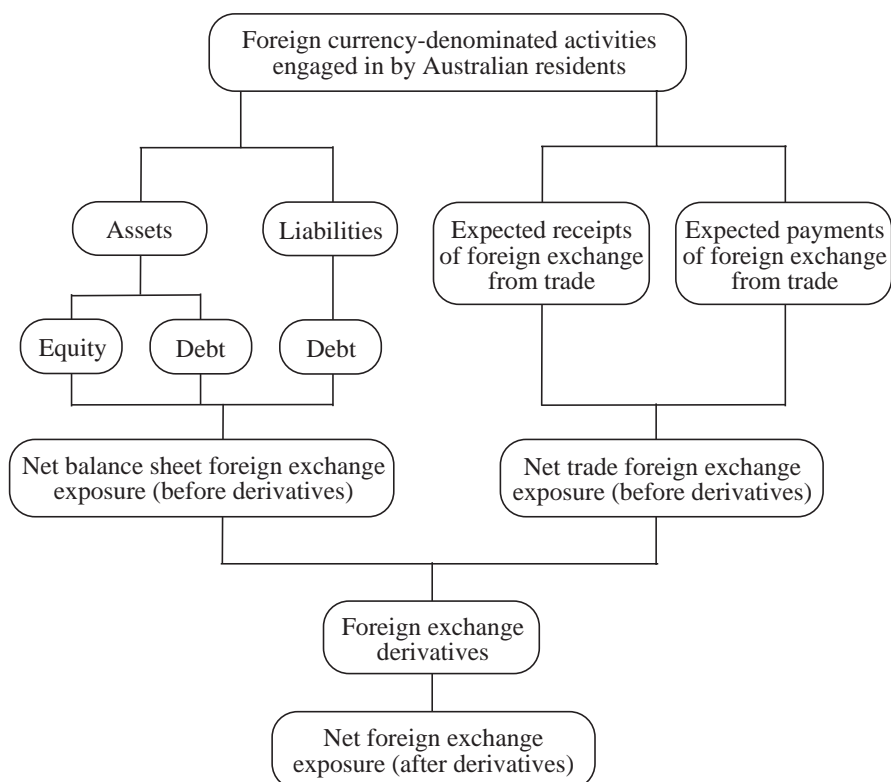
<sup>5</sup> The empirical literature on foreign exchange hedging is relatively sparse. References cited in this paper provide a selection of related articles which cover issues relevant to the topic but not directly dealt with in the interest of brevity. Discussion of why companies hedge can be found in Berkman, Bradbury and Magan (1997), Geczy, Minton and Schrand (1997), Cassie (2001), Battellino (2002), Berkman *et al* (2002) and Lel (2004), while general market risk is covered by Group of Thirty (1993, 1994) and BIS (2005). The Reserve Bank's articles related to foreign exchange exposures can be found in RBA (1986, 1994, 1997, 2000, 2002) and Becker, Debelle and Fabbro (2005).

<sup>6</sup> The Bureau of Industry Economics (BIE 1991) found that around 83 per cent of manufacturing firms used some combination of natural hedging in conjunction with derivatives, while only 17 per cent relied exclusively on the use of derivatives. Similar results were found in surveys for other countries (e.g., Statistics New Zealand 1999), and not surprisingly multinational firms are prevalent natural hedgers (Fosler and Winger 2004).

for one part of their balance sheet by hedging against appreciation in the Australian dollar, while also purchasing insurance against depreciation on an offsetting position.

Figure 1 provides a stylised illustration. Natural hedging can be characterised as structuring the first layers of core business activities so that net exposure is eliminated or reduced before entering into derivative contracts. While this is important – particularly for large firms with diversified business activities – it is often difficult to quantify or even observe. In the event that natural hedging is not viable, too costly, or insufficient to reduce foreign exchange risk to the desired level, firms may choose to enter explicit derivative contracts in securities to further reduce risks. The remaining net position gives the best indication of the concept of foreign currency exposure dealt with in this paper.

**Figure 1: Decision to Hedge Foreign Currency Exposures**



## 2.1 Natural Hedging

Firms involved in international trade often attempt to ‘match’ the currency denomination of their receipts and payments in order to limit foreign exchange



exposure. Similarly, this principle is employed by firms by taking on foreign currency assets or liabilities to net out existing exposures.<sup>7</sup>

Similar to the technique of matching, multinational firms often use a strategy called ‘leading and lagging’. This strategy essentially involves a parent company bringing forward or delaying payments or receipts of foreign currency with its subsidiaries to offset the currency risks associated with other foreign currency transactions. This strategy is one of managing cash flows across the consolidated group by the parent company.

Some firms are also able to achieve a partial natural hedge through the correlation between the price of the goods they produce and the exchange rate. An example would be an Australian gold mining company that sells bullion into world markets in US dollars. An appreciation of the Australian dollar would lower its receipts in local currency terms. However, as an appreciation of the Australian dollar is often correlated with gold prices, it is likely that rising prices would provide at least a partial offset to the dampening impact on revenue from the exchange rate.

In managing foreign exchange risks, firms may also be able to avoid engaging in explicit hedges if they have sufficient currency diversification across their costs and revenues, or assets and liabilities. Diversification should act to reduce aggregate currency exposure, at least to a level below the sum of all individual currency exposures. This technique is often referred to as ‘pooling’ and is adopted by some of the larger Australian resource companies. The Conference Board survey (Fosler and Winger 2004) found that nearly one-third of multinational firms stated that pooling was a very important part of their hedging strategy. Faff and Marshall (2002) also found that pooling was a common method of natural hedging by multinational firms from the US, UK, and Asia-Pacific region.

---

<sup>7</sup> This is often referred to as a ‘money market hedge’. For example, to offset the risk on an existing foreign currency liability, a firm could borrow in domestic currency, exchange this amount in the spot market for foreign currency, and invest in a secure offshore asset. These physical transactions are the underlying basis upon which pricing of forward foreign exchange contracts is based.

## 2.2 Foreign Exchange Derivatives

Firms that consider any residual exposure to exchange rate fluctuations undesirable (after taking into account natural hedges) often choose to explicitly purchase insurance using financial derivative contracts. The main types of derivatives used in hedging are foreign exchange forward contracts, cross-currency interest rate swaps, and foreign exchange options.

### 2.2.1 *Outright foreign exchange forward contracts*

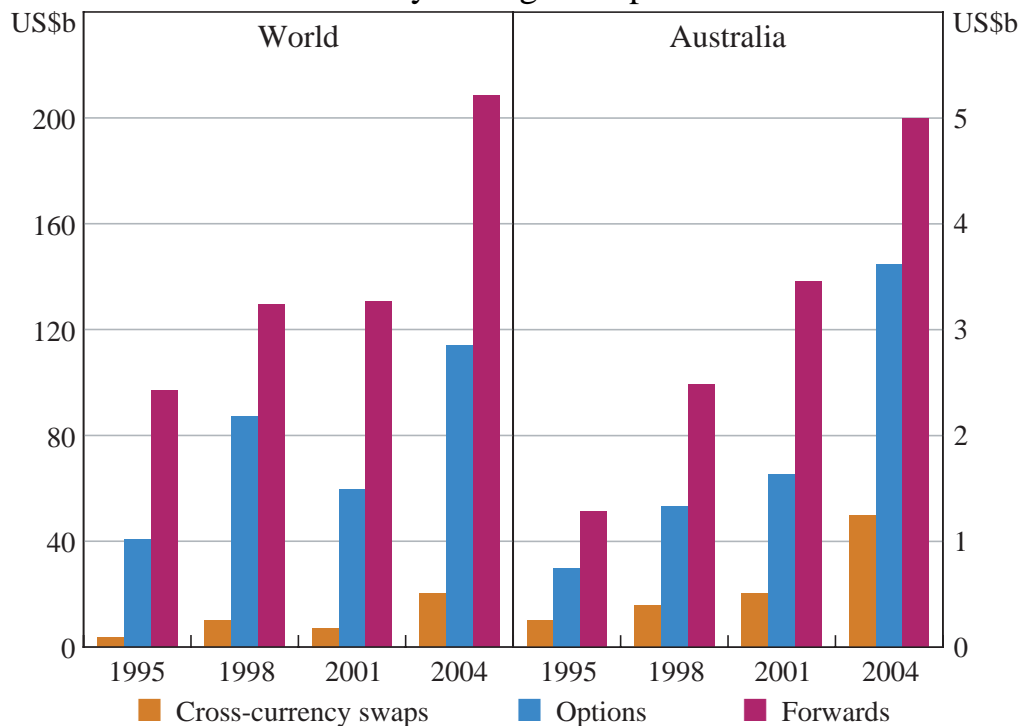
A simple way to limit risk surrounding exchange rate fluctuations is a commitment to an outright purchase or sale of currency at a specified future date, for a predetermined price.<sup>8</sup> For firms expecting to receive or make foreign currency payments at a specific future date, forwards are a flexible and readily available hedging instrument. Australian exporters who typically receive revenues in foreign currencies tend to enter forward agreements to purchase the Australian dollar, while importers mainly purchase foreign currencies forward. A simple example would be that of an exporter of wheat who has a long lag between incurring initial costs and receiving export revenue in US dollars as contracted. A contract to sell forward the expected foreign revenues for Australian dollars would eliminate some cash flow uncertainty. Since the forward rate would be agreed upon entering the contract, subsequent exchange rate movements become irrelevant.<sup>9</sup> For Australia and most other countries, forwards are the most commonly used hedging instrument (Figure 2).

---

<sup>8</sup> Currency futures essentially have the same function as forwards. An important difference between the two instruments is that forwards are traded over-the-counter (OTC), meaning directly between counterparties, while futures are standardised exchange-traded instruments settled with a central counterparty, and therefore less flexible.

<sup>9</sup> The terms of a forward agreement usually imply that if the exchange rate were to move favourably, those benefits would be foregone by the firm. Survey responses collected by Teoh and Er (1988) suggest that Australian non-financial firms generally did not take short-term positions in exchange rate markets for speculative purposes. Surveys covering firms in the US, Switzerland, Hong Kong, Singapore, the Netherlands and NZ provide evidence that supports the contention that firms are 'passive' rather than 'active' in this respect, seeking mainly to smooth cash flows. See Bodnar, Hayt and Marston (1998), Loderer and Pichler (2000), Sheedy (2001), Bodnar, de Jong and Macrae (2002) and Briggs (2004).

**Figure 2: Foreign Exchange Derivatives Turnover**  
Daily average in April



Source: BIS

Early surveys of Australian non-financial firms also demonstrate the preference for forwards. Teoh and Er (1988) found that forwards were the most used derivative, with swaps also used by larger firms (see also Batten, Mellor and Wan 1992, and Naughton and Teoh 1995). The BIE (1991) survey found that around 90 per cent of manufacturers tended to use forwards, 17 per cent used options, and 7 per cent used other instruments. More recently, the 2001 and 2005 ABS surveys found for non-financial firms that the notional values of currency forwards accounted for nearly 90 per cent of outstanding derivative contracts, cross-currency interest rate swaps accounted for 5½ per cent and 9 per cent in each of the respective surveys, while options accounted for around 6 per cent and 2 per cent in each of the respective surveys. Futures and all other derivatives accounted for a negligible proportion of outstanding derivatives.<sup>10</sup>

<sup>10</sup> Surveys of firms across a number of countries – including the US, Germany, Switzerland, the Netherlands, Sweden, and Korea – also show a clear preference for forwards over other derivatives. See, for example, Bodnar, Hayt and Marston (1996), Bodnar and Gebhardt (1998), Loderer and Pichler (2000), Bodnar *et al* (2002), Bartram, Brown and Fehle (2004) and Pramborg (2005).

The prevalence of forwards over other derivatives in currency hedging may reflect certain features. First, unlike options, there is no initial outlay required. Second, while futures are standardised in amount and maturity, forwards can be tailored to suit an individual firm's needs. Furthermore, the markets for futures in some minor currencies either do not exist, or are relatively illiquid.

### *2.2.2 Cross-currency interest rate swaps*

A cross-currency interest rate swap involves the exchange of a stream of interest payments in one currency for a stream of interest receipts in another over a given period of time. At maturity, there is typically also an exchange of principal. Since these transactions involve exchange rate risk they can be structured to offset an existing exposure. This type of derivative is therefore primarily used to hedge balance sheet exposure on debt securities and the associated transaction risk on interest payments.

The use of these instruments can be illustrated using the following example based on practices common in the Australian banking sector. Figure 3 describes the issuance of foreign currency-denominated debt into an offshore market by a bank. The bank uses the proceeds from the bond issuance to fund its core business of domestic lending and insulates itself from exchange rate fluctuations by entering into a cross-currency interest rate swap.

Initially, the bank issues floating-rate US dollar-denominated debt to non-resident investors in the offshore market and swaps the principal received at origination into Australian dollars in the foreign exchange market. The local currency principal is then lent to a resident borrower. At this stage, the bank has created a foreign exchange balance-sheet exposure in that it has raised a foreign currency liability (which will have to be repaid at maturity) to fund a local currency asset. Furthermore, there is a risk that the Australian dollar interest received on the asset will not be sufficient to cover the servicing burden denominated in foreign currency. The hedging strategy therefore has to address the on-balance-sheet translation exposure arising from the US dollar liability, as well as the series of transaction exposures to the US dollar that arise as a result of interest payments.

The bank could enter into a cross-currency interest rate swap to fully cover these exposures. The swap transaction would have the following main characteristics:

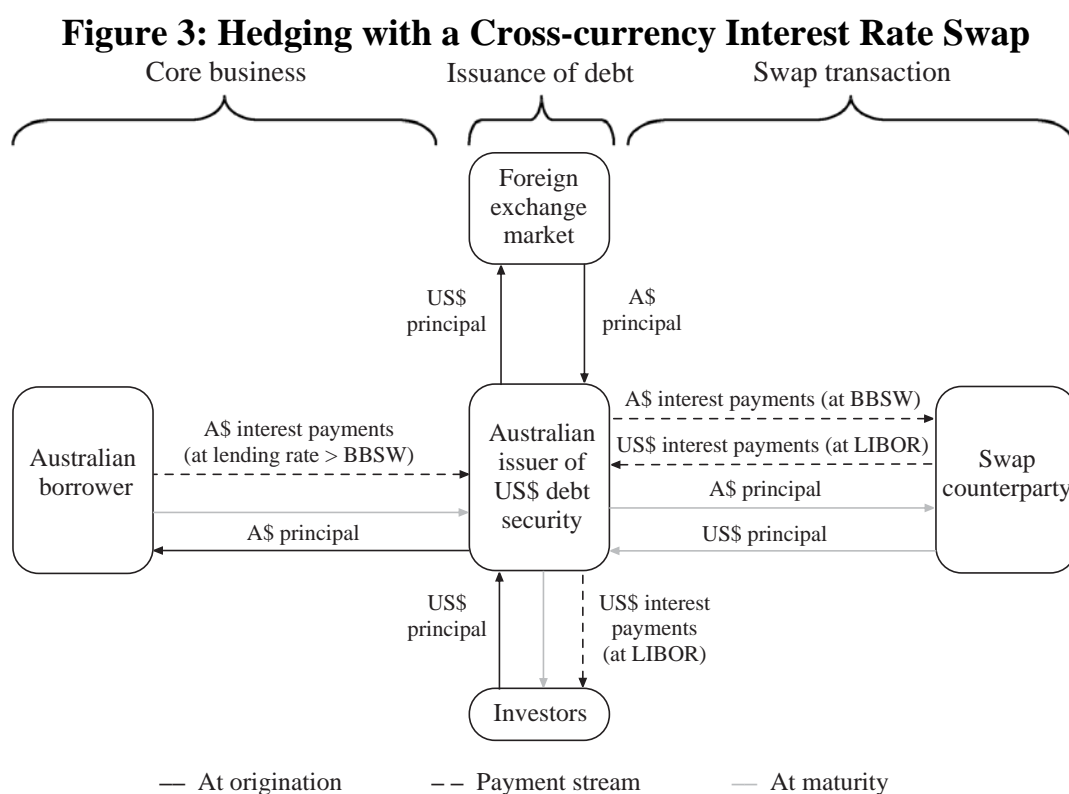
- the bank enters an agreement with the swap counterparty under which the bank will receive a US dollar principal amount at maturity equal to that of the original debt issuance. In return, the bank undertakes to deliver an Australian dollar principal (predetermined by the prevailing spot rate at the time of arrangement), which is correspondingly matched by its loan book asset. This ensures that the balance sheet exposure is fully hedged; and
- for the duration of the swap the bank also receives a stream of US dollar interest payments from the swap counterparty, which it uses to meet the debt-servicing obligations on its US dollar liability. In return, the bank makes a series of Australian dollar-denominated interest payments to the swap counterparty that are met by the interest receipts from the Australian dollar loan asset. This ensures that the transaction exposure is also fully hedged.<sup>11</sup>

As an additional consideration, if the eventual holder of the foreign exchange risk embodied in the swap transaction is a non-resident, then the Australian bank has succeeded in taking on a foreign currency-denominated liability with the ultimate exchange rate risk held by non-residents. Natural non-resident counterparties are foreign institutions, such as the World Bank, which issue Australian dollar-denominated debt and hedge this exposure back into foreign currencies.<sup>12</sup>

---

<sup>11</sup> The bank makes and receives foreign currency interest payments at the London interbank offer rate (LIBOR), and makes local currency interest payments to the swap counterparty at the bank bill swap rate (BBSW). However, the rate at which it is able to lend out the local currency principal is higher than BBSW and represents the margin it is able to generate on its core business functions. Importantly, this means that once all hedging is taken into account, this margin is the only residual. Therefore, for a fully hedged offshore debt issuance there is no interest rate differential motivating the bank's decision to fund itself offshore. However, there are a range of other reasons why banks may prefer to fund their domestic lending through offshore debt issuance (see Battellino 2002 for a discussion).

<sup>12</sup> The World Bank alone issued over \$8 billion of Australian dollar-denominated debt during 2004 and 2005.



Note: Bank bill swap rate (BBSW), London interbank offer rate (LIBOR)

### 2.2.3 Foreign exchange options

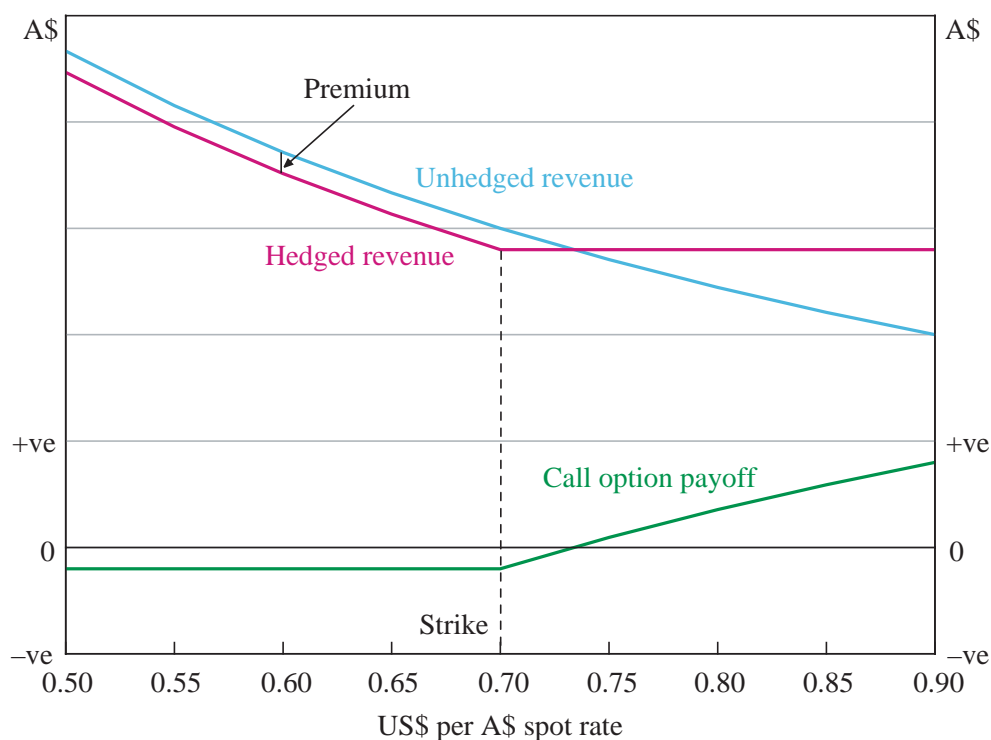
Currency options give the holder the right, but not the obligation, to purchase ('call') or sell ('put') an amount of one currency for another at a given future date, for a pre-arranged exchange rate ('strike'). Importantly, the holder of the instrument has discretion over whether or not to exercise his right to transact, allowing for a greater degree of flexibility than forwards, and leaving open the possibility of gaining from favourable exchange rate movements. This flexibility comes at a premium built into the price of the option.<sup>13</sup>

For example, to hedge the anticipated receipt of foreign currency, an exporter may buy a call option to purchase the Australian dollar for a predetermined strike rate at a future date (Figure 4). This eliminates the downside risk to revenue that is

<sup>13</sup> The two standard 'vanilla' options are the European-style option, which gives a buyer the right to exercise the option only at the expiry date, and the American-style option, which gives a buyer the right to exercise the option at any time up to the expiry date. Options are traded both over-the-counter (OTC) and on exchanges. When traded on exchanges, they generally take the form of an option on a futures contract. OTC trading in European-style options accounts for the majority of total turnover in options (see Bodnar *et al* 1998).

implied by exchange rate appreciation beyond the option strike, while at the same time preserving any revenue gains that would accrue if the exchange rate depreciates (under which circumstance the holder would choose not to exercise the option, but rather convert receipts into Australian dollars in the spot market at a more favourable price).

**Figure 4: Export Revenue under Option Hedging**



Note: Hedged revenue is equivalent to unhedged revenue plus the call option pay-off.

On the other hand, the counterparty to the transaction (usually a bank), while earning the option premium, has unlimited potential for loss and is therefore exposed to adverse exchange rate movements. The option writer can hedge this exposure by purchasing an option providing an equal and opposite position, or by using a dynamic hedging method (Taleb 1997 and Nandi and Waggoner 2000 provide a detailed discussion of these techniques).

### 3. Hedging Practices in Australia

While Australian firms generally appear to be in a good position to deal with currency fluctuations (see below), outside the banking sector this has not always

been the case, and even within the banking sector hedging practices have evolved considerably.

Hereafter, we consider data up to March 2005 in line with the latest available hedging survey for Australia.

### **3.1 Adapting to Exchange Rate Fluctuations**

From past work and survey evidence we know that the banking sector has always been well-insulated against adverse exchange rate fluctuations. Banks had little foreign currency exposure in the immediate period following the floating of the Australian dollar, due to regulations prohibiting many international transactions (RBA 1986). However, as these restrictions were removed with banking system deregulation, banks increasingly financed their domestic assets by raising short-term liabilities abroad. Nonetheless, prudential oversight continued to ensure that banks matched foreign currency liabilities with assets to limit net exposures. This has been facilitated by a greater use of derivatives to hedge exchange rate risk. Under the current market risk guidelines, authorised deposit-taking institutions are required to calculate their foreign currency exposure daily and comply with capital adequacy requirements on both their traded and non-traded currency positions.<sup>14</sup> As a result, currency fluctuations remain of little direct consequence to the banking books of the major Australian banks.

In contrast, non-financial firms have at times found it difficult to adapt to movements in the Australian dollar. With no direct prudential guidance and little experience with foreign exchange risk management, there have been episodes when sizable currency movements imposed considerable losses.

Following capital market opening in the 1980s, foreign currency loans, commonly denominated in Swiss francs, became easily accessible to a wide range of borrowers. It is estimated that there were up to 3 000 foreign currency loans made

---

<sup>14</sup> Refer also to APRA (2000). Prior to these arrangements, the Reserve Bank imposed strict limits on the foreign currency positions of foreign exchange dealers, which limited exposures.



by 1986,<sup>15</sup> with many of the smaller borrowers believed to have had little understanding of the foreign exchange risks associated with these loans. These loans were appealing to many borrowers given the relatively low interest rates in countries such as Switzerland. As the Australian dollar fell by more than 50 per cent against the Swiss franc between 1985 and the middle of 1986, large foreign exchange losses substantially exceeding interest savings were incurred by unhedged borrowers.

A Riethmuller and Phillips (1986) survey showed that a relatively high proportion of importers and manufacturers were not hedged, despite some large movements in the Australian dollar prior to the float.<sup>16</sup> Table 1 indicates that more than half of respondents had less than 5 per cent of their foreign exchange exposure hedged in 1984. Between 1984 and 1986 there appears to have been an increase in hedging, driven in part by losses stemming from exchange rate depreciation. However, relatively little is known about the nature of the foreign exchange exposures themselves around this time. It may well be that exposure to exchange rate changes was much shorter-term and that the remaining risks were offset through natural hedging, so that explicit use of derivatives was less crucial than it is today.

---

**Table 1: Currency Hedging by Importers and Manufacturers**

Per cent of exposure hedged	Percentage of firms		
	1984	1985	1986
Less than 5	53.8	46.2	40.9
Between 5 and 25	12.9	8.6	6.5
Between 25 and 50	5.4	6.5	3.2
Between 50 and 75	4.3	14.0	17.2
More than 75	23.7	24.7	32.3

Source: Riethmuller and Phillips (1986)

---

<sup>15</sup> See Martin (1991).

<sup>16</sup> For example, the Australian dollar fell by 17 per cent against the US dollar in the year to October 1982.

Providing further evidence of increased hedging in the early post-float period, the BIE (1991) found that the average proportion of exchange rate exposure hedged by exporters rose from around 50 per cent in 1984/85, to 60 per cent in 1985/86, and then to 70 per cent in 1989/90. Respondents indicated that the two most important factors behind this increase in their hedging were greater underlying exposure to exchange rate risk and uncertainty over future currency movements.

This rise in hedging activity in the early post-float period was also supported by the formulation of explicit hedging policies. Teoh and Er (1988) found that relative to foreign-owned firms operating in Australia, domestic firms tended to report less established hedging policies prior to the float. However, in the post-float period this difference was no longer significant, with Australian companies developing more comprehensive hedging policies. This then also led to greater demand for the necessary instruments, which saw the markets for derivative products grow over time.

Improvements in the management of currency risk continued in the early 1990s. In a survey of Australian firms, Naughton and Teoh (1995) found that five years prior, larger firms and firms with substantial international operations and exposures tended to be increasing resources devoted to risk management. Specifically, over this period, larger firms tended to develop formal policies, increase staff in foreign exchange risk management, implement forecasting, and improve reporting systems – perhaps taking advantage of economies of scale in currency risk management relative to smaller firms.

### **3.2 What Hedges are in Place?**

Comprehensive information about net foreign currency exposures of Australian firms was lacking until the inaugural ABS survey of hedging practices in 2001. The findings of that survey showed that every sector of the economy with foreign currency exposures, either through trade or balance sheets, hedged some part of this exposure back into Australian dollars by making extensive use of foreign exchange derivatives. Given the importance of the findings in 2001, the Reserve

Bank asked the ABS to conduct a second survey in 2005.<sup>17</sup> The results, outlined in Table 2, were broadly in line with the findings of the earlier survey. Australian residents in aggregate held a net foreign currency asset position amounting to \$218 billion as at 31 March 2005. And while the banking sector had a large net foreign currency liability position, this was fully hedged by derivatives. All of the other major sectors also had a long (or net asset) foreign currency position after taking into account the notional value of existing derivative contracts employed to hedge against exchange rate fluctuations.<sup>18</sup>

**Table 2: Sectoral Foreign Currency Exposure**

\$ billion, as at 31 March 2005

	Banks	Other private financial corporations	Other resident sectors	RBA	Government	Total economy
Net exposure before derivatives	-153	114	97	44	-6	96
Net position in derivatives	153	-15	2	-21	3	122
<b>Net foreign exchange exposure after derivatives</b>	<b>1</b>	<b>99</b>	<b>99</b>	<b>22</b>	<b>-3</b>	<b>218</b>

Notes: Negatives indicate a short (or net liability) position in foreign currencies. Amounts may not add due to rounding.

Source: ABS Cat No 5308.0

Respondents reiterated their intention reported in the 2001 survey to hedge a high proportion (78.9 per cent) of exchange rate risk arising from foreign debt exposures, but only a small proportion (20.9 per cent) of the exchange rate risk pertaining to equity investments abroad. Hedging was again mainly undertaken through the use of forward foreign exchange contracts and cross-currency interest rate swaps.

<sup>17</sup> For results of the hedging survey refer to Becker *et al* (2005) and ABS (2005).

<sup>18</sup> The government sector is somewhat different. The state governments continue to borrow offshore but hedge all of these borrowings back into Australian dollars. The remaining small foreign currency exposure of this sector is the result of international transactions, on which the Australian Government has a 'no hedging' policy.

Perhaps the most important result was that the counterparties to the net position in derivatives were non-residents, thereby insulating residents as a whole against unfavourable exchange rate fluctuations by exporting foreign currency risk abroad.<sup>19</sup> Under these contracts, non-residents have effectively guaranteed to supply Australian residents, at some point in the future, with foreign currency in return for Australian dollars at predetermined exchange rates. These contracts are only possible because non-residents are prepared to hold a proportion of Australian dollars in their portfolios.

### **3.3 Time Horizon of Firms' Hedging**

Another notable feature of hedging is that, for most firms, hedges tend to cover transactions for a relatively near-term horizon of less than one year.<sup>20</sup> These results most likely reflect the uncertainty many firms face in determining the extent of their exposure beyond short horizons. A firm would typically only hedge those foreign currency transactions it can anticipate with a considerable degree of certainty, because if the underlying transaction were not to eventuate, then the hedge itself would create an exposure. Another factor may be that longer-term derivatives are seen by banks as a higher credit risk, which may limit the ability of firms lacking a strong credit rating (that is, typically smaller firms) to obtain long-term forward cover.

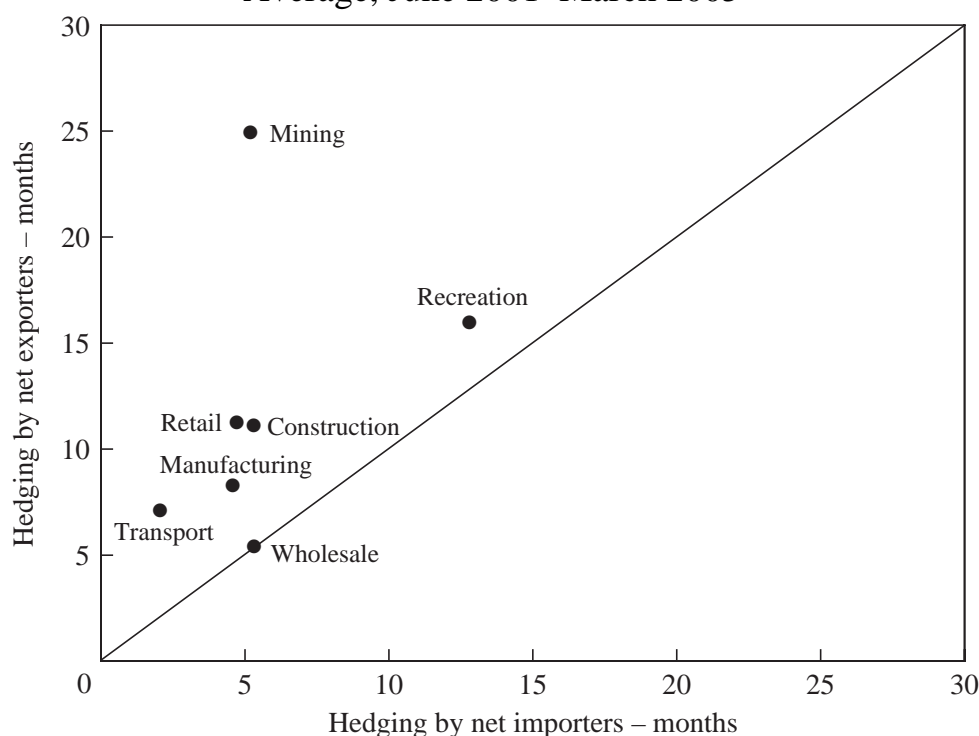
Exporters typically tend to hold longer hedging contracts compared with importers (Figure 5). That this is especially true of the mining sector is likely to be a result of the long-term supply contracts that mining companies tend to engage in and the durability and homogeneous nature of some commodities.

---

<sup>19</sup> This must be true since the net long position in derivatives held by banks, other resident sectors, and the government is much larger than the combined short position of the other sectors. That is, the economy's overall net long position of \$122 billion in derivatives must be matched by a short position held by non-residents.

<sup>20</sup> Australian practices appear to be in line with international norms. See, for example, Bodnar *et al* (1996, 1998), Bodnar and Gebhardt (1998), Brookes *et al* (2000), Loderer and Pichler (2000), Sheedy (2001), Bodnar *et al* (2002) and Pramborg (2005).

**Figure 5: Firms' Usual Term of Hedging**  
Average, June 2001–March 2005



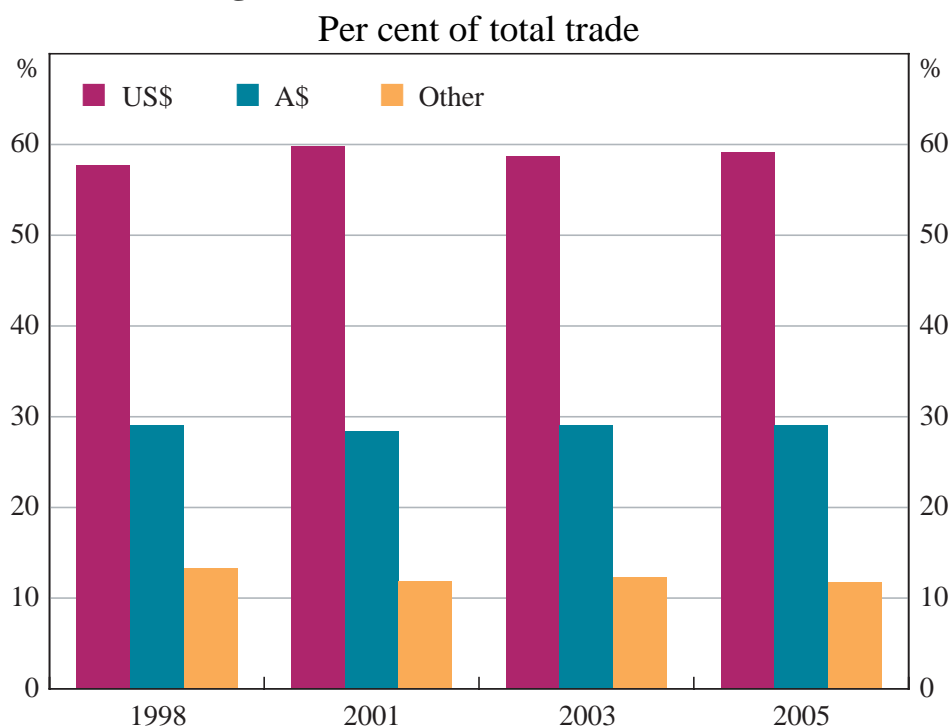
Source: NAB

### 3.4 Foreign Currency Exposure is Predominantly to the US Dollar

Since 1997, around 70 per cent of Australia's trade has been invoiced in foreign currencies (Figure 6). Most of this has been in US dollars, reflecting the importance of commodities in Australia's exports (which are usually quoted in US dollars) and the general importance of the US dollar as an international medium of exchange.

Foreign currency balance-sheet exposures are also mainly denominated in US dollars. The 2005 ABS survey on hedging practices showed that the US dollar made up at least 50 per cent of the private sector's exposure. The euro is also an important currency denominator, accounting for around 15 per cent of total exposures; the other currencies explicitly enumerated in the survey (the British pound, Japanese yen, and Swiss franc) play a relatively minor role.

Further evidence that the main exposures are denominated in US dollars can be drawn from turnover in derivatives markets, where around 85 per cent of Australian dollar trading in forwards and options is against the US dollar.

**Figure 6: Trade Invoice Currencies**

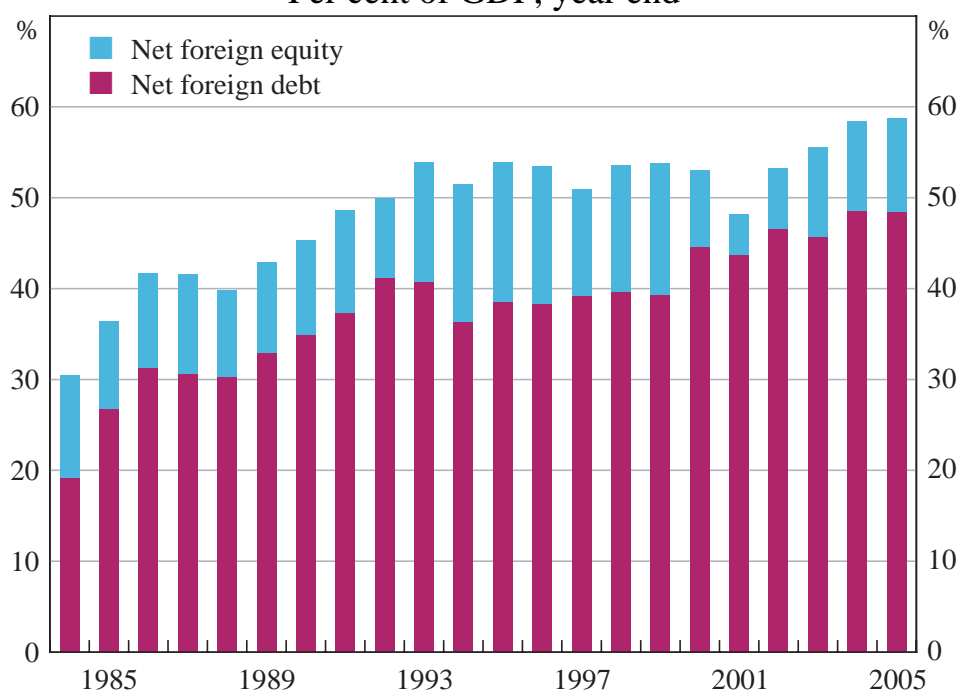
Source: ABS Cat Nos 5422.0 and 1301.0 (2005)

#### 4. Measuring Foreign Currency Exposure

As foreign capital has always flowed into Australia, at least in gross terms, since the early 1970s, this has allowed investment to outpace domestic saving. This process has continued in recent years. As a result, net foreign liabilities rose from around 30 per cent of GDP in the mid 1980s to around 60 per cent of GDP by March 2005 (Figure 7). This has been mainly in the form of net foreign debt, with net foreign equity relatively stable over the period.

The net foreign debt position of a country is often used as a crude measure of its external vulnerability, particularly to exchange rate depreciation. However, an accurate understanding of the exposures to foreign currency fluctuations requires a detailed examination of gross assets and liabilities, by debt and equity, their respective shares denominated in local and foreign currency terms, and finally the extent of hedging provided by off-balance-sheet derivative instruments.

**Figure 7: Australia's Net Foreign Liabilities**  
Per cent of GDP, year end



Note: Latest figure is March 2005

Source: ABS Cat Nos 5302.0 and 5206.0

#### 4.1 Gross Foreign Assets and Liabilities

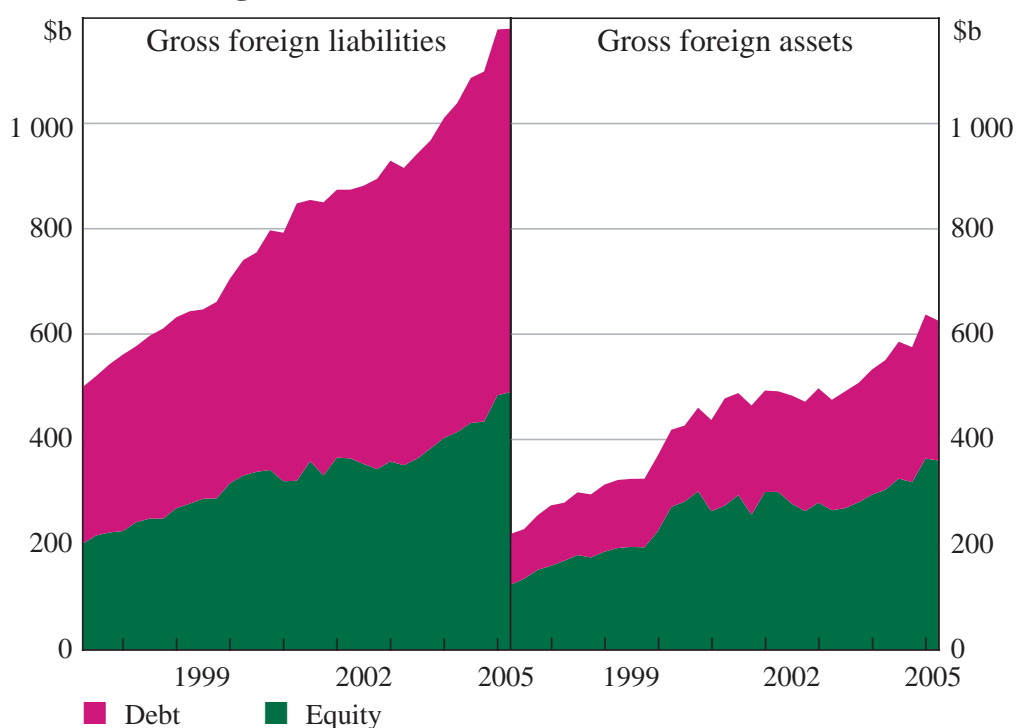
An examination of Australia's gross external position indicates that the accumulation of foreign debt has been most important in explaining trends on the liabilities side (Figure 8). However, as at March 2005 a considerable proportion of total liabilities (around 40 per cent) consisted of foreign claims on domestic equity. Since the claim on domestic firms' equity by foreigners is in Australian dollars we can infer that these liabilities are unaffected by exchange rate fluctuations.<sup>21</sup> Around 60 per cent of foreign assets consist of equities, and these are denominated in foreign currency terms.

A considerable proportion of foreign debt liabilities are denominated in local currency terms, as foreigners are willing to hold a portion of their foreign assets in Australian dollars. This reflects Australia's status as a mature industrialised

<sup>21</sup> Relatively minor exceptions are American Depository Receipts and dual-listed company structures.

economy with favourable credit ratings for the public sector and many large private firms. In the case of foreign debt assets, some proportion of these is also denominated in Australian dollars. These represent purchases by domestic residents of Australian dollar-denominated securities issued by foreign borrowers.

**Figure 8: Australia's External Position**



Source: ABS Cat No 5302.0

Identifying the value of local and foreign currency denominations for both assets and liabilities reveals a crucial point about Australian residents' overall foreign exchange exposure (Figure 9).

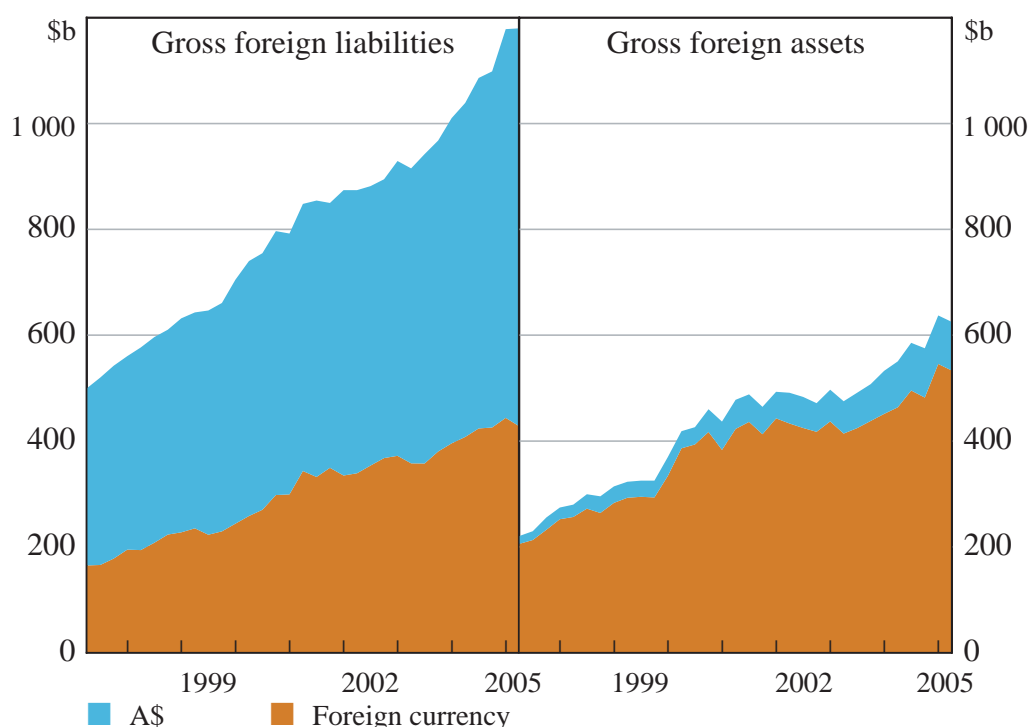
Gross foreign currency-denominated assets were \$533 billion as at the end of March 2005, exceeding gross foreign currency-denominated liabilities of \$428 billion. That is, the economy as a whole had a positive net foreign currency asset position. Therefore, a depreciation of the Australian dollar would actually result in an overall reduction in the value of net foreign liabilities of Australian residents, other things equal.

This result is illustrated in more detail in Table 3, where the interaction between foreign currency assets and liabilities for a given exchange rate depreciation is shown. Total foreign assets amounted to \$625 billion as at the end of March 2005.



Of this, \$360 billion was in equity, and therefore in foreign currencies. The remainder was in debt, of which the external accounts show two-thirds were denominated in foreign currencies, with the remainder in Australian dollars. Foreign liabilities amounted to \$1 180 billion. The equity claims of foreign residents are denominated in Australian dollars. Almost 40 per cent of debt liabilities were also in local currency terms, with the remaining 60 per cent in foreign currencies.

**Figure 9: Australia's External Position**



Sources: ABS Cat No 5302.0; authors' calculations

The overall net foreign liability position was \$555 billion as at the end of March 2005. However, looking only at assets and liabilities denominated in foreign currencies, there is a net foreign asset position of \$105 billion. The impact of depreciation in the local currency is to boost only the Australian dollar value of amounts denominated in foreign currencies. As a result of a 10 per cent depreciation of the Australian dollar, foreign currency-denominated assets would rise by \$59 billion (from \$533 billion to \$592 billion), but foreign currency-denominated liabilities would rise by only \$48 billion (from \$428 billion to \$476 billion). Hence (other things equal) a 10 per cent depreciation would have

**Table 3: Australia's External Position**  
\$ billion, as at March 2005

	Total	<i>Of which:</i> denominated in foreign currencies
<b>Assets</b>		
Foreign equity	360	360
Foreign debt	265	173
<b>Liabilities</b>		
Foreign equity	490	0
Foreign debt	690	428
<b>Net foreign asset position</b>	<b>-555</b>	<b>105</b>
Memorandum items:		
Australian GDP		848
Change in net foreign assets after 10 per cent depreciation		12 (1½ per cent of GDP)
Sources: ABS Cat No 5302.0; authors' calculations		

lowered the overall net foreign liability position by \$12 billion (or 1½ per cent of GDP).<sup>22,23</sup>

This estimate of the valuation effects of a depreciation can be further refined to take into account off-balance-sheet derivatives.

## 4.2 International Adjustment Augmented for Hedging Practices

The latest hedging survey shows that firms sought to limit their foreign currency exposure on debt assets and liabilities by converting around 79 per cent back into local currency terms, while around 21 per cent of foreign equity assets were hedged back into Australian dollars as at 31 March 2005.

<sup>22</sup> Other industrialised countries, such as the US, are in a similar position (see Appendix A). It is worth noting that this example is deliberately stylised to focus only on the direct sensitivities to a change in the exchange rate. Other things are unlikely to remain equal in the event of a sharp depreciation, the most obvious being the listed share prices of Australian firms in the tradables sector.

<sup>23</sup> Emerging-market countries are often characterised by their inability to access international capital in their local currency. The resulting foreign exchange exposures create vulnerabilities often summarised by the term 'original sin' (see also Hausmann *et al* 2002).

The last column of Table 4 shows the estimated values of residents' exposures denominated in foreign currencies after accounting for hedging activities. On the asset side, hedging acts to limit the valuation gains from depreciation as it shifts some foreign currency-equity assets back into Australian dollars. However, this dampening effect is more than offset by the fact that derivatives convert a much larger proportion of foreign currency-denominated debt liabilities back into local currency terms, thus reducing the increase in the value of the liabilities which would have otherwise been brought about by exchange rate depreciation. Overall the net foreign asset position subject to exchange rate fluctuations increases to \$232 billion with hedging. In other words, residents have an even larger net long position in foreign currency after accounting for hedging.

**Table 4: Australia's External Position Augmented for Hedging Policies**

\$ billion, as at March 2005

	Total	<i>Of which:</i> denominated in foreign currencies	<i>Of which:</i> denominated in foreign currencies (after hedging)
<b>Assets</b>			
Foreign equity	360	360	285
Foreign debt	265	173	37
<b>Liabilities</b>			
Foreign equity	490	0	0
Foreign debt	690	428	90
<b>Net foreign asset position</b>	<b>-555</b>	<b>105</b>	<b>232</b>
Memorandum items:			
Australian GDP			848
Change in net foreign assets after 10 per cent depreciation (after accounting for hedging)			26 (3 per cent of GDP)

Notes: As stated above, 79 per cent of foreign currency-debt assets and liabilities, and 21 per cent of foreign equity assets were hedged back into Australian dollars. We use this data to calculate values for Australia's foreign assets and liabilities denominated in foreign currencies after hedging.

Sources: ABS Cat Nos 5302.0 and 5308.0; authors' calculations

Allowing for the same 10 per cent depreciation of the Australian dollar and taking account of hedging, foreign currency-denominated assets would rise by \$36 billion (from \$322 billion to \$358 billion), while foreign currency-denominated liabilities would rise by only \$10 billion (from \$90 billion to \$100 billion). The decline in net foreign liabilities would therefore be twice as large with hedging at around

\$26 billion (or 3 per cent of GDP), indicating the important role that hedging of foreign currency exposures plays in the Australian economy.

With the overall balance sheet position of Australian residents long in foreign exchange after hedging is taken into account, there would be valuation losses associated with Australian dollar appreciation. But since periods of exchange rate appreciation are usually those when the economy overall is performing strongly, the impact of such losses should generally be of less significance.

### **4.3 Residual Risks to Consider**

Given its external position, Australia has often been thought to have a large balance sheet exposure to exchange rate depreciation. The sections above show this not to be the case in 2005, due to the currency composition of the external accounts as well as hedging. However, this is not to say that the economy is unaffected by exchange rate fluctuations. The exchange rate remains an important macroeconomic price, and a number of exchange rate-related considerations remain. Several of these are outlined below.

At the outset of this paper we defined its scope as dealing with directly quantifiable financial gains and losses on balance sheets and capital flows from exchange rate changes, rather than more commonly debated macroeconomic effects such as competitiveness. Nonetheless, these effects remain important, and insofar as hedging has implications for the degree of pass-through from the exchange rate to economic activity and inflation, they are related.

While hedging using derivatives is able to insulate balance sheet positions from exchange rate swings indefinitely once in place, hedging is more limited in its effectiveness in insulating trade flows. The practice of hedging trade positions over an average horizon of one year smooths cash flows, but does not provide full cover against adverse exchange rate movements given that cycles in the Australian dollar typically last for several years. For example, a one-year export contract denominated in US dollars may be hedged with derivative instruments that guarantee a given Australian dollar-denominated revenue stream over that period. However, at the time a new contract is agreed the hedge may have to be renewed at

a less favourable exchange rate if the Australian dollar has appreciated in the interim.

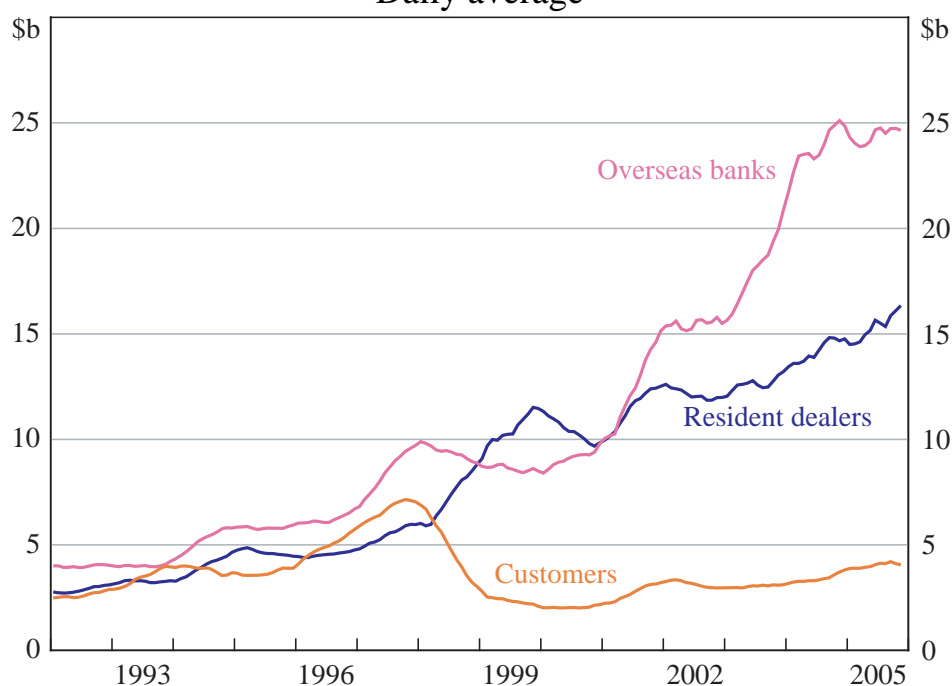
A further source of risk arises from the 'rollover risk' associated with renewing existing hedging contracts or creating new positions in derivatives contracts. If non-residents were no longer willing to be counterparties to the hedging instruments that create an exposure to the Australian dollar, it would not be possible for residents to continue to pass their foreign currency risk onto the rest of the world. Given that the banking sector is the largest single source of foreign currency exposures before taking into account hedging, the rollover risk is most relevant to this sector. The potential concern is whether it is likely that for one reason or another Australian banks would not be able to swap their foreign currency debt back into local currency terms, and if so, what the consequences would be. However, such risks appear to be well-contained as there is a wide base of international investors who hold a proportion of their portfolios in Australian dollars. This is also reflected in the depth of the Australian dollar swaps market with average daily turnover of around \$45 billion, of which \$25 billion per day is between domestic and overseas banks (Figure 10).<sup>24</sup>

The impact on banks of a sudden shift in sentiment which limited their ability to raise debt in offshore markets would depend on the context in which this occurred. One could envisage such a change would be most likely to occur when the economy was subject to an adverse shock. The main impact would be a decline in the exchange rate. This, of itself, would not have any significant effect on banks because, as noted, banks have no net foreign currency exposure on the existing stock of debt. There would be some rise in spreads on bank debt, both overseas and in domestic markets, but the main impact on banks' interest costs would depend on what happened to inflation, as this would be the major influence on the level of interest rates. While some might argue that a fall in the exchange rate would be inflationary, it is not clear that this would in fact be the case. This is because the underlying cause of the fall in the exchange rate would most likely be a deflationary shock.

---

<sup>24</sup> From Table 2 we know that the net position of banks in derivatives is \$153 billion. The Australian foreign exchange swaps market is therefore sufficiently deep for this position to be turned over more than 3 times a month, or around 45 times a year once turnover in cross-currency interest rate derivatives is also taken into account.

**Figure 10: Foreign Exchange Swaps Turnover**  
Daily average



Note: 12-month rolling average

Source: RBA

## 5. Conclusion

At face value, Australia's overall net foreign liability position could be interpreted as a substantial source of vulnerability to sudden exchange rate depreciation. In this paper, we show that foreign currency-denominated assets exceed foreign currency-denominated liabilities, even before accounting for hedging, thereby conferring a transfer of wealth from the rest of the world to Australian residents in the event of exchange rate depreciation.

Furthermore, overseas demand for Australian dollar assets has allowed Australian residents to further hedge their net foreign currency exposures back into local currency terms through the use of derivatives, insulating the economy against the wide fluctuations that can be observed in the exchange rate. As a result, Australia's external position is less sensitive to exchange rate depreciation than it might otherwise be. We have shown that after taking into consideration the currency composition of foreign assets and liabilities in conjunction with off-balance-sheet hedging, a 10 per cent depreciation in the exchange rate confers a transfer of

wealth from abroad to Australian residents amounting to as much as 3 per cent of GDP.

While this paper restricts itself to a particular aspect of how the exchange rate interacts with the macroeconomy, focusing only on the risks to balance sheets and trade flows, it argues that hedging helps to remove one of the most important potential sources of foreign exchange risk to the economy. As a result we observe that despite wide swings in the Australian dollar, the economy and, specifically, the banking sector, have proved resilient to variability in the nominal exchange rate.

## **Appendix A: Foreign Currency Exposure of the United States**

The US is the pre-eminent example of a developed net debtor country that is able to gain access to foreign capital without having to assume unwanted foreign currency exposure. As is the case for Australia, an important feature of the US external position is that a considerable proportion of gross foreign liabilities are denominated in its local currency, while the majority of foreign assets are held in foreign currencies. That is, that part of the external position affected by exchange rate fluctuations is in fact a net asset position.

### **A.1 Gross Foreign Assets and Liabilities**

US foreign equity assets are assumed to be entirely denominated in foreign currencies, while foreign equity liabilities are denominated in US dollars.<sup>25</sup> The currency composition of foreign debt assets and liabilities can be derived from the benchmark Treasury surveys on ‘US Portfolio Holdings of Foreign Securities’, and ‘Foreign Portfolio Holdings of US Securities’.<sup>26</sup>

Table A1 shows that while overall net foreign liabilities amounted to US\$2.5 trillion as at the end of 2004, gross foreign currency-denominated assets were US\$6.4 trillion (55 per cent of GDP), exceeding gross foreign currency-denominated liabilities of just US\$0.6 trillion (5 per cent of GDP). The economy as a whole therefore had a large positive net foreign currency asset position of around

---

<sup>25</sup> Some qualifications surround this assumption. Firstly, some offshore portfolio and direct equity holdings by US residents are in countries such as Ecuador and the British Virgin Islands that have adopted a hard fix to the US dollar through dollarisation, and are therefore not denominated in foreign currency. However, the sum of US equity claims on these countries amounts to less than 1 per cent of the total. Secondly, there may be some doubt about the effective currency denomination of US direct and portfolio equity claims through special purpose vehicles and hedge funds in the Caribbean banking centres (that is, Cayman Islands, Bahamas, Bermuda and Netherlands Antilles). In total, the claims amounted to around US\$541 billion in 2004. While this is a non-trivial absolute value, it represents less than 10 per cent of foreign equity assets and has correspondingly little impact for the results presented here. Given the difficulties associated with making accurate estimates of these two considerations, and given their relatively small overall impact, we retain the working assumption that the entire stock of US claims on foreign equity assets is denominated in foreign currency terms. Further exceptions on the liabilities side may pertain to dual-listed company structures.

<sup>26</sup> In this section we follow the approach taken by Gourinchas and Rey (2005).



US\$5.8 trillion (50 per cent of GDP). Hence, like several other developed net debtor countries, residents of the US would enjoy a transfer of wealth from abroad resulting in the event of an exchange rate depreciation.

**Table A1: United States' External Position**

US\$ billion, as at December 2004

	Total	<i>Of which:</i> denominated in foreign currencies
<b>Assets</b>		
Foreign equity	5 807	5 807
Foreign debt	4 165	623
<b>Liabilities</b>		
Foreign equity	4 615	0
Foreign debt	7 899	612
<b>Net foreign asset position</b>	<b>-2 542</b>	<b>5 818</b>
Memorandum items:		
US GDP		11 734
Change in net foreign assets after 10 per cent depreciation		646 (5½ per cent of GDP)
Sources: BEA; US Treasury; authors' calculations		

Allowing for a 10 per cent depreciation in the US dollar, foreign currency-denominated assets would rise by US\$714 billion (from US\$6 430 billion to US\$7 144 billion), while foreign currency-denominated liabilities would rise by only US\$68 billion (from US\$612 billion to US\$680 billion). Net foreign liabilities therefore would decline by around US\$646 billion (or 5½ per cent of GDP) as a result of a 10 per cent depreciation in the US dollar.

While there is no information available for the US on the notional value of derivatives outstanding to augment this analysis further, we expect that hedging is far less important for the US than Australia, given the currency composition of the external accounts discussed above.

## References

**ABS (Australian Bureau of Statistics) (2002)**, 'Measuring Australia's Foreign Currency Exposure', in 'Balance of Payments and International Investment Position', Cat No 5302.0, December quarter, pp 11–16.

**ABS (2005)**, 'Foreign Currency Exposure', Cat No 5308.0.

**Allayannis G and E Ofek (2001)**, 'Exchange Rate Exposure, Hedging, and the Use of Foreign Currency Derivatives', *Journal of International Money and Finance*, 20(2), pp 273–296.

**APRA (Australian Prudential Regulation Authority) (2000)**, 'Capital Adequacy: Market Risk', Australian Prudential Standard 113.

**Bartov E, GM Bodnar and A Kaul (1995)**, 'Exchange Rate Variability and the Riskiness of U.S. Multinational Firms: Evidence from the Breakdown of the Bretton Woods System', NBER Working Paper No 5323.

**Bartram SM, GW Brown and FR Fehle (2004)**, 'International Evidence on Financial Derivatives Usage', Kenan-Flagler Business School Working Paper.

**Battellino R (2002)**, 'Why do so Many Australian Borrowers Issue Bonds Offshore?', Reserve Bank of Australia *Bulletin*, December, pp 19–24.

**Batten JA, R Mellor and V Wan (1992)**, 'Foreign Exchange Risk Management Practices and Products Used by Australian Firms', University of Western Sydney Discussion Paper No E9209.

**Becker C, G Debelle and D Fabbro (2005)**, 'Australia's Foreign Currency Exposure and Hedging Practices', Reserve Bank of Australia *Bulletin*, December, pp 1–8.

**Berkman H, ME Bradbury, P Hancock and C Innes (2002)**, 'Derivative Financial Instrument Use in Australia', *Journal of Accounting and Finance*, 42(2), pp 97–109.

**Berkman H, ME Bradbury and S Magan (1997)**, ‘An International Comparison of Derivatives Use’, *Financial Management*, 26(4), pp 69–73.

**BIE (Bureau of Industry Economics) (1991)**, ‘Consequences of Exchange Rate Variability: Survey Evidence from Trade-Exposed Manufacturers’, Research Report No 13.

**BIS (Bank for International Settlements) (2005)**, ‘Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2004’, press release, Basel, 17 March, available at <[www.bis.org/press/p050316.htm](http://www.bis.org/press/p050316.htm)>.

**Bodnar GM, A de Jong and V Macrae (2002)**, ‘The Impact of Institutional Differences on Derivatives Usage’, ERIM Report Series Reference No ERS-2001-89-F&A, European Financial Management Association 2002 London Meetings, 26–29 June.

**Bodnar GM and G Gebhardt (1998)**, ‘Derivatives Usage in Risk Management by U.S. and German Non-Financial Firms: A Comparative Survey’, NBER Working Paper No 6705.

**Bodnar GM, GS Hayt and RC Marston (1996)**, ‘1995 Wharton Survey of Derivatives Usage by US Non-Financial Firms’, *Financial Management*, 25(4), pp 113–133.

**Bodnar GM, GS Hayt and RC Marston (1998)**, ‘1998 Wharton Survey of Financial Risk Management by US Non-Financial Firms’, *Financial Management*, 27(4), pp 70–91.

**Briggs P (2004)**, ‘Currency Hedging by Exporters and Importers’, Reserve Bank of New Zealand *Bulletin*, 67(4), pp 17–27.

**Brookes A, D Hargreaves, C Lucas and BD White (2000)**, ‘Can Hedging Insulate Firms from Exchange Rate Risk?’, Reserve Bank of New Zealand *Bulletin*, 63(1), pp 21–34.

**Cassie I (2001)**, 'Currency Risk: A Funds Management Approach', *Economic Papers*, Special Edition, pp 82–91.

**Dominguez KME and LL Tesar (2001)**, 'Exchange Rate Exposure', NBER Working Paper No 8453.

**Faff R and AP Marshall (2002)**, 'The Choice of Foreign Exchange Hedging Techniques: An International Study', in JA Batten and TA Fetherston (eds), *Financial Risk and Financial Risk Management*, Elsevier Science, Oxford, pp 137–172.

**Fosler G and E Winger (2004)**, 'Do Exchange Rates Matter? A Global Survey of CEOs and CFOs on Exchange Rates', The Conference Board Research Report No R-1349-04-RR.

**Geczy C, BA Minton and C Schrand (1997)**, 'Why Firms use Currency Derivatives', *Journal of Finance*, 52(4), pp 1323–1354.

**Gourinchas P-O and H Rey (2005)**, 'International Financial Adjustment', NBER Working Paper No 11155.

**Group of Thirty (1993)**, *Derivatives: Practices and Principles*, Group of Thirty, Washington DC.

**Group of Thirty (1994)**, *Derivatives Follow-up Survey of Industry Practice*, Group of Thirty, Washington DC.

**Hausmann R, U Panizza and E Stein (2002)**, 'Original Sin, Passthrough, and Fear of Floating,' in MI Blejer and M Škreb (eds), *Financial Policies in Emerging Markets*, Cambridge, MIT Press, pp 19–46.

**Lel U (2004)**, 'Currency Risk Management, Corporate Governance, and Financial Market Development', Indiana University, available at <<http://mypage.iu.edu/~ulel/Hedging.Decision.pdf>>.

**Loderer C and K Pichler (2000)**, 'Firms, Do You Know Your Currency Risk Exposure? Survey Results', *Journal of Empirical Finance*, 7(3–4), pp 317–344.

**Martin SP (1991)**, *A Pocket Full of Change: Banking and Deregulation*, Australian Government Publishing Service, Canberra.

**Nandi S and DF Waggoner (2000)**, 'Issues in Hedging Options Positions', Federal Reserve Bank of Atlanta *Economic Review*, 85(1), pp 24–39.

**Naughton T and HY Teoh (1995)**, 'Foreign Exchange Risk Strategies of Australian Firms', in T Bos and TA Fetherston (eds), *Advances in Pacific Basin Financial Markets*, 1, pp 173–195.

**Nguyen H and R Faff (2003)**, 'Can the Use of Foreign Currency Derivatives Explain Variations in Foreign Exchange Exposure? Evidence from Australian Companies', *Journal of Multinational Financial Management*, 13(3), pp 193–215.

**Pramborg B (2005)**, 'Foreign Exchange Risk Management by Swedish and Korean Non-Financial Firms: A Comparative Survey', *Pacific-Basin Finance Journal*, 13(3), pp 343–366.

**RBA (Reserve Bank of Australia) (1986)**, 'Banks' Foreign Currency Balance Sheets in Australia', Reserve Bank of Australia *Bulletin*, December, pp 11–15.

**RBA (1994)**, 'Australian Banks' Activities in Derivative Markets: Products and Risk-Management Practices', Reserve Bank of Australia *Bulletin*, September, pp 1–8.

**RBA (1997)**, 'Capital Adequacy of Banks: Market Risk', Prudential Statement No C3.

**RBA (2000)**, 'Foreign Exchange Exposures of Australian Banks', Reserve Bank of Australia *Bulletin*, August, pp 43–49.

**RBA (2002)**, 'Australia's Foreign Currency Exposure and Hedging Practices', Reserve Bank of Australia *Bulletin*, August, pp 56–60.

**Riethmuller PC and RW Phillips (1986)**, *The Depreciation of the Australian Dollar: Its Impact on Importers and Manufacturers*, Bureau of Industry Economic Information Bulletin No 9, Australian Government Publishing Service, Canberra.

**Sheedy E (2001)**, 'Corporate Use of Derivatives in Hong Kong and Singapore: A Survey', Macquarie University Applied Finance Centre Research Paper No 23.

**Statistics New Zealand (1999)**, 'Hedging of New Zealand's Foreign Currency Denominated Overseas Debt', *Key Statistics*, July, pp 7–10, available at <http://www.stats.govt.nz/products-and-services/Articles/hedging-oseas+debt-Jul99.htm>.

**Stone A, T Wheatley and L Wilkinson (2005)**, 'A Small Model of the Australian Macroeconomy: An Update', Reserve Bank of Australia Research Discussion Paper No 2005-11.

**Taleb N (1997)**, *Dynamic Hedging: Managing Vanilla and Exotic Options*, John Wiley & Sons, New York.

**Teoh HY and M Er (1988)**, 'Impact of Floating Exchange Rates on Company Risk Management Practices: The Australian Experience', University of Wollongong Working Paper No 1.