

# Comparing international competitiveness effects: exchange rates and carbon prices

17 November 2010

Briefing report by Access Economics Pty Limited for  
Clean Energy Council

© Access Economics Pty Limited

This work is copyright. The *Copyright Act 1968* permits fair dealing for study, research, news reporting, criticism or review. Selected passages, tables or diagrams may be reproduced for such purposes provided acknowledgment of the source is included. Permission for any more extensive reproduction must be obtained from Access Economics Pty Limited through the contact officer listed for this report.

**Disclaimer**

While every effort has been made to ensure the accuracy of this document and any attachments, the uncertain nature of economic data, forecasting and analysis means that Access Economics Pty Limited is unable to make any warranties in relation to the information contained herein. Access Economics Pty Limited, its employees and agents disclaim liability for any loss or damage which may arise as a consequence of any person relying on the information contained in this document and any attachments.

**Access Economics Pty Limited**

**ABN 82 113 621 361**

**[www.AccessEconomics.com.au](http://www.AccessEconomics.com.au)**

**CANBERRA**

Level 1  
9 Sydney Avenue  
Barton ACT 2600

T: +61 2 6175 2000  
F: +61 2 6175 2001

**MELBOURNE**

Level 27  
150 Lonsdale Street  
Melbourne VIC 3000

T: +61 3 9659 8300  
F: +61 3 9659 8301

**SYDNEY**

Suite 1401, Level 14  
68 Pitt Street  
Sydney NSW 2000

T: +61 2 9376 2500  
F: +61 2 9376 2501

## Contents

Summary .....	1
Appendix A : Exchange rates .....	5
Appendix B : Framework of the analysis .....	7
Appendix C : Hedging of currency and carbon risks .....	11
References .....	15

## Charts

Chart 1.1 : Percent change in GDP relative to reference case scenario (2020) .....	2
Chart A.1 : \$A versus other currencies .....	5
Chart A.2 : The Australian terms of trade and real TWI exchange rate .....	6
Chart B.1 : Carbon price path over time (\$/t CO <sub>2</sub> -e) .....	10

## Tables

Table B.1 : AE-RGEM regions .....	7
Table B.2 : AE-RGEM sectoral detail .....	8

## Summary

Many Australian producers compete in global markets, either by exporting their goods overseas or by competing with goods imported into Australia. There are a multitude of factors that affect the international competitiveness of these producers which are attributable to being based in Australia. These range from the benefits of having a relatively well educated workforce to disadvantages associated with geographical distance to certain markets.

Two issues currently attracting attention in relation to their impacts on Australian producers' competitiveness are the relative strength of the Australian dollar and the potential impacts of a carbon price on energy prices.

A resurgence of demand from developing economies, particularly China, along with a range of other factors has seen commodity prices rise and with that, the Australia dollar has appreciated. This has been coupled with weakness in the US economy. On average, the Australian economy has grown faster than the US economy over the past decade. Currently, the US is printing money (which pressures the currency further) while the Australian economy remains strong with interest rates on the rise. This has caused the \$A to appreciate strongly against the \$US in recent months. On 15 October 2010 the \$A reached parity with the \$US for the first time since it was floated in December 1983 (some discussion of Australia's exchange rate movements is in Appendix A).

In terms of a potential carbon price, the government has recently formed a Multi-Party Climate Change Committee to consider issues relating to Australia's climate change response policy and the potential design and scope of a carbon price. One element of the Committee's considerations will be to provide independent information on how a carbon price will affect the Australian economy. Movement towards a market mechanism, such as a carbon price, has been muted for a number of years in the Australian context.

Against that background, this report considers the economy-wide impacts of an exchange rate appreciation relative to the imposition of a carbon price. The purpose of the analysis is to assess the relative impacts of both factors and consider mechanisms that Australian producers can utilise to mitigate their adverse consequences.

### Reductions in competitiveness

Economic modelling has been undertaken to assess a reduction in Australian competitiveness in global markets associated with both an exchange rate appreciation and a carbon price. The modelling is based on an application of Access Economics' in-house, computable general equilibrium model. This model is global in the sense that it links the Australian economy to each of our major trading partners. The model also has significant sectoral detail, particularly electricity generation, which makes it ideally suited to assess the relative impacts of exchange rate movements and carbon pricing (the model is detailed in Appendix B).

The modelling relies on a set of input assumptions about future developments that are inherently uncertain. In this case, inputs include the long term trend in Australia's exchange rate and the nature and form of any carbon change response policy that results in carbon being priced.

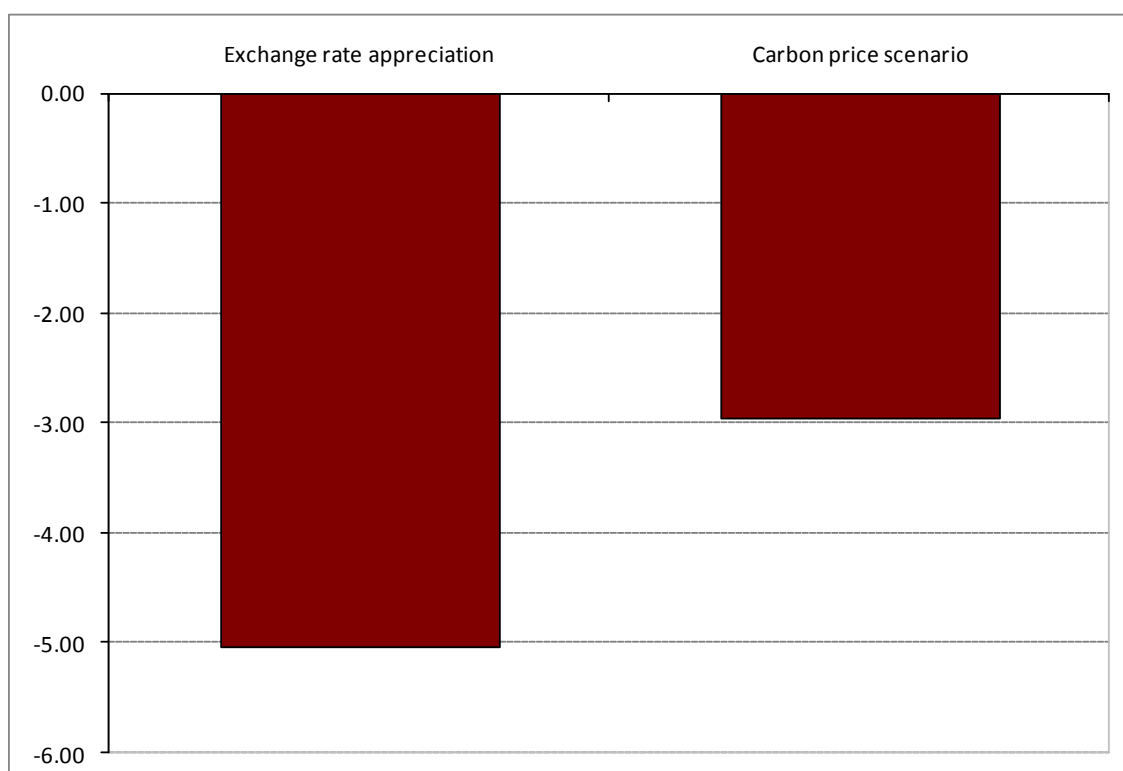
Two scenarios, therefore, are considered:

- The exchange rate scenario considers a long term appreciation in Australia’s currency against all countries by 20% at 2020.
  - Throughout 2010 the exchange rate (\$A versus \$US) has varied between 81.6 cents to parity, the scenario here assumes a similar sized movement of 20% over the course of 10 years.
- The imposition of a carbon price similar to that published by the Commonwealth Treasury in considering the Carbon Pollution Reduction Scheme. This price path commences at \$10/t CO<sub>2</sub>-e in 2010 and increases to approximately \$50/t CO<sub>2</sub>-e in 2020
  - The scenario modelled here includes no protection for emissions intensive trade exposed sectors and assumes Australia acts independently of all other countries except Europe and Japan.
    - Europe and Japan are assumed to impose carbon prices of similar magnitudes to Australia. Permits are not tradeable across countries.

### Relative impacts

The analysis shows that the appreciation of the exchange rate scenario has a considerably higher impact on the Australian economy than the carbon price scenario. In 2020, the assumed appreciation of the Australian dollar is projected to lower economic activity (measured by real gross domestic product) by just over 5% relative to the reference case scenario. The carbon price scenario is projected to reduce real GDP by 3% relative to the reference case at 2020.

**Chart 1.1: Percent change in GDP relative to reference case scenario (2020)**



Source: Access Economics

In terms of real GDP growth rates over the period 2010 to 2020, the appreciation of the exchange rate is projected to reduce growth by 0.5% per annum. This compares with a 0.3% reduction in growth under the carbon price scenario.

Both sets of results are influenced by a loss in Australia's global competitiveness through either an appreciating currency or the imposition of a carbon tax. An appreciating currency makes Australia exports more expensive (or reduces the Australian dollar value of exports traded in US dollars) while concurrently making imports less expensive. This results in a shift from Australian producers to overseas producers, with the accompanying reduction in output. A price on carbon, by raising input costs such as electricity, also reduces the international competitiveness of Australian producers, thus reducing output (there are also distortionary effects of carbon prices throughout the domestic economy).

Based on the results presented above, the 20% increase in Australia's exchange rate is estimated to produce the equivalent reduction in real GDP of an \$85 per tonne carbon price.

While the mechanisms are similar, the magnitudes of the projected impacts differ across each scenario. This indicates that under the chosen assumptions, the relative loss in international competitiveness is higher under the exchange rate scenario than the carbon price scenario. This relates not only to the relative size of the shocks but the relative burden as well. In other words, exchange rate movements have a broader impact on Australia's international competitiveness, effectively moving the relative price of all traded goods. The impacts of carbon pricing, however, are not evenly spread. The reduction in international competitiveness is more acute in emission intensive, trade exposed sectors.

### **Risk mitigation**

Australian producers have the opportunity to mitigate the risks of adverse exchange rate movements or rising carbon prices through different hedging mechanisms (discussed in detail in Appendix C).

In the case of exchange rate movements, hedging takes a conventional approach of transferring the risk to the party that bears the least cost through financial instruments. This may include the purchase of futures contracts, exchange rate swaps or simply holding reserves of the foreign currency.

For a carbon price, hedging requires investment in physical assets that reduce exposure to the costs of pollution. In this instance the hedging may involve changing manufacturing processes to be less carbon intensive, the purchase and installation of more efficient equipment and the change of fuel sources from say, electric to gas. In the longer term financial instruments that allow more traditional hedging will emerge offering producers more options to mitigate emissions based risks.

Exchange rate movements and the introduction of a carbon price are similar to the extent that both have comparable economic impacts and firms are able to adapt to the new environment. They do, however, differ in that exchange rate movements are largely influenced by external factors whereas a carbon price will be heavily influenced by Australian policy makers. Furthermore, the transition from an economy with no carbon price to one with a carbon price can be managed.

This transition has been debated and was addressed in the most recent CPRS proposal by fixing the carbon price in the early years of the scheme. Furthermore, there was no limit on the number of permits that could be purchased at that price. Firms faced a degree of certainty under these terms allowing decisions to be made with some level of confidence.

In contrast to this firms face great difficulty in predicting exchange rate movements making adjustment much more difficult. In early 2007, the AUD was trading at around USD\$0.80, by late 2008 it had almost reached parity and only 6 months later it had fallen below the USD\$0.70 mark. By late 2009 it had returned to around USD\$0.90 and reached parity near the end of 2010.

With such volatility it is difficult to make structural adjustments leaving little option but to insure against such movements using financial instruments. In this context, the costs associated with exchange rate movements are potentially higher than those illustrated in the results above.

## Conclusions

The results show that the introduction of a carbon price is not dissimilar to the effects of an exchange rate appreciation. In recent times the Australian economy has demonstrated its ability to cope with significant exchange rate movements despite the substantial degree of underlying uncertainty.

In contrast to exchange rate movements, the Australian Government has considerable power in terms of influencing the price of carbon and subsequently the level of certainty. The introduction of a carbon price, and thus the addition of more certainty in this area of policy, would further enhance the ability of firms and individuals to adjust their behaviour in response to the changing economic environment.

## Appendix A: Exchange rates

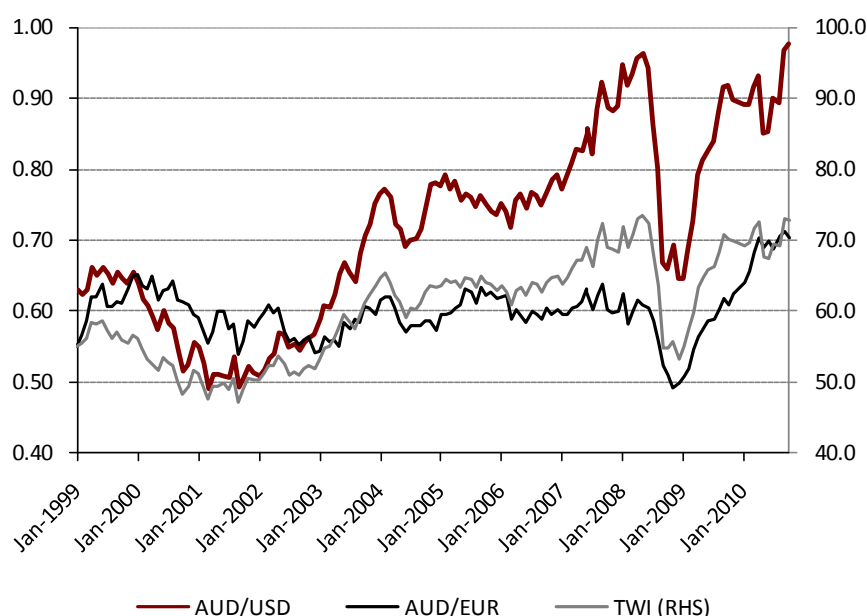
At its most basic, an exchange rate reflects the ‘relative price’ of one nation’s output versus that of other nations. The value underpinning a currency is influenced by a range of short and long term variables, including the terms of trade, commodity prices, interest rate differentials and the global economy.

### Changes to the value of the \$A

For most of its history the Australian currency was pegged, initially to the British pound, and then to the \$US. It was then fixed against a ‘basket’ of the 22 currencies which account for more than 90% of Australia’s gross merchandise trade (the Trade Weighted Index). There were therefore sharp shifts from time to time as those fixed rates moved out of line with economic fundamentals.

Australia floated its exchange rate in December 1983. Since floating, the Australian dollar (\$A) has been relatively heavily traded due to a comparative lack of central bank intervention, the overall stability of the Australian economy and government, strong economic linkages to developing Asian economies, and the associated link between the \$A and the industrial commodity cycle. Chart A.1 shows the strength of the \$A versus the \$US, the Euro and the trade weighted index.

Chart A.1: \$A versus other currencies



Source: RBA exchange rate data, 2010

The fundamental value of the Australian dollar has changed in recent years:

- In the first two decades after the \$A was first freely floated, it averaged US 70.7 cents and a Trade Weighted Index against Australia’s major trading partners (TWI) of 57.6.

- In the subsequent six and a half years, the relevant averages have been US 79.2 cents, 59.5 euro cents, and a TWI of 64.3.
- At 4pm AEDT on 10 November the currency was trading at US \$1.0038 and 72.94 euro cents, and a TWI of 74.6.

Australia's position as a small open economy means that, as a world price-taker, the Australian exchange rate is predominantly determined by global forces. While domestic conditions have implications for the overall health of the economy, factors such as changes in consumer demand or growth in particular sub-sectors of the domestic economy have little discernible effect on the exchange rate.

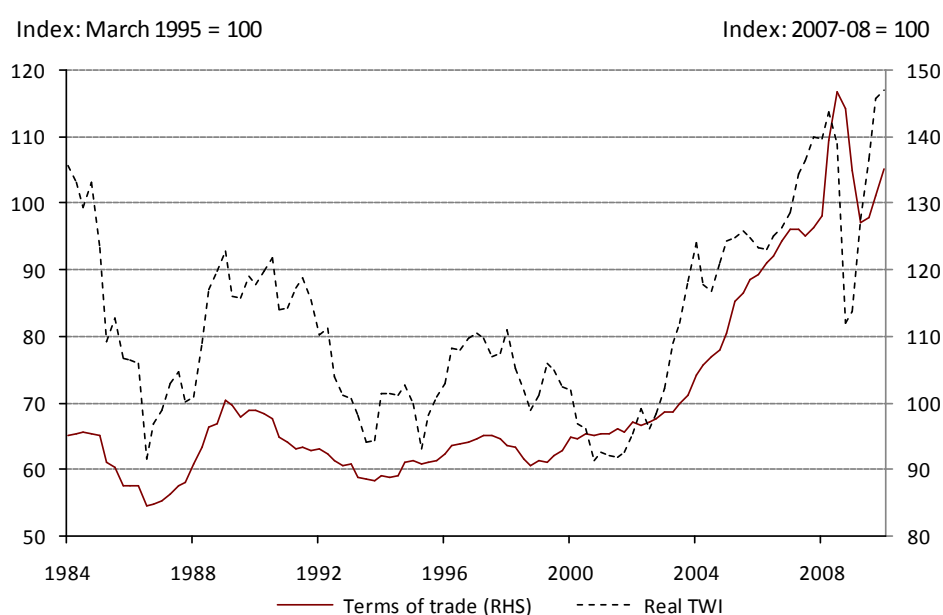
### Commodity prices and terms of trade

The turning point for the \$A came in 2003, when emerging economies – especially China – started to rapidly increase their industrial commodity demand. That surge in global demand outpaced supply causing a sharp increase in commodity prices. There was a matching lift in Australia's terms of trade.

Terms of trade is the ratio of Australia's export prices to import prices, which has been the most important determinant of the long-run level of the \$A. A higher terms of trade reflects a greater demand for Australia's exports relative to imports, and therefore increased revenues from exports and greater demand for the \$A. That increased demand generates an appreciation in the value of the Australian currency. Conversely, a lower terms of trade implies lower demand for Australian exports and a depreciation in the value of the \$A.

Chart A.2 shows the movements in the terms of trade relative to the Trade Weighted Index. Since 2003 Australia's terms of trade has increased 65%. The sharp upward trend in the terms of trade has generated a significant appreciation in the dollar. The relationship is most obvious between mid-2008 until mid-2010. The rapid fall and recovery in commodity prices during the global financial crisis was reflected in similar volatility in the exchange rate.

**Chart A.2: The Australian terms of trade and real TWI exchange rate**



Source: Australian Bureau of Statistics, Reserve Bank of Australia

## Appendix B: Framework of the analysis

The approach used in the analysis here employs AE-RGEM, Access Economics' in house general equilibrium model. The model allows the broader economic impacts of changes in policy and the economic environment to be assessed and quantified. It contains a regional structure of the major world economies together with detail at the state level for Australia. The sectoral breakdown is sufficiently detailed to allow the identification of those industries that will be most impacted by the scenarios being modelled.

The model is primarily based on input-output or social accounting matrices, as a means of describing how economies are linked through production, consumption, trade and investment flows. For example, the model considers:

- direct linkages between industries and countries through purchases and sales of each other's goods and services; and
- indirect linkages through mechanisms such as the collective competition for available resources, such as labour, that operates in an economy-wide or global context.

In this application of the model eight countries, together with the Australian states, are detailed in the database (Table B.1).

**Table B.1: AE-RGEM regions**

Australia	India
China	North America
Japan	Europe
Korea	Rest of the world

Source: Access Economics

The model accounts for both primary energy sources (such as gas and coal), electricity generation as well as key energy users such as minerals processing. With this level of detail, the model is able to capture the flow on effects of changes in supply conditions through to end users and project economy-wide impacts represented by changes in, for example, GDP.

In addition, the model has been developed specifically with climate change response policy in mind. General equilibrium models like AE-RGEM are widely used for scenario analysis relating to climate change response policy through either setting a cap on emissions or imposing a price on carbon. The main benefit of a model such as AE-RGEM is that greenhouse gas emissions arise from a range of activities across the economy; as such, policies designed to constrain emissions growth will have widespread economic consequences.

Finally, AE-RGEM is dynamic model that solves year-on-year over a specified timeframe. The model is ideally suited to scenario analysis as, in this mode, it is used to project the relationship between variables under different assumptions, or states, over a pre-defined period.

The sectoral detail in the model includes data on 39 industries as per Table B.2.

**Table B.2: AE-RGEM sectoral detail**

Crops	Aluminium
Livestock	Other non ferrous metals
Other agriculture	Pulp, paper and printing products
Forestry	Motor vehicle parts
Brown coal	Electrical equipment
Thermal coal	Other manufacturing
Coking coal	Water
Crude oil	Electricity generation(a)
Condensates	Electricity distribution
Natural gas	Gas distribution
LNG	Construction
Bauxite	Trade
Other minerals	Air transport
Processed foods	Water transport
Lumber and wood products	Land transport
Petroleum products	Communications
Chemical, rubber and plastics	Business services
Non metallic minerals	Government services
Iron and steel	Other services
Alumina	

(a) Electricity is generated using brown coal, black coal, gas, oil-fired, nuclear, hydropower and other renewables.

## Scenario analysis

Three scenarios are considered in the analysis presented here:

- A business as usual case,
- Exchange rate appreciation, and
- Carbon price scenario.

Each of these is modelled as follows.

### Business as usual

The modelling results presented here are a comparison of a world in which no changes occur, a business as usual scenario, and one in which either the exchange rate appreciates or a carbon price is introduced. In this sense, the business as usual scenario is the counterfactual for the analysis. In order to construct the business as usual scenario a number of other changes to the economy are incorporated into the baseline.

Access Economics regularly prepares economic forecasts of GDP, employment, population growth, etc. The business as usual scenario takes these forecasts and constructs the baseline from which the scenarios are compared. The difference between this and each scenario shows the impacts of the exchange rate movement and the new carbon price.

## Exchange rate appreciation

This scenario models a change in the international competitiveness of Australian firms due to an appreciation in the Australian dollar. History has shown that the value of the Australian dollar can vary significantly, indeed during 2010 its value has moved between \$A0.80 per USD to parity. The scenario examined here considers a similar sized appreciation of 20% compared to the rest of the world.

The change in exchange rate is modelled through a direct alteration to Australia's international competitiveness. The modelling takes no account of the driving.

To target a 20% rise in export prices, the tax on imports of the destination country is altered. This is done by estimating the current tax income from imports in each sector as a proportion of the total value of imports and then adjusting the tax variable accordingly. Similarly, reducing the price seen by Australian importers is achieved by lowering export taxes in the source country. Interstate trade is not altered as imports and exports between states take place in the domestic currency and thus prices remain constant. The transition from the present valuation and the 20% appreciation takes place over the period 2011 to 2020.

The impacts of this shock are seen economy wide as the exchange rate appreciation is not discriminatory in terms of the sector it applies to.

## Carbon prices

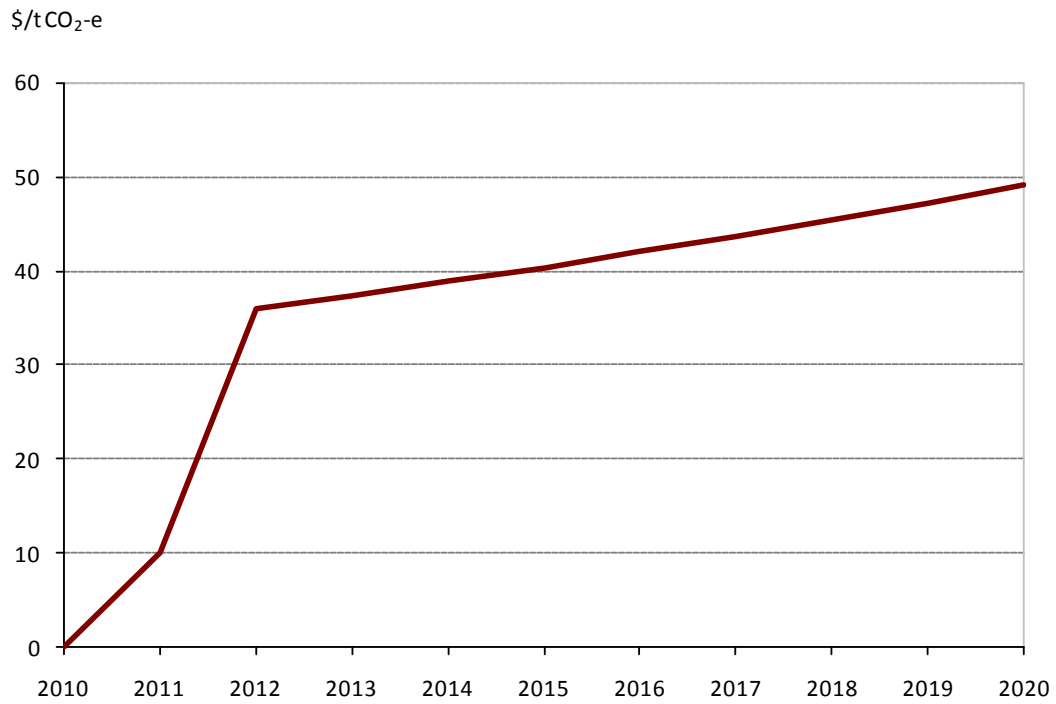
Carbon prices are included in the model such that either a price or an emissions target can be set. For the modelling undertaken here prices are targeted. The price path used in the analysis is based on the CPRS scheme previously put before parliament with one notable exception.

The CPRS initially allowed for a fixed price of \$10/t CO<sub>2</sub>-e throughout 2010 and an unlimited amount of permits to be available during this first year of operation. In the modelling exercise carried out here the same transition is allowed but it occurs in 2011, one year later than previously allowed for.

Throughout the period under consideration, 2010 to 2020, the carbon price rises from its introductory level to around \$50. In the early years the price rises quite rapidly to reflect the commencement of the scheme and the change from an economy with no carbon price to one with a price. From 2012 onwards the price is allowed to adjust to reflect supply and demand for permits.

The cap and trade nature of the scheme indicates that only a fixed number of permits are available in any given year. To meet the objectives of the scheme this number is reduced each year which, assuming demand for permits remains constant or even grows with output, suggests a slight increase in price. Chart B.1 shows this effect with the price rising to almost \$50/t CO<sub>2</sub>-e by 2020.

**Chart B.1: Carbon price path over time (\$/t CO<sub>2</sub>-e)**



With the exception of Europe and Japan, no carbon price is assumed to apply in the other regions of the model. In Europe and Japan, carbon prices are assumed to reach slightly higher levels than assumed in Australia, around AUD\$80 per tonne by 2020 (in real terms).

## Appendix C: Hedging of currency and carbon risks

Both foreign exchange fluctuations and the introduction of a carbon price pose risks to businesses' revenue. However, once identified, these risks can be managed. Handling currency risk is normally done through forward contracts, a financial instrument, while managing carbon risks is likely to be done through investment in projects, infrastructure or asset diversification.

### Currency risks

As explained earlier, Australian businesses are exposed to currency risk when they purchase or sell items in a foreign currency or take out loans denominated in a foreign currency. Currency risk presents both an upside and a downside. When the Australian dollar appreciates more foreign currency can be purchased for a given amount of Australian dollars. After an appreciation importers find it cheaper to purchase goods overseas (a positive risk) while exporters find their goods more expensive and so less competitive (a negative risk). Under currency depreciation the opposite effects occur. For borrowers, if a loan is taken out denominated in a foreign currency an appreciation makes the loan easier to pay off while a depreciation makes it harder to pay off, in this way a loan can be thought of as importing investment capital from overseas. In extreme circumstances currency devaluation may mean that the loan can no longer be serviced from the projects revenue.

Considering an exchange rate fluctuation where the Australian dollar appreciates against the US dollar, this causes Australian exports to become more costly to people in the US and so harms the Australian exporter, on the other hand American exporters benefit as their goods appear cheaper. If the Australian dollar then depreciates significantly, the Australian exporter benefits while the American exporter suffers. There is a clear symmetry in the effects of exchange rate fluctuations and this symmetry allows for the managing of currency risk through hedging.

In this situation the Australian and American exporters could make an agreement that when one of them is benefiting from a currency fluctuation they share the benefits with the other. This would reduce, and possibly eliminate, the negative effects being borne by the other. Under such an agreement both firms have reduced both their upside and downside risks. This is, in essence, what hedging achieves.

Hedging of currency risk is often done through forward contracts. Forward contracts, a financial instrument, are a type of derivative. Derivatives are contracts whose value depends on the price of an underlying asset such as a stock, bond, commodity or even the weather. Forward contracts are an agreement between two parties to buy or sell an asset at a specified time in the future for a price agreed to today. Forward contracts are traded over the counter (OTC) and can be adapted in many ways to suit the specific needs of the parties agreeing to the contract. For foreign exchange, a forward contract simply involves two parties agreeing to a trade of currency at a given rate of exchange at some set date in the future. An example may help to illustrate how this concept can be used to manage foreign exchange risks.

Consider an Australian exporter who anticipates selling a large amount overseas in six months time. After the sale the exporter will have a large amount of foreign currency which must be

converted to Australian dollars. This exposes the exporter to the risk that there will be an appreciation of the Australian dollar. Putting some numbers to this example, the exporter may anticipate sales of USD \$1,000 in six months time, and at the current exchange rate of roughly parity this would translate into AUD \$1,000 but if the Australian dollar appreciates between now and when the exporter makes the sale such that it takes USD \$1.05 to purchase AUD \$1 then the exporter will only be able to exchange the USD \$1,000 for AUD \$952. This issue becomes a serious problem as future exchange rates are unknown and very hard to predict (Kilian and Taylor 2003). This means that the Australian exporter could make, for example, AUD \$952 or AUD \$900 or AUD \$1,050 depending on the particular exchange rate on the day they exchange their USD for AUD. This is undesirable from the exporters' point of view as it exposes them to significant risks and makes business planning difficult. To manage this risk the exporter could take out a forward contract, knowing that they have a sale in six months time the Australian exporter could agree to a forward contract which locks in an exchange of USD \$1,000 for, say, AUD \$1,050 in six months time. In this way the exporter has hedged their risk, this is because they no longer face the loss that would come from an unexpected appreciation of the AUD but also no longer face the gain from a depreciation.

Every forward contract requires a counterparty, that is the other person who agrees to the contract, and it may not be immediately clear how the counterparty gains from agreeing to the forward contract. This is particularly the case as, when the currency exchange is actually made it appears as if one party wins while the other loses. In our example above, the forward contract implied a future exchange rate of 0.95, if the exchange rate on that day actually turns out to be 0.97 it appears as if the Australian exporter has 'won' from the deal while the counterparty as 'lost' (the Australian exporter has gotten AUD \$1,050 when the market rate would have given them only AUD \$1,031).

However, considering the example in more detail can provide an insight to the gains from trade. In the above example the counterparty could be an American exporter who is going to be selling goods in Australia in six months time. This American exporter faces exactly opposite risks to the Australian exporter, they will have AUD which they are looking to turn into USD, would benefit from an appreciation of the AUD and would suffer from a depreciation of the AUD. So by agreeing to the contract with the Australian exporter the American exporter can also manage their currency risks. In this way the two exporters essentially exchange their opposite risks with one another effectively eliminating them, both sides benefit from this agreement and both sides gain security in their business planning. In practice such forward transactions normally take place with a bank, hedge fund, mutual company or other financial institution rather than directly with between two parties (BIS 2010).

The participation of Australian businesses in the currency forward market is hard to measure given that forward contracts are traded over the counter, between the two participants, and don't need to be publicly recorded or notified.

In a recent survey of the international foreign exchange and derivatives market, the Bank of International Settlements (BIS) produced a number of statistics which give an idea about the size of the forward market in Australia:

- average daily turnover in global foreign exchange markets was around \$4 trillion of which \$0.5 trillion were forward contracts
- The Australian Dollar was involved in around \$302 billion of trades each day.
- The majority of forward contracts were made for periods of between 7 days and 1 year.

- Australian markets turned over around \$192 billion dollars of foreign exchange transactions each day, this makes Australia the 7<sup>th</sup> largest location for foreign exchange trade (BIS 2010).

Applying the global proportion of forward contracts to the total amount of foreign exchange transactions conducted in the Australian dollar suggests a market of around \$38 billion of forward contracts in Australian dollars each day.

Although this description has focused on forward contracts, there are a number of other financial derivatives that can be used to manage currency risk including futures, swaps and options. Each of these are similar in that they work by offsetting one party's potential gains against another party's potential losses but differ significantly in the precise problems they are designed to address, the rules for the parties involved and the way that they are created.

## Carbon risks

The risk posed by carbon pricing is somewhat different to currency risk as it is not related to fluctuations in price but rather an unknown probability of an increase in costs.

The emissions trading scheme is designed to reduce the overall level of carbon emissions by placing a cap on emissions with businesses emitting over a certain level being obliged to purchase permits to do so. At the end of the compliance year, businesses will be required to surrender permits equivalent to the level of their emissions. The allocation of permits will be lower than the current level of emissions. Permits will be auctioned by the Government and once auctioned, they can be freely traded on a secondary market and the price at which the permits trade is referred to as the carbon price. Over time, there will be further abatement of emissions through a series of reductions in the number of permits leading to an increase in the carbon price. As a cost for emitting carbon into the atmosphere is created, businesses will need to consider how to best manage this cost and the risks created by it.

The Carbon Pollution Reduction Scheme (CPRS) is designed to be the centrepiece of Australia's climate change response policy. Under the CPRS, businesses which emit more than 25,000 t CO<sub>2</sub>-e emissions per year will be required to purchase permits, which accounts for around 1,000 businesses in Australia. However, the proposed scheme has gone through numerous amendments since it was first introduced and the implementation of the CPRS was delayed in April 2010 until after the end of the commitment period of the Kyoto Protocol. Therefore regulatory uncertainty in terms of the delays in implementing the CPRS and the details of such a scheme add further uncertainty for businesses.

In the current design of the scheme, the CPRS has a five year transition period over which the cap on prices would gradually be removed and the carbon price allowed to increase. Initially permits would sell for \$10/ t CO<sub>2</sub>-e for the first year with unlimited supply. Subsequent years would see a price cap of \$40/ t CO<sub>2</sub>-e which would increase by 5% per year until 2015, after which the price will be determined by the market.

Generally, if carbon price risks are not built into company valuations, there is the risk of bad capital investments. For example, there may be insufficient investment in renewable energy projects since they may not be currently profitable and overinvestment in high emissions producing industries since the carbon price has not been taken into account.

Businesses can account for carbon price risks by

- changing the portfolio of assets that they own and incorporating emissions considerations into their core business strategies, i.e. acquisitions, asset divestitures, operations, since any changes in carbon prices may affect their asset values; and
- investing in emissions abatement through fuel switching to different energy sources, i.e. switching from coal power to gas or renewable energy sources like wind generation, and increasing their energy efficiency to minimise emissions. This may also involve investing in technologies that make coal production more efficient.

Businesses can build a portfolio of assets which is carbon risk neutral by combining emitting assets and sequestering assets, similar to building a portfolio that is market risk neutral or using futures to be exchange rate risk neutral. For example, in Brazil, a steel pipe manufacturer has invested in forestry to provide renewable energy for its production needs and avoid the use of coal. Although the CPRS in Australia does not allow for carbon offsets, elsewhere businesses can invest in such carbon absorbing companies and profit from the sale of carbon credits that it generates. ClimateCare, recently purchased by JPMorgan, develops energy efficiency projects worldwide from which businesses purchase carbon credits to offset their emissions voluntarily without being mandated to do so. The World Bank has identified that in 2007, 68 countries offered projects with private sector buyers and investors spending US\$8.2 billion on emissions reductions of 634 million tonnes of carbon dioxide equivalent through primary projects (World Bank 2008).

The CPRS itself currently provides means to manage carbon price risks. Within the current form of the CPRS, emitting industries can hedge against carbon price volatility through the banking or borrowing of permits. The current scheme allows unlimited banking of permits and a limited amount of borrowing of permits, specifically up to 15% of a business's liability. If a business considers that the carbon price will increase in the future, they can elect to hold and bank permits, and surrender or sell them at a later date.

Businesses may also try to manage the carbon price risk by timing the purchase of permits. Under the CPRS, permits will be auctioned monthly while businesses are required to surrender permits for their emissions within one compliance year. An auction of a compliance year's vintage will be held within a month before the final surrender date for that year and this is designed to enable businesses to purchase additional permits as necessary once the emissions for that year have been determined. Therefore if a business anticipates the price of permits to fall, they can delay the purchase of the permits until the end of the compliance year.

Under the CPRS, Australian businesses can also purchase unlimited permits from international carbon markets while Australian permits can be sold internationally five years after the start of the scheme. This will help smooth carbon prices and also reduce costs by ensuring that the cheapest permits are purchased first.

Businesses can hedge carbon price risks through dealing in financial instruments such as forward contracts. The CPRS allows non-liable entities to bid in the auctions for permits so financial intermediaries can also purchase permits. This will aid in the development of a secondary market for the trading of permits as financial products.

To hedge against carbon price volatility, businesses can trade in futures and forward contracts whereby they agree to purchase the permits at a later time but at a price already agreed upon.

Therefore if they anticipate that the price of permits will rise in the future, they can enter into a contract to purchase the permits at a later date to meet their compliance obligations but at the current lower price. This also involves the risk that carbon prices may decrease from current prices in which case the businesses will be purchasing permits at a relatively higher price. This operates along the same lines as a foreign exchange rate hedging whereby businesses may agree to undertake a transaction at a future time but at an exchange rate that has already been determined to minimise the risks of currency appreciation/depreciation.

In 2007, around US\$50 billion worth of permits and derivative contracts were traded under the EU ETS over the counter, bilaterally and on exchange platforms (World Bank 2008). This included businesses hedging their carbon price risks through purchasing permits as well as financial intermediaries purchasing permits.

The Chicago Climate Futures Exchange offers futures exchange for US emissions permits as well as offering a futures contract to directly hedge exposure to a possible future US carbon market that may mandate carbon prices and greenhouse gas emissions reductions.

## References

BIS (Bank of International Settlements), 2010. Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2010 – Preliminary Global Results - Turnover, September 2010.

Kilian, L. and Taylor, M. P., 2003. “Why is it so difficult to beat the random walk forecast of exchange rates?”, *Journal of International Economics* 60(1), May 2003, pp 85-107.

Pedro Moura Costa and Le Chen, The Brazilian steel & iron sector and the CDM: examples of EcoSecurities’ activities in this field, EcoSecurities, April 2002, [http://www.ecosecurities.com/Assets/23543/Pubs\\_The%20Brazilian%20steel%20and%20iron%20sector%20and%20the%20CDM%20Examples%20of%20EcoSecurities'%20activities%20in%20the%20field.pdf](http://www.ecosecurities.com/Assets/23543/Pubs_The%20Brazilian%20steel%20and%20iron%20sector%20and%20the%20CDM%20Examples%20of%20EcoSecurities'%20activities%20in%20the%20field.pdf), accessed on 11 November 2010.

The World Bank, *State and Trends of the Carbon Market 2008*, May 2008, <http://siteresources.worldbank.org/NEWS/Resources/State&Trendsformatted06May10pm.pdf>, accessed on 11 November 2010.