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Electronic Indicators of Economic Activity

Troy Gill, Dilhan Perera and David Sunner*

There is a rich array of timely high-frequency electronic data that potentially is informative about current economic conditions. In particular, data on electronic transactions and internet searches can be useful complements to more standard indicators of economic activity. While a limited selection of electronic data is currently used by national statisticians in the production of economic indicators, electronic data are likely to become an increasingly important source of information.

Introduction

Assessing current economic activity is an important part of macroeconomic policymaking. However, official economic statistics can take some time to compile and to be published. For example, quarterly gross domestic product (GDP) figures are released around nine weeks after the end of the relevant quarter. As a result, the Reserve Bank looks at a range of more timely, but less complete, indicators to gauge current conditions in the economy, such as the various business surveys and the Bank's business liaison program.[1]

Over recent years, however, technological developments, and the digitisation of information and activity, have generated a vast array of electronic data, which can potentially be analysed on a daily basis, or even in real time. Some of these data cover very large numbers of individuals and businesses – far more than many traditional surveys used by statistical agencies – and have the potential to be useful for monitoring and measuring aggregate economic conditions. While official statisticians are increasingly using electronic data in the production of economic indicators, this is still very much in its infancy.[2] Economists and policymakers are also making greater use of electronic data to understand economic developments and as a cross-check on data from official agencies.

This article examines the usefulness of wholesale and retail electronic transactions data and internet search data in assessing current economic activity. Given the growth of electronic payments and internet use by Australian households and businesses, these data can help to track economy-wide spending and activity. While wholesale and retail payments data already provide some additional information on national accounts aggregates, and internet search data also appear promising as economic indicators, these sources are expected to become even more useful in the future, as new technology is adopted and electronic means of payment evolve further. As such, these data are worth monitoring more closely.

Wholesale Payments

Payments generated by corporates and financial institutions reflect a wide range of activities such as purchases of goods, business investment, imports and exports, and financial transactions. Recently, wholesale payments data have attracted attention

* The authors are from Economic Analysis Department and Payments Settlements Department. The authors would like to thank Tapas Strickland and James Bishop, formerly of Economic Analysis Department, for analysis featured in this article.

1 For an overview of the main business surveys in Australia and how they are used by the Reserve Bank, see Park (2011).

2 For example, the Australian Bureau of Statistics (ABS) makes use of electronic tax collection data and Medicare data.

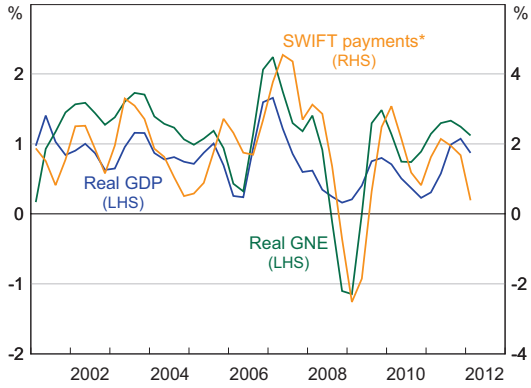
as a potential economic indicator, with the financial message service provider SWIFT releasing an index that helps to predict OECD GDP growth using SWIFT payments sent on behalf of corporate customers.[3] SWIFT (2012) suggests that inclusion of customer-to-customer payment volumes data can improve the explanatory power of a simple model of GDP growth.

In Australia, data are available on the SWIFT payments settled across the Reserve Bank Information and Transfer System (RITS), which is Australia's real-time gross settlement system.[4] Although banks can use various payment instruments for their customers' transactions, large-value corporate customer payments will usually be sent using SWIFT, particularly wholesale transactions relating to business investment.

These data have several advantages over other more established indicators of economic activity. They are very timely, with a day's payment data available at the conclusion of each business day. They cover a very large number of payments and being actual fund transfers of banks and their customers are free from reporting error and revisions. However, RITS transaction data do have some limitations. The data include financial transactions and clearly exclude many small transactions by individuals and businesses, while shifts between payment methods can introduce volatility. Also, payments between two customers holding accounts at the same bank will not normally be sent to RITS for settlement and are therefore not captured in the data. The historical time series is also relatively short compared with more established indicators. While electronic payments data clearly have their limitations, it is worth noting that existing measures, such as GDP and gross national expenditure (GNE), are also imperfect estimates of actual economic activity.

Nevertheless, SWIFT payments track changes in these measures of economic activity reasonably well (Graph 1, Table 1).[5] Interestingly, the number, rather than the value, of payments is more highly correlated with economic activity. This may be because volatility in the values series is affected by large financial transactions, such as swaps, which are not directly relevant for measuring economic output and demand. The relationships with real and nominal measures of economic activity are similar. Given the greater emphasis on real measures of activity in economic analysis, the following analysis focuses on the usefulness of electronic payments as an indicator of *real* measures of economic activity.

Graph 1
SWIFT Payments and Economic Activity*
Trend, quarterly growth



* Number of SWIFT interbank payments settled in RITS, 7-period Henderson trend
Sources: ABS; RBA

Another way to assess the usefulness of wholesale payments data is to observe whether they can improve the explanatory power of models of economic activity. A test that represents a relatively low hurdle is whether wholesale payments contain information not already provided by a lag of the

3 SWIFT uses message types to distinguish between different business purposes; the index constructed by SWIFT (2012) includes customer-to-customer payments (SWIFT MT103 payments) but does not include bank-to-bank payments (SWIFT MT202 payments).

4 Other payments settled in RITS include retail transactions such as direct entry, cheques and card transactions, as well as transactions arising from wholesale debt securities, equity and money market transactions. For further discussion on the settlement of payments in RITS, see Gallagher, Gauntlett and Sunner (2010).

5 For the purposes of this article, the SWIFT data were aggregated and seasonally adjusted at a quarterly frequency, after being lagged by one month; the quarterly SWIFT data have a stronger relationship with official measures of economic activity when lagged by one month, which is consistent with invoicing arrangements that typically allow some time for payment after receipt of the service or good.

Table 1: Correlations between SWIFT Payments and Economic Activity[a]
March 2001 to March 2012, quarterly

	SWIFT payments	
Economic variable	Value	Number
Real GDP	0.17	0.49
Real GNE	0.31	0.56
Real domestic demand	0.27	0.40
Nominal GDP	0.38	0.48
Nominal GNE	0.32	0.51
Nominal domestic demand	0.30	0.35

(a) Contemporaneous correlations based on seasonally adjusted data; RITS data are available from July 1998, but possible structural breaks restrict analysis to 2001 onwards
Source: RBA

economic activity variable itself, that is, whether payments can improve the fit of a baseline model where growth in the economy is modelled as a simple autoregressive process. In addition to the baseline model, Equation (1) is estimated for each activity variable (GDP in this example):

$$\Delta GDP_t = \alpha_0 + \alpha_1 \Delta GDP_{t-1} + \alpha_2 \Delta SWIFT_t + \varepsilon_t \quad (1)$$

where *SWIFT* is the number of payments settled per quarter, ε is an error term and Δ denotes quarterly per cent growth. For comparison, Equation (2) is also estimated for each activity variable:

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta GDP_{t-1} + \beta_2 survey_t + \varepsilon_t \quad (2)$$

where *survey* is the NAB survey measure of business conditions.

The results suggest that SWIFT payments data do indeed contain additional information, as the fit of the models improves noticeably, with the models explaining an additional 10–30 per cent of the quarterly movement in broad measures of economic activity, relative to the baseline model (Table 2). This improvement is comparable to that achieved with the inclusion of the business conditions survey measure in the baseline model.[6] The inclusion of the payments variable also slightly improves the models' out-of-sample predictive ability (to a greater extent than the inclusion of the survey variable), as shown by the fall in the mean absolute error (MAE), which is the average absolute difference between predicted and actual quarterly growth in the economic variable for the quarter ahead.

A more challenging test is whether SWIFT payments data can improve models of economic activity that already include a range of timely economic indicators. Principal component analysis can be used to summarise the information provided by such other indicators (Gillitzer, Kearns and Richards 2005). This technique identifies the movements of common factors (the principal components) and their importance in driving movements in a set of variables. Two first principal components are estimated, one based on various surveys of economic conditions ('survey variables'), and one on a broader collection of variables including surveys, financial market indicators and official ABS statistics ('all variables').[7] Two corresponding baseline models

6 The results for *nominal* measures of economic activity are similar to those shown in Table 2.

7 The survey indicators include the NAB business conditions and business confidence indices, the Westpac-Melbourne Institute consumer sentiment index, a composite AIG business conditions index, and changes in the NAB survey measure of capacity utilisation. In addition to these measures, the broader collection of indicators includes growth in the ANZ job advertisements series; imports; exports; retail sales; dwelling approvals; total credit; real equity, commodity and dwelling prices; and changes in the unemployment rate.

Table 2: Information Content of SWIFT Payments Data – Autoregressive Models[(a)]
March 2001 to March 2012, quarterly

Economic variable	Baseline	SWIFT payments	Survey
Real GDP			
Adjusted R^2	0.05	0.31	0.19
MAE (ppt)	0.30	0.29	0.54
Real GNE			
Adjusted R^2	0.00	0.29	0.27
MAE (ppt)	0.54	0.29	0.85
Real domestic demand			
Adjusted R^2	0.03	0.16	0.31
MAE (ppt)	0.91	0.75	0.82

(a) MAE is calculated using one quarter ahead out-of-sample predictions for the four quarters to March 2012
Source: RBA

are estimated, with growth in the economic variable explained by a principal component. In addition to the baseline models, Equation (3) is estimated for each principal component and each activity variable (GDP in this example):

$$\Delta GDP_t = \gamma_0 + \gamma_1 PC_t + \gamma_2 \Delta SWIFT_t + \varepsilon_t \quad (3)$$

where *PC* is the estimated first principal component of other timely indicators (either 'survey variables' or 'all variables').

The inclusion of a SWIFT payments variable into the baseline models improves their explanatory power, as shown by the increase in the adjusted R^2 figures (Table 3). The inclusion of the payments variable also improves the models' out-of-sample predictive ability, as shown by falls in the MAEs. However, the MAE results appear somewhat sensitive to the length of the period chosen for the out-of-sample

Table 3: Information Content of SWIFT Payments Data – Principal Component Models[(a)]
March 2001 to March 2012, quarterly

	Survey variables		All variables	
Economic variable	Baseline	SWIFT payments	Baseline	SWIFT payments
Real GDP				
Adjusted R^2	0.06	0.23	0.05	0.22
MAE (ppt)	0.47	0.39	0.51	0.41
Real GNE				
Adjusted R^2	0.34	0.50	0.33	0.48
MAE (ppt)	0.67	0.57	0.78	0.67
Real domestic demand				
Adjusted R^2	0.35	0.40	0.38	0.41
MAE (ppt)	0.75	0.68	0.79	0.70

(a) MAE is calculated using one quarter ahead out-of-sample predictions for the four quarters to March 2012
Source: RBA

forecasts.[8] Nonetheless, the results from the various tests suggest that wholesale SWIFT electronic transactions data have some relationship with key economy-wide measures of activity and, moreover, contain useful information in addition to that already reflected in other timely indicators.

Retail Payments

Electronic data are also generated when consumers and businesses use credit and debit cards to purchase goods and services. With the growing adoption of electronic means of payment, such electronic transactions data are a potentially rich and timely source of information on economic activity. In Australia, such data are collected from financial institutions by the Reserve Bank and published as part of the monthly Retail Payments Statistics (RPS).[9]

These data have several advantages as indicators of household consumption and broader measures of spending. First, the data are close to a census of transactions in the economy (for the non-cash payment methods covered); data are drawn from most financial institutions that have retail payment operations and some other payment system participants and are therefore subject to only minor sampling error, which can be a significant problem for traditional statistical survey collection. For this reason, and similar to wholesale payments, the retail transaction data could reasonably be considered as an alternative indicator of activity in their own right. Furthermore, the data cover a wider variety of sales than other indicators – such as the ABS Retail Trade Survey (which tends to capture the sale of goods rather than services). Indeed, the monthly value of electronic card transactions is more than twice the monthly value of retail sales (but still less than total household consumption spending).[10] It is also possible to obtain an indication of trends in some economic activities that cannot be gleaned from official statistics, such as online purchases or purchases overseas.

On the other hand, the RPS data do have some limitations. Importantly, they do not capture all transactions in the economy: for example, purchases made using cash, among other payment methods, are not directly included. The data also capture a mix of consumer and business transactions, which could weaken their ability to track consumer spending. The data also include spending on both final *and intermediate* goods and services, whereas the latter is excluded from economy-wide measures of spending; this raises the possibility of multiple transactions being recorded even though they relate to just one final good or service. Finally, since data are collected from a large number of financial institutions for the construction of these statistics, they are less timely than some other indicators of spending, being published around six weeks after the end of the reference month.[11]

Overseas research suggests that electronic card transactions are a potentially useful complement to more traditional monthly indicators of spending. In New Zealand, Minish (2007) shows that monthly electronic transactions data by industry type are useful as an early indicator of retail sales and broader consumer spending. Similarly, Galbraith and Tkacz (2007) find that high-frequency Canadian debit card transactions data can reduce consensus forecast errors for GDP and consumption growth, and help to predict future revisions to official data.

8 For example, there was no improvement in MAEs from the baseline model when the out-of-sample forecasting was conducted over eight quarters, rather than four.

9 The published RPS data include ATM cash withdrawals, EFTPOS transactions, credit and charge card transactions, as well as direct debits and credits, and cheques. For more information, see <http://www.rba.gov.au/payments-system/resources/statistics/retail-paymts-stat-collect/index.html>.

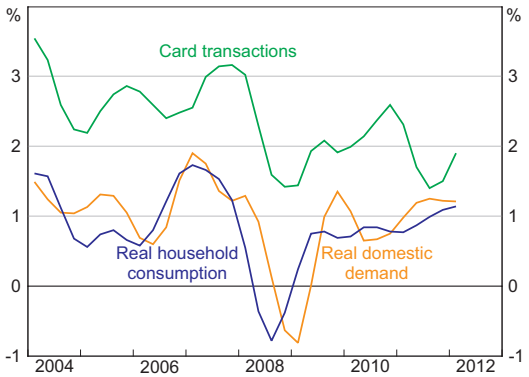
10 The activity captured by the Retail Trade Survey accounts for roughly one-third of household consumption spending (and over 40 per cent of consumption spending excluding housing). For the purpose of this comparison, 'electronic transactions' is broadly defined to include ATM and over-the-counter cash withdrawals, EFTPOS purchases and cash outs, purchases on scheme debit cards, and purchases and cash advances on charge and credit cards. It includes both domestic and overseas transactions on cards issued in Australia, but not domestic transactions on foreign cards.

11 Data on the settlement of low-value payments are, however, available to the Reserve Bank on a daily basis from RITS.

To assess whether retail payments data can serve as a useful indicator of spending in Australia, a similar analysis to the previous section is employed. Both the value and number of electronic card transactions are considered, as well as 'purchases only' transactions, which exclude cash withdrawals and cash advances.[12] The sample period is relatively short, as the complete set of credit and debit card statistics is only available from late 2002, and the data are affected by various payments system reforms, which changed the relative cost and usage of different payment methods. Nonetheless, it is possible to draw some tentative conclusions.

Correlation analysis suggests that there is a potentially useful relationship between the *value* of 'purchases only' retail transactions and official spending measures (Graph 2, Table 4).[13] Although the correlations are low for GDP, they are noticeably higher for measures of domestic spending. This is consistent with retail payments data measuring spending on cards issued in Australia, which includes spending on imports – for example, when the cards are used overseas – but not exports. However, growth in the *number* of retail card transactions is not closely related to growth in economic activity. This result perhaps reflects the ongoing structural shift from cash to electronic means of payment, which appears to be having a larger impact on the total number of transactions than the total value (that is, the average size of electronic transactions has declined); once this transition has run its course, however, the electronic transactions data will cover a larger, and arguably more representative, share of aggregate spending, which is expected to improve their usefulness as an indicator. Finally, the correlations are broadly similar for nominal and real measures of activity. Given this, and in line with the previous section, the following analysis focuses on 'purchases only' electronic transactions as an indicator of *real* measures of economic activity.

Graph 2
Card Transactions, Consumption and Domestic Demand Growth*
Trend, quarterly



* Card transactions refers to the value of purchases on electronic cards issued to individuals and businesses in Australia; household consumption excludes housing; 7-period Henderson trend
Sources: ABS; RBA

Following the same approach employed in the previous section, the inclusion of electronic purchases modestly improves the fit of autoregressive models of spending, although the adjusted R^2 statistics remain low (Table 5). For household consumption and retail sales, the improvement also slightly exceeds that achieved by alternatively including a survey measure of consumer sentiment in the models. The inclusion of electronic purchases also slightly improves the models' out-of-sample predictive ability for domestic demand, albeit little more than the improvement achieved with the inclusion of a survey variable. These findings suggest that retail payments data may be better indicators of household demand than broader measures of spending (such as GDP or GNE), which is consistent with the majority of card transactions being conducted by individuals rather than businesses.[14]

12 Cheque and direct entry transactions are excluded from the dataset as direct entry payments are likely to partly reflect movements of money between accounts and wage and dividend payments, while cheques are often used for transactions not directly related to real economic activity, such as property settlements.

13 The correlations between *total* card transactions and official spending measures are in general a little lower than for 'purchases only' transactions. Also, the correlations between the value of 'purchases only' transactions and the real economic variables shown in Table 4 are little changed when the transactions data are deflated by the price deflator corresponding to each real economic variable.

14 The results shown in Table 5 are similar for nominal measures of economic activity, although in the latter case the improvement in the adjusted R^2 for household consumption was larger for the survey variable.

Table 4: Correlations between Retail Payments and Economic Activity[a]
December 2003 to March 2012, quarterly

	Retail payments	
Economic variable	Value	Number
Real retail sales	0.34	0.05
Real consumption (excl rent)	0.40	0.23
Real domestic demand	0.31	0.25
Real GDP	0.09	0.06
Nominal retail sales	0.28	–0.04
Nominal consumption (excl rent)	0.36	0.09
Nominal domestic demand	0.29	0.05
Nominal GDP	0.09	–0.07

(a) Contemporaneous correlations based on seasonally adjusted data
Source: RBA

Table 5: Information Content of Retail Payments Data – Autoregressive Models[a]
December 2003 to March 2012, quarterly

Economic variable	Baseline	Retail payments	Survey[b]
Real retail sales			
Adjusted R^2	0.02	0.08	–0.01
MAE (ppt)	0.49	0.52	0.48
Real household consumption (excl rent)			
Adjusted R^2	0.08	0.16	0.15
MAE (ppt)	0.49	0.52	0.62
Real domestic demand			
Adjusted R^2	0.03	0.08	0.35
MAE (ppt)	0.94	0.86	0.88
Real GDP			
Adjusted R^2	0.01	0.00	0.16
MAE (ppt)	0.36	0.46	0.61

(a) MAE is calculated using one quarter ahead out-of-sample predictions for the four quarters to March 2012
(b) For household consumption and retail sales, the survey variable is the Westpac-Melbourne Institute Consumer Sentiment Index
Source: RBA

In models where growth in spending is explained by the first principal component of various timely data (including retail sales), the inclusion of the electronic purchases variable resulted in little change to the explanatory power (Table 6). Similarly, the inclusion of retail transactions data did not reduce the forecast errors for any of the economic variables.[15]

15 While the MAEs are slightly lower than those shown in Table 6 when the out-of-sample prediction is conducted over eight quarters, rather than four, the results are nonetheless similar.

Table 6: Information Content of Retail Payments Data – Principal Component Models[(a)]
December 2003 to March 2012, quarterly

	Survey variables		All variables	
Economic variable	Baseline	Retail payments	Baseline	Retail payments
Real household consumption (excl rent)				
Adjusted R^2	0.25	0.27	0.44	0.42
MAE (ppt)	0.56	0.65	0.74	0.77
Real domestic demand				
Adjusted R^2	0.35	0.33	0.38	0.36
MAE (ppt)	0.81	0.81	0.83	0.83
Real GDP				
Adjusted R^2	0.05	0.03	0.04	0.02
MAE (ppt)	0.51	0.51	0.53	0.54

(a) MAE is calculated using one quarter ahead out-of-sample predictions for the four quarters to March 2012
Source: RBA

Retail payments data are also available on a daily basis from RITS. While the collection method is different, conceptually these data represent a sub-sample of the RPS electronic transactions data; the narrower scope of these data reflects the fact that payments between customers holding accounts at the *same* bank will not normally be sent to RITS for settlement and are therefore not captured. The RITS data are also less detailed than the monthly RPS; for example, 'purchases only' transactions cannot be identified separately as in the above analysis. However, the RITS data are extremely timely, as a day's payments are available at the close of business the same day. Moreover, when aggregated to a monthly or quarterly frequency, the daily RITS data are highly correlated with the RPS data. Given this, it is not surprising that the above analysis yields very similar results when conducted with the RITS data.

In summary, the retail electronic transactions data appear to be of some use in providing a timely read on official measures of domestic demand. In particular, the transactions data performed somewhat better than consumer sentiment in raising the explanatory power of simple models of household consumption and retail sales. However, official statistics themselves are not free of measurement error. For example, the ABS has identified the real-time measurement of households' spending on services as an area for improvement in their Forward Work Program. Given that retail electronic transactions data are an independent measure of spending in the economy, and include spending on some services, these kinds of data are likely to be used more extensively in official measures of spending in the future. Together with the fact that the structural shift towards electronic payment methods will eventually run its course, this suggests that both the very timely and high-frequency RITS payments data and the RPS data will become increasingly useful for monitoring current economic conditions in the years ahead.

Commercial Banks' Electronic Payments Indicators

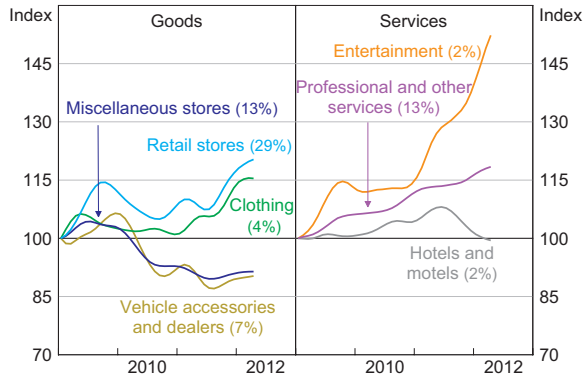
In addition to the electronic transactions data collected by the Bank, some financial institutions publish monthly indices of activity based on electronic transactions, such as those made through their merchant facilities or on the credit and debit cards issued by them. These include the Commonwealth Bank 'Business Sales Indicator'

(CBA BSI), the ANZ 'Small Business Sales Trends' index and the NAB 'Online Retail Sales Index'.[16]

As with electronic payments data more generally, the scope of these data suggests that they could be useful indicators of various types of spending in the economy. Moreover, the indices have a timely release of three to four weeks after the reference month, and therefore precede the publication of monthly ABS retail sales data and quarterly household consumption data in the national accounts. Each index also provides an independent measure of some types of spending that are less well measured in official data and not separately identified in the RPS data, such as spending at service providers and at overseas online retailers. However, the transactions underlying each of these indices are only a sample of all electronic transactions, and payments more generally, and the extent to which they are representative of broader spending patterns may change over time.

A particular advantage of the CBA BSI, compared with the RPS data considered in the previous section, is that the data are broken down by 20 merchant types. This enables spending to be tracked at a much more detailed level. For example, it is possible to construct separate measures of spending on goods and services – the measure of services spending could be particularly useful given the paucity of indicators for this type of expenditure (Graph 3).[17] It is also possible to create a 'household BSI' by excluding certain business-related categories, which should enhance its usefulness as an indicator of household spending.

Graph 3
Household Card Spending by Category*
Trend, January 2009 = 100



* Data are adjusted for seasonality and breaks by the RBA before calculating a 13-period Henderson trend; numbers in brackets refer to each category's share of the aggregate BSI in 2011
Sources: CBA; RBA

When the CBA BSI data are analysed as in the previous section, the pattern of results are generally similar to those obtained using the RPS data. Nevertheless, a few differences emerge. Although the RPS data are somewhat more correlated with most official measures of activity, the CBA BSI is more correlated with real retail sales. This may partly reflect the fact that the CBA BSI measures spending in Australia (at CBA merchant facilities), similar to the Retail Trade Survey, while the published RPS data measure spending on Australian-issued cards and so include overseas spending. The ability to identify spending by different types of retailer separately also means that the CBA BSI is more useful than the broader electronic transactions data for analysing more detailed official statistics on monthly retail sales.

Internet Search Data

Access to the internet has become pervasive in Australia and internet use continues to grow strongly, with households increasingly using the internet to compare and buy goods and services, access government services and engage in online banking. Accordingly, data on internet usage can provide useful information about economic activity.

One such measure of internet activity is the volume of internet searches – how often particular terms are

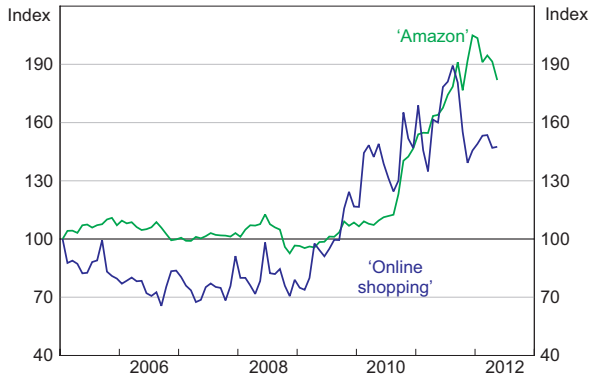
16 The CBA BSI measures the value of credit and debit card transactions processed through the Commonwealth Bank's Australian merchant facilities. The ANZ 'Small Business Sales Trends' index measures the value of credit and debit card transactions processed through ANZ merchant facilities as well as ANZ card transactions processed through other facilities, for businesses with annual turnover less than $5 million (and at least two years old). The 'Online Retail Sales Index', produced by NAB and Quantium, estimates online retail spending, based on an analysis of credit and debit card transactions, as well as BPAY, direct debit and PayPal transactions, made by NAB customers.

17 However, such a measure is limited by the fact that merchants within a specific category may sell a variety of products, including both goods and services.

entered into search engines. As noted in McLaren and Shanbhogue (2011), internet search data have a number of benefits when compared with other economic indicators: the data are available weekly and are therefore very timely, cover a large sample of households and businesses, and avoid the rigidity of survey questionnaires. In particular, internet search data can provide insight into issues not well covered by existing consumer or business surveys, or official data, such as novel or unexpected developments. For example, the rise of online shopping, especially at overseas retailers, has been difficult to track owing to a lack of official data, but Google search data for various relevant search terms such as 'Amazon' and 'online shopping' are useful indicators of the recent increase in this activity (Graph 4). Nonetheless, there are a range of drawbacks with internet search data, including their relatively short history, the possibly unrepresentative nature of the sample given the variation in internet use across different groups by age and income, and the likelihood of considerable noise in the data (owing to factors such as changes in the market share of firms like Amazon, and changes in search terms and behaviour).

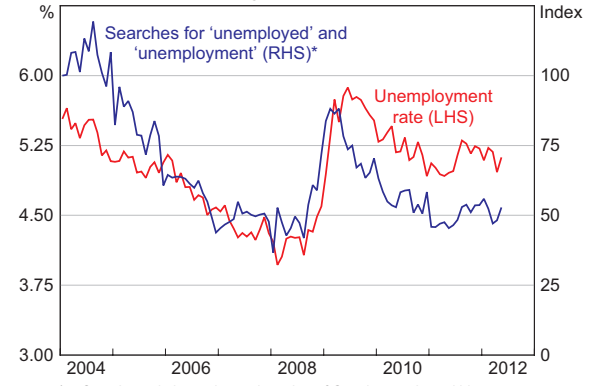
A growing literature has found that online search data – typically sourced from Google – can yield valuable insights into current economic trends.[18] Following early work by Ettredge, Gerdes and Karuga (2005), which found that web search data were useful in forecasting official unemployment data, Choi and Varian (2009a, 2009b, 2011) show that search engine data can help forecast near-term motor vehicle sales, initial jobless claims and home sales in the United States, as well as visitors to Hong Kong. Indeed, there are now a wide range of research papers analysing data from various countries, which find relationships between search data and housing market indicators, particularly dwelling sales and prices, unemployment, and household consumption and confidence. Accordingly, replicating and extending these analyses with Australian data may yield useful results; for example, internet search data in Australia appear promising as a timely leading indicator of the unemployment rate (Graph 5). Furthermore, the usefulness of internet search data is likely to increase with time, as the history of data increases, as internet use becomes more pervasive across the population, as more economic activities become linked in with the internet, and as the availability and flexibility of internet search data continue to improve.

Graph 4
Google Searches for Online Retailers*
January 2005 = 100



* Searches relative to the total number of Google searches within Australia; seasonally adjusted by the RBA
Sources: Google; RBA

Graph 5
Unemployment Indicators



* Searches relative to the total number of Google searches within Australia; January 2004 = 100; seasonally adjusted by the RBA
Sources: ABS; Google; RBA

18 Previous studies generally source online search data from the Google Insights for Search application, owing to its flexibility and free availability, as well as the representativeness of the data given Google's large share of the search engine market.

Conclusion

Electronic indicators provide timely information about spending in the economy. Wholesale and retail payments data from RITS are available daily, search data from Google are currently available at a weekly frequency with minimal lag, and detailed transactions data from commercial banks are available less than four weeks after the end of each month. Electronic data can also provide information on activity that is not available from official statistics or surveys of businesses and households. Wholesale and retail payments data appear to contain useful information about aggregate economic indicators. These payments data capture a very large sample of actual economic activity and, along with other electronic data, are likely to be used increasingly by official statisticians and others to improve the real-time measurement of economic aggregates. Both payments and internet search data are likely to become more useful as economic indicators over time as payments behaviour and internet usage become more stable. Accordingly, electronic indicators of economic activity will continue to be monitored in assessing current conditions. ✠

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Costs and Margins in the Retail Supply Chain

Patrick D'Arcy, David Norman and Shalini Shan*

Retail goods are an important component of the consumption basket and changes in their prices have had a significant influence on CPI inflation over the past decade, particularly following movements in the exchange rate. To help understand the drivers of inflation for retail goods, this article sets out the major costs and margins involved in supplying retail goods to consumers. Notwithstanding dispersion across different types of goods, on average, around half of the final price of retail items can be attributed to the cost of the goods themselves, with the remaining half covering the gross margins of wholesale and retail firms in the distribution supply chain. The costs incurred by distributors are broadly split between labour and other input costs, with distributors' profit margins accounting for a little under 10 per cent of the final sale price. These shares have remained relatively stable for at least the past decade.

Introduction

The retail supply chain, which includes both retailers and parts of the wholesale sector, accounts for a significant part of Australian economic activity, representing around 7 per cent of GDP and more than 10 per cent of total employment. Purchases of retail goods (such as food and beverages, clothing, household goods and motor vehicles) collectively make up around 30 per cent of the basket of household expenditure covered by the consumer price index (CPI). To better understand the factors that influence trends in retail goods prices, and hence overall inflation, it is helpful to know the various costs incurred and margins applied by distributors (retailers and wholesalers) in the process of getting goods to consumers. For example, it is useful to know how much of final prices is due to the cost of imported goods when assessing the extent to which movements in the exchange rate are likely to be reflected in final consumer prices. Likewise, knowing the cost incurred in employing labour to distribute goods enables an understanding of the impact of changing labour costs on retail prices. More generally, the relative importance of distribution costs in the overall supply chain has important implications for how changes in demand or discounting behaviour can affect firms' profitability.

This article presents evidence on the magnitude of these various costs and margins, along with some discussion about how these have changed over time. While there is significant dispersion in margins across different types of distributors, in terms of average margins there are two key results. First, in relation to how the costs of producing and selling retail goods are divided among various inputs: around half of the final sale price can be attributed to the cost of goods (of which 40 per cent is imported), with the other half reflecting the costs associated with distribution. These distribution costs are the amounts paid for labour and other inputs, and the net profits of distributors: around 25 per cent of the final sale price is due to various intermediate inputs (such as rent and business services), and a further 15 per cent is attributable to labour inputs, leaving a little under 10 per cent of the final sale price as profits for the domestic distribution sector.

Second, the prices of domestically produced manufactures and the prices of labour and intermediate inputs used in the distribution process have risen faster than final consumer prices. In

* The authors are from Economic Analysis Department and thank Michelle Bergmann for research assistance.

response to competitive pressures, distributors appear to have increased the volume of goods sourced from foreign manufacturers and generated significant productivity gains. As a result, the average prices that distributors pay for manufactured goods have risen only gradually over the past decade – and broadly in line with the final consumer prices – and distributors' margins have remained relatively stable.

The Retail Supply Chain

In order to understand the details of the cost structure of retail goods, it is helpful to first consider the process by which these goods are made available to consumers at retail outlets, and the costs involved in each stage of the supply chain.

Figure 1 sets out the stylised process involved in moving goods from manufacturers to consumers.[1] The start of this process is the production of goods in factories, be they in Australia or overseas. To produce these goods, manufacturing firms require raw materials (including imported materials) and incur a range of costs in production, the largest of which are typically labour and energy. Having produced the item, the manufacturer then sells and transports the product to a wholesaler. As part of this process, the manufacturer (or wholesaler) will incur transport costs and, if the goods are sourced from overseas, shipping and potentially tariff costs. The cost of the product itself and these transport and tariff costs collectively comprise the wholesaler's 'cost of goods sold' (COGS). For the wholesaler to distribute these goods to retailers, it must also incur operating costs, which are collectively referred to as the wholesalers' 'cost of doing business' (CODB), and include expenses paid by the wholesaler to its staff, landlords and freight providers (as well as the holding cost of inventory). To cover these costs and generate a return on its assets, the wholesaler applies a 'gross margin' (which is the difference between its sale and purchase price, or equivalently the sum of its CODB and 'net' or profit margin). At this stage, ownership of the goods passes to a retailer, who pays the sum of COGS and the wholesaler's gross margin.

The final stage in the process is for the retailer to sell products to consumers. As with the wholesaler, the retailer incurs a range of costs collectively referred to as the retailers' CODB. These costs of doing business include its staff and rent costs, and other expenses such as marketing, packaging and administration (among others). The final price charged by the retailer includes what it has paid the wholesaler plus the retail gross margin, which covers its own cost of doing business and its profit margin.[2]

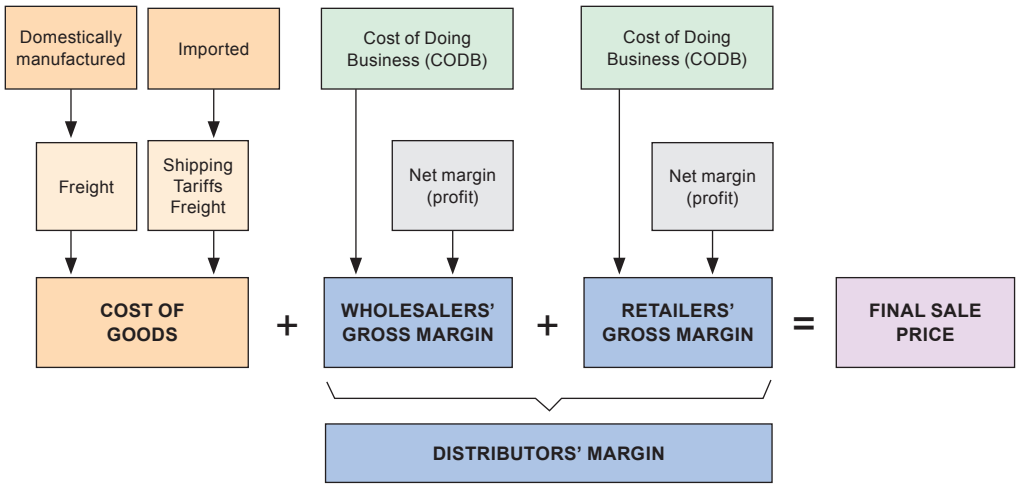
In summary, there are five major types of costs incurred in getting retail goods to market: the cost of the goods themselves (which includes any freight to warehouses and applicable tariffs); the wholesaler's cost of doing business; the wholesaler's net margin; the retailer's cost of doing business; and the retailer's net margin. The gross margins of the wholesalers and retailers in the distribution sector are the sum of their cost of doing business and net margins. These gross margins represent a payment for the services provided by distribution firms acting as intermediaries between manufacturers and consumers. All margins are typically expressed as a share of revenue or final prices.

The process by which retailers determine an appropriate gross margin to apply to various goods is complicated, with most retailers varying this margin across each product they sell. There are a range of factors that influence this decision. The competitiveness of the market for the good is important; goods that are sold exclusively through a limited set of retailers are likely to have a larger gross margin. At the extreme, some retailers claim that the market for their good is so competitive that final prices bear little resemblance to costs due to the need to price-to-market, at least in the short term. The characteristics of the retailer itself can also matter, for example, with retailers that operate with rapid turnover of stock typically applying smaller

1 This is a stylised process because in some cases wholesalers may sell directly to consumers, or retailers may bypass wholesalers and source goods directly from manufacturers.

2 Goods and services tax is also levied by the retailer at this stage, but the one-off effect on prices of its introduction is excluded from the measures of consumer prices used in this article.

Figure 1: The Supply Chain for Retail Goods



Source: RBA

gross margins than others (consistent with lower costs of carrying stocks).

The remainder of this article sets out the relative importance of each of these costs and margins, and how they have changed over time, drawing primarily on the input-output tables published by the Australian Bureau of Statistics (ABS).[3] These tables provide a detailed snapshot of the Australian economy at a point in time. As the name suggests, they enable an examination of the inputs that are used by industries to produce outputs, and so they capture the inter-relationships between industries throughout the economy. The tables identify how much of each input (goods, intermediate inputs and labour) is used to produce a unit of a given type of output. The extent to which goods and intermediate inputs are sourced from domestic or overseas manufacturers can also be identified, and information on the margins that are applied by distributors can be inferred. Input-output tables are published with a considerable time lag, reflecting the scale of information required; the latest available data are for 2007/08. More recent estimates of expenditure on inputs to the retail supply chain, based on alternative ABS data, suggest that the key results presented here are unlikely to have changed substantially since 2007/08. Indeed, independent estimates of these various costs and margins have been derived through recent discussions with a range of retailers and are generally very similar to the results shown below.

The Cost Structure of Retail Goods

Estimates using these input-output tables show that around half of the final price of retail goods can be attributed to the cost of goods and half to distributors' gross margins (Table 1). These shares have changed only moderately over the nine years from 1998/99 to 2007/08, with the share owing to the cost of goods declining by 3 percentage points over this time. Around 60 per cent of expenditure on sourcing goods is for domestically manufactured goods, while the remaining 40 per cent is for imports.[4] Although the relative expenditure shares

3 The input-output framework employed in this paper is similar to that used by Campa and Goldberg (2005), which assesses the size of distribution margins across countries and industries in the late 1990s and early 2000s. The use of ABS input-output data is detailed further in Appendix A.

4 The largest contributors to the domestic share of expenditure on sourcing goods are domestically manufactured food and motor vehicles. The imported share (of 40 per cent) includes motor vehicles and computing & electronic equipment as well as clothing. This estimate of the import share does not include any imported intermediate inputs used in the production of domestically manufactured goods. Taking this into account would increase the import share of total expenditure on goods to around 50 per cent.

on imported and domestically produced goods have not changed greatly over time, the volume of imports has risen sharply in response to lower import prices, with these two effects offsetting each other. This is consistent with global trade developments and Australia's evolving trade patterns, which have seen strong growth in imports of manufactured goods, including consumer goods, balanced by sustained growth in Australia's commodity exports.

Distributors' gross margins can be divided into a wholesale and retail component, with each able to be further broken down into the CODB and net margin for each sector. In 2007/08, retailers' gross margins accounted for around one-third of the final price of retail goods, with wholesalers' gross margins around half that (Table 2). The bulk of these gross margins reflect a charge to cover distributors' CODB (a total of 40 per cent of the final sale price), with the remainder reflecting net profit margins at the wholesale and retail levels. Interestingly, the gross margin share for wholesalers has risen significantly since the early 2000s, with part of this increase offset by a decline in the share of final prices attributable to the retailers' gross margin. In both cases, these changes reflect movements in their CODB, with net margins little changed.[5]

An alternative way to split distributors' gross margins is into the various types of inputs used. Table 3 shows that the cost to distributors of employing labour accounts for just under 20 per cent of the final sale price, with intermediate inputs comprising a little more than 20 per cent of the final price. Of

Table 1: Components of Retail Prices
Per cent of final sale price

	Cost of goods			Distributors' gross margins
	Imports	Domestic	Total	
1998/99	18	37	55	45
2004/05	18	36	53	47
2007/08	20	32	52	48

Sources: ABS; RBA

Table 2: Distributors' Gross Margins
Per cent of final sale price

	Wholesalers			Retailers			
	CODB	Net margin	Total	CODB	Net margin	Total	Total
1998/99	8	<1	9	33	3	36	45
2004/05	10	2	12	28	7	35	47
2007/08	14	2	16	26	6	32	48

Sources: ABS; RBA

Table 3: Distributors' Gross Margins by Input
Per cent of final sale price

	Labour	Other inputs	Net margin	Total
1998/99	17	25	3	45
2004/05	14	24	9	47
2007/08	17	23	8	48

Sources: ABS; RBA

5 The decomposition of distribution margins into wholesale and retail components can be affected by reclassification over time; the relative contribution of the wholesale sector may have expanded due to an increasing number of wholesalers engaging in direct retailing activity.

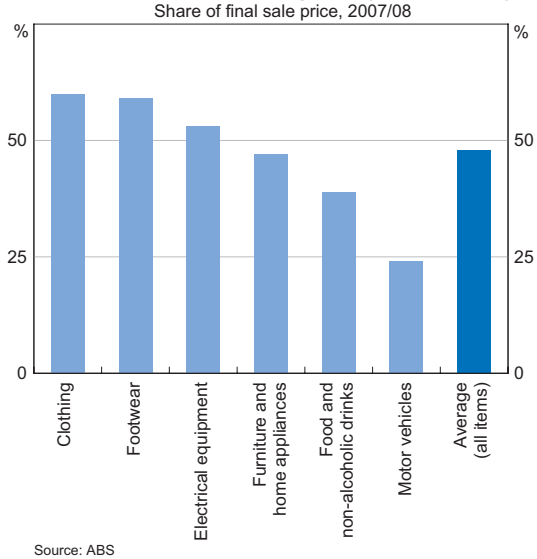
these intermediate inputs, the most significant for wholesalers are property & business services and transport, while the most important for retailers are rent, finance and business services. Retailers are somewhat more labour-intensive than wholesalers: labour and intermediate inputs account for a similar proportion of retailers' CODB, but intermediate input expenses for wholesalers are around twice that of their expenditure on labour.

The input-output tables also provide estimates of the gross margin for various types of manufactured goods, and illustrate a wide range of dispersion around the aggregate results presented in Table 1. For example, in 2007/08, distributors' gross margins are somewhat higher for clothing and footwear (around 60 per cent), close to average for electrical equipment and homewares (including furniture and domestic appliances), slightly lower for food and non-alcoholic drinks and significantly lower for motor vehicles (around 25 per cent; Graph 1).

As a cross-check on the estimates obtained from the input-output tables, estimates of the relative importance of each cost and margin have been obtained through discussions with distributors. At an aggregate level, these figures are very similar to the cost structure presented in the tables above. The estimates of gross margins by type of product in Graph 1 are also consistent with those derived from our discussions. Furthermore, distributors highlighted the fact that gross margins can vary significantly from the aggregate results across outlets, as a result of differences in the scale of operation and speed with which stock turns over. For example, department stores and discount clothing outlets (which have rapid turnover) typically apply much smaller gross margins than high-end fashion outlets, whose turnover is much less frequent and gross margin larger as a result.

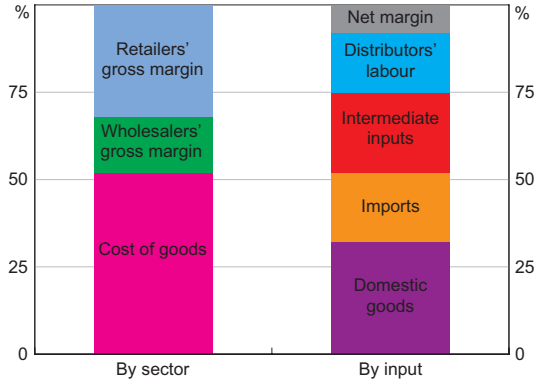
Summarising all this, the cost of goods accounts for around half of the final sale price of retail items, shared between its two inputs – imports and domestically produced goods (Graph 2). The remainder reflects the cost of distribution. Splitting this into the various inputs involved in distribution shows that around 20 per cent of the final price is attributable to each of labour and intermediate inputs used by distributors, with the final 10 per cent of the sale price being the net profit of wholesalers and retailers combined.

Graph 1
Distributors' Gross Margins by Product Type
Share of final sale price, 2007/08



Source: ABS

Graph 2
Cost Structure of Consumer Goods
Share of final sale price, 2007/08



Sources: ABS; RBA

Trends in Input Prices and the Composition of Inputs

Although the cost structure of retail goods has been broadly stable over the past decade or so, this has

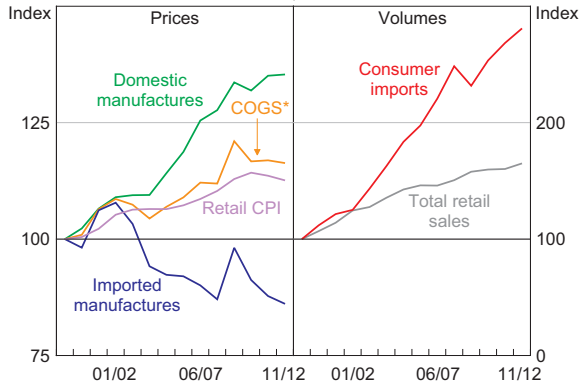
occurred despite disparate trends in the prices of inputs to the retail supply chain. In particular, the prices of inputs involved in distributing goods – including labour and domestic intermediate inputs – have risen faster than both the prices distributors pay for manufactured goods and the final prices distributors receive from consumers. This reflects changes in the competitive environment that have required distributors to adjust the composition and use of inputs over time. In particular, a greater volume of goods have been sourced from foreign suppliers and distributors have improved productivity over time, so that the inputs to distributing goods are used more efficiently.

The average price distributors pay for goods is determined by prices for domestically manufactured goods and imported goods. The producer price index's measure of the prices received by manufacturers for their goods (excluding oil) is a reasonable proxy for changes in the cost of domestically produced goods and the import price index for consumer goods measures changes in the price of imported retail goods.[6] The prices of domestically produced goods have risen steadily since 1999, but import prices have trended down since the early 2000s, with particularly pronounced deflation between 2002 and 2005 and in the last few years, following episodes of sharp appreciation in the Australian dollar (Graph 3, left panel). In addition to the effect of the higher exchange rate, import prices have also been held down by the emergence of China and other Asian economies as low-cost suppliers of manufactured goods. Despite the fall in import prices, the shares of expenditure on imported and domestically produced goods shown in Table 3 have been fairly stable. This indicates that falls in the price of imported goods have been offset by a compositional shift toward more imported goods. This compositional shift is evident in the imports data, with growth in the volume of consumer imports outpacing growth in aggregate sales volumes (Graph 3, right panel).

To see how the average price distributors pay for manufactured and imported goods – the price index for COGS – has changed over time, it is necessary to weight together the price series for domestically manufactured goods and imported goods according to their evolving shares. Falling import prices and the resulting compositional shifts have helped to restrain inflation in the average price distributors pay for manufactured goods. The cumulative rise in the estimated price series for goods sold, of around 12 per cent between 1998/99 and 2007/08, is similar to the rise in the price of retail goods in the CPI, consistent with the relatively stable share of the cost of goods in final prices.[7]

Relative to the average price distributors pay for manufactured goods and final selling prices, the prices of the inputs used to distribute these goods – the various components of the distributors' gross margin – have risen consistently. The price of labour can be measured using the wage price index for the retail and wholesale industries and the price of intermediate inputs can be proxied by constructing an implicit price deflator from national accounts'

Graph 3
Goods – Prices and Volumes
Distribution sector, 1998/99 = 100



* Weighted average of domestic and imported manufactures price indices
Sources: ABS; RBA

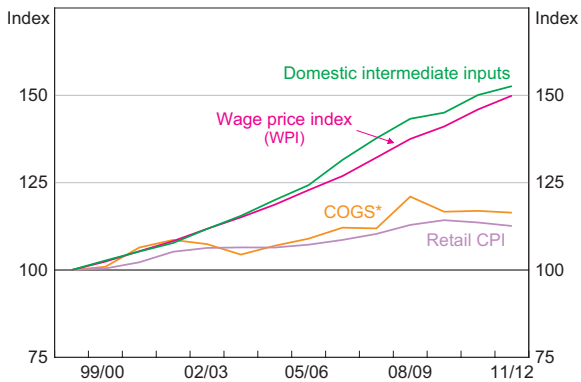
6 The producer price index for the manufacturing industry includes a number of items that are unrelated to the price of retail goods, such as construction materials and basic metals. However, excluding such items does not change materially the results presented, and for simplicity such complications are ignored.

7 The compositional shift towards greater import volumes is estimated to have reduced the cumulative increase in the average price distributors pay for goods by around 6 per cent between 1998/99 and 2007/08.

data. These input price measures are shown in Graph 4, alongside the cost of goods sold and the final retail price measure from the CPI. Both wages and the price of intermediate inputs have risen much faster than either the cost of goods sold or final prices, consistent with wage inflation in the broader economy outpacing retail goods price inflation. Annual inflation in wages and the price of intermediate inputs has been over 3 per cent since 1998/99, compared with less than 1 per cent annual inflation in final prices for retail goods. Within the intermediate inputs series, the prices of most major expenditure items (including rents and the prices of road freight, warehousing and various business services) have also increased by between 3–4 per cent per annum.[8]

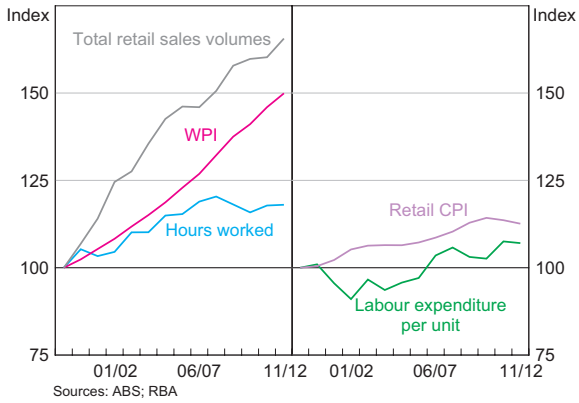
The faster pace of inflation in wages and intermediate input costs faced by distributors, relative to final sale prices, has been offset by productivity improvements in the distribution chain. The number of hours worked in the distribution sector has risen by much less than growth in the volume of goods distributed. In other words, ongoing productivity gains have resulted in a significant fall in the number of hours required to achieve one unit of sales volumes (Graph 5, left panel).[9] Accordingly, distributors' total expenditure on labour per unit of sales appears to have risen only moderately over this time, and broadly in line with the rise in final retail prices (Graph 5, right panel). Although some of these gains are likely to reflect growth in sales volumes due to improvements in the *quality* of goods (particularly electronics), rather than the quantity handled by the distribution chain, advances in distribution sector efficiency have also been important.

Graph 4
Distribution Sector – Input Prices
1998/99 = 100



* Weighted average of domestic and imported manufactures price indices
Sources: ABS; RBA

Graph 5
Distribution Sector – Labour Costs
1998/99 = 100



Sources: ABS; RBA

Increases in efficiency have occurred through a combination of both investment in new capital and the more efficient use of labour, perhaps reflecting trends such as the growth of 'big box' retailing, and greater use of information technology and advanced supply chain techniques to reduce the need for logistical staff at the wholesale and retail level. Distributors are also likely to have found some efficiency gains in their use of intermediate inputs over this time, including improved inventory management, that have enabled them to stabilise

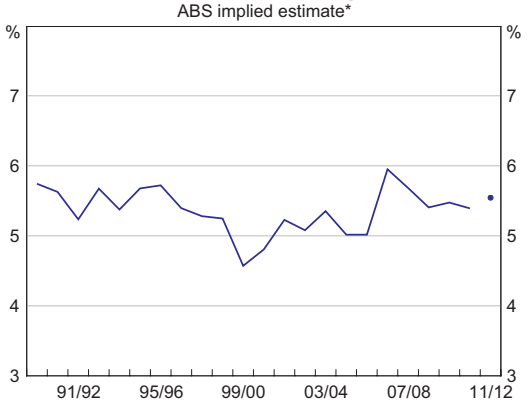
8 These disaggregated estimates of inflation in the price of intermediate inputs are sourced independently of the deflator shown in Graph 4. For rents, data from Jones Lang LaSalle are used. For freight and business services prices, the ABS producer price indices are used.

9 The definition of productivity used here is different to the standard gross value added (GVA) industry measures published by the ABS. Here the output measure is the volume of retail sales and the inputs are the labour and domestic intermediate inputs used in the wholesale and retail sectors. It is thus more akin to a 'gross output' measure of productivity, although the inputs into the manufacture of goods are not included. Nevertheless, the rate of productivity growth by this measure has slowed in the second half of the past decade, in line with the GVA measure and trends in other industries (see D'Arcy and Gustafsson (2012)).

the share of their revenue that is paid to providers of intermediate inputs. Indeed, such a result is consistent with the finding from input-output tables that the share of final prices accounted for by the CODB has increased only marginally over time.

Aside from the inputs to distribution – for which prices have risen relatively rapidly – the remainder of the gross margin is the distributors' profit or net margin. The analysis based on input-output tables relies on a range of assumptions and is not precise enough to provide time-series estimates of changes in distributors' net margins.[10] Nevertheless, ABS data on profits and revenues in these sectors provide some guidance, and suggest that retail net margins have been relatively stable over the past decade or so (Graph 6).[11] This suggests that the adjustments made by distributors, in shifting supply toward more imported goods and in becoming more efficient in their use of domestic inputs, have not only maintained relatively stable gross margins but have also prevented large declines in net margins.

Graph 6
Retailers' Net Margins
ABS implied estimate*



* Gross operating surplus (from national accounts) as share of income from sales (from Business Indicators survey)
Sources: ABS; RBA

Conclusion

Input-output tables contain a wealth of information on the relative importance of various costs incurred in getting goods from factories and ports to consumers. These data contain some important insights. One is that only half of the final price of retail goods is attributable to the cost of producing these items. The other half is the cost of distributing these items, with just under 20 per cent owing to the cost of employing labour in the distribution sector, a little over 20 per cent paid to providers of intermediate inputs such as freight and rent, and the remaining 10 per cent is retained by distributors as profit. These results also show that the growing importance of imported goods, which in part have had a lower rate of inflation owing to the appreciation of the Australian dollar, has contributed to restraining inflation in consumer goods. It also highlights the importance of ongoing productivity improvements in the distribution chain, which over the past decade have helped to keep the cost of doing business from rising in line with the prices of domestic inputs, including wages. The nature of retailing is continually changing, particularly in recent times with the rapid growth of online retailing and changing consumer preferences (Productivity Commission 2011). This is likely to see further evolution in how distributors organise their operations.

10 Although it is possible to construct an estimate of the net margin within the framework developed in this article, the estimate would be subject to considerable measurement error as it would incorporate measurement error from each of the four cost components. In particular, it is difficult to precisely estimate how expenditure on intermediate inputs has changed since 2007/08 and quantify the effect of efficiency gains in the use of intermediate inputs.

11 The ABS currently does not calculate an explicit measure of retail net margins (although the possibility of publishing a measure as part of the producer price index is currently being investigated). The measure shown in Graph 6 is calculated from ABS data on profits and sales in the retail sector. Listed retailers' financial results suggest somewhat greater volatility in net margins, and a sharper decline in recent years, than the more comprehensive ABS data.

Appendix A

This appendix sets out the use of input-output (IO) tables from the ABS to calculate the relative importance of costs and margins as a share of final retail prices. Rows in the IO tables denote supply of each industry, while the columns represent the demand from each industry, including final demand. The tables thus represent the supply-use relationships among all industries and sectors.

The output of an industry is broken down into its uses, for example as an intermediate input into another industry's production or as part of final household or government consumption. Columns in the IO tables denote the sources and magnitudes of each of the inputs used by an industry, including intermediate inputs from other industries, and labour and imports.

The IO tables provide detailed information for over 100 sub-industries, which can be aggregated to form the major industries of interest for this article: consumer goods manufacturing and wholesale and retail trade. One limitation of the IO data for this analysis is that the standard ABS definitions of 'wholesale' and 'retail' cover industries involved in suppling retail goods to households, and also distribution firms involved in supplying intermediate inputs into industries like agriculture. (It does not, however, include restaurants, cafes & takeaway outlets, which are part of the ABS Retail Trade Survey. Accordingly, the outputs of these industries have been excluded from the CPI measure of retail prices, which covers only retail goods.)

Estimates of expenditure shares (the cost structure of retailers) from IO tables were derived using the methodology below. All table numbers in this appendix refer to the ABS input-output tables (ABS 5209.0.55.001).

- The **cost of goods sold** (COGS) is approximated from Table 8 as household final consumption expenditure on the output of the manufacturing industry (manufactured goods). The output of the manufacturing industry in Table 8 includes both domestically produced output and also similar goods which are imported (referred to as the 'indirect allocation of imports'). In contrast, in Table 5, the output of the manufacturing industry excludes any imported content, with imports separately allocated as an input to an industry's production similar to labour and intermediate inputs. This distinction allows us to estimate the share of final goods which is imported versus domestically manufactured, calculated as the difference between Table 8 and Table 5.
- The distributors' **gross margin** is calculated as a function of the gross margin of wholesalers and retailers. Estimates of wholesale and retail gross earnings are calculated from Table 8 as the value of supply from the wholesale and retail trade industry to households; this is analogous to household consumption expenditure on the services provided by distributors in acting as intermediaries between manufacturers and consumers.
- The division of gross earnings into the **costs of doing business** and **profit** is derived from the wholesale and retail trade industries' use of all other industries' output (both domestic and imported) and compensation of employees, as well as their gross operating surplus.
- The sum of these components approximates total retail trade income and is used as the denominator to convert all these estimates into a margin.
- Distributors' **gross margin by type of product** is derived from Table 4 as the margin divided by the purchasers' price.

To estimate changes in the prices of certain input costs over time, the following methodology is used:

- To calculate a price index for the **cost of goods sold** we use price indices for domestically manufactured goods (the Producer Price Index for the manufacturing industry) and imported consumer goods (the Import Price Index for consumer goods). These two price indices are then weighted by their share of total COGS expenditure, derived from the IO tables. IO

tables (for 1998/99, 2001/02, 2004/05, 2005/06 and 2007/08) provide estimates of the relative expenditure weight of domestic and imported goods in these 'base' years. In between the base years, where an IO table is not available, nominal expenditure is interpolated, assuming that both prices and volumes adjust at a constant rate. For estimates after 2007/08, the relative expenditure shares on domestic and imported goods are updated using data on consumer imports prices, manufactures producer prices, consumer import volumes and retail sales volumes).

- A price index for the cost of **domestic intermediate inputs** used by distributors in doing business is constructed using data from the annual national accounts. Implicit price deflators – measured as the ratio of gross value added in current prices and chained volumes terms – are calculated for each industry. These deflators are then weighted according to each industry's contribution to total usage of intermediate inputs by the distribution sector. This weighted index excludes price changes in any imported intermediate inputs, since these account for no more than 5 per cent of total intermediate input usage.
- To estimate the impact of changes in the *quantity* of imports purchased (relative to domestic manufactures) on inflation in COGS prices over time, we compare published changes in COGS expenditure (from the IO tables) with the expenditure implied by movements in the relative price of imports alone (i.e. assuming no change in relative quantities since the 1998/99 IO table). This exercise suggests that a solid increase in the volume of imported goods has underpinned changes in COGS expenditure in the IO tables, which is consistent with ABS data on consumer import volumes (see Graph 2).

To compare changes in these input prices with final **consumer retail prices**, we calculate a price index for a subset of the consumer price basket which includes a range of 'retail goods'. Our subset of CPI retail goods includes food & non-alcoholic beverages (excluding fruit & vegetables and meals out & takeaway foods), alcoholic beverages, clothing & footwear (less cleaning, repair & hire of clothing & footwear), furnishings, household equipment & services (less domestic & household services), motor vehicles, spare parts & accessories for motor vehicles, audio, visual & computing equipment & services, newspapers, books & stationary, equipment for sports, camping & recreation and games toys & hobbies.

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Australia's Productivity Performance and Real Incomes

Patrick D'Arcy and Linus Gustafsson*

In the medium to long run, the growth of real income depends largely on productivity growth. Australia's trend productivity growth declined noticeably in the 2000s compared with the period of strong growth in the 1990s. However, the effect of the decline in productivity growth on per capita real income growth has been offset by the boost to incomes from a rise in the terms of trade. Much of the moderation in productivity growth can be attributed to a decline in the level of productivity in the mining and utilities industries. Nevertheless, there has also been a broad-based slowdown across other industries. The fall in mining productivity is largely a consequence of strong global demand, and the effect on income has been offset by high prices for resources. In contrast, the weakness in productivity growth outside of the mining industry has imposed a cost on the domestic economy, in part through higher non-tradables prices. With the terms of trade likely to ease over the next few years, real income growth will slow unless there is a pick-up in productivity growth. For inflation to remain consistent with the Bank's target this will also imply a slowing in the pace of growth in nominal factor incomes.

Introduction

Productivity refers to the efficiency with which an economy employs resources to produce economic output. Growth in productivity is the key driver of growth in per capita income and living standards in the long run. The trend in productivity growth is determined by the development of new technologies and how efficiently resources – labour, capital and fixed resources (such as land) – are organised in the production process. These are factors that determine the capacity of the economy to supply goods and services and are not directly responsive to monetary policy in the short run. Nevertheless, because inflationary pressures reflect the balance of supply and demand growth in the economy, trend productivity growth is an important determinant of the pace at which the economy can grow over the medium term without generating inflationary pressures. Understanding developments in trend productivity growth is therefore an important consideration for monetary policy formulation.

Following a period in the 1990s and early 2000s when, by historical standards, Australia experienced unusually rapid productivity growth, trend productivity growth slowed over the latter part of the 2000s. The slowing in aggregate productivity growth is widely recognised, but there has been some debate about how broad based this has been across industries and about the reasons for the slowdown. Weaker productivity outcomes have been especially pronounced in the mining and utilities industries, where the level of productivity has fallen. However, there has also been a marked slowing in trend productivity growth across most other industries.

The historically high trend productivity growth in the 1990s allowed the economy and incomes to grow at a relatively rapid pace without generating inflationary pressures. This experience was common

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to a wide range of countries in the 1990s, and over time it became evident that unexpectedly strong trend growth in productivity was contributing to low inflation outcomes compared with earlier decades. More recently, the rise in Australia's terms of trade has allowed real incomes to grow faster than productivity without generating inflationary pressures.

This article reviews the evidence on Australia's productivity performance and discusses the implications for income growth and inflation. The first part provides some data on the decomposition of trend labour productivity into the contributions from capital deepening and multifactor productivity over recent decades. (Labour productivity measures the amount of output produced per unit of labour input – measured in hours worked – while multifactor productivity measures the amount of output for a given amount of both labour and capital inputs.) It finds that despite continued capital deepening for the economy overall, there has been broad-based slowing in labour productivity owing to a slowdown in multifactor productivity growth.) The second part of the article reviews some of the proposed explanations for the slowdown in trend productivity growth in the 2000s compared with the rapid growth of the 1990s. The final section discusses how, despite the offsetting effect of the rise in the terms of trade on real incomes growth, slower productivity growth outside of the mining industry has been a drag on real income growth and, at the margin, contributed to inflationary pressure in the economy.

Australia's Productivity Performance in the 2000s

One of the difficulties when analysing developments in productivity growth is separating short-term cyclical effects from changes in underlying trend productivity growth. From the perspective of understanding the implications for monetary policy, it is changes to the trend rate of productivity growth that are most relevant. To abstract from short-term volatility, this article focuses on average growth rates over the productivity growth cycles identified by the Australian Bureau of Statistics (ABS), but it also includes recent data covering part of an incomplete productivity growth cycle. Although using an incomplete cycle risks including some cyclical element in the estimates of trend growth, the forward looking nature of monetary policy means that it is necessary to attempt to update estimates of the trend in real time. Throughout the article, the 1990s is used to refer to the period covering the two ABS growth cycles between 1993/94 and 2003/04, and the 2000s refers to the period between 2003/04 and 2010/11.[1]

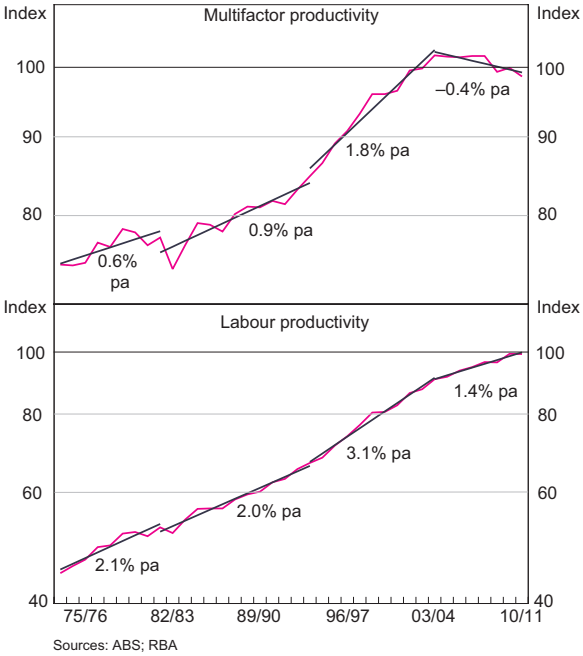
As has been recognised by a range of analysts and commentators,[2] Australia's productivity growth slowed in the 2000s compared with the very strong productivity growth of the 1990s (Graph 1). The slowdown is evident for the whole economy, but it is most appropriate to focus on the market sector, which accounts for around two-thirds of total output. Inputs and outputs in the market sector can be independently measured so that productivity outcomes can be calculated directly. But, for the non-market sector, including large parts of the health and education industries, there are no market transactions for output, making it difficult to measure output – and therefore productivity – independently of inputs.

Growth in labour productivity is typically higher than multifactor productivity because it includes the additional labour productivity generated by capital deepening as the capital-labour ratio grows over time. Decomposing labour productivity growth into capital deepening and multifactor productivity growth indicates that the slowdown in labour productivity growth has been a result of slower

1 The purpose of identifying cycles is to allow underlying trends in productivity to be estimated, by identifying a period during which short-term cyclical effects largely cancel out. Including the incomplete cycle of 2007/08 to 2010/11 in the analysis does not change the conclusions presented in this article, but it does strengthen them somewhat.

2 Dolman (2009) and Eslake (2011) provide comprehensive reviews of the productivity slowdown, as does Parham (2012), although he concentrates on comparing the late 2000s with the early 2000s. See Richardson and Denniss (2011) for a somewhat different assessment.

Graph 1
Productivity in Selected Market Sector Industries
2009/10 = 100, log scale



Sources: ABS; RBA

growth in multifactor productivity (Table 1). Indeed, the contribution of capital deepening to labour productivity growth was somewhat larger in the 2000s than in the 1990s. This is because investment and capital accumulation were quite strong in the 2000s, largely reflecting the increase in the share of resources used by the rapidly expanding and capital-intensive mining and utilities industries. However, somewhat surprisingly, despite the high level of investment in these two industries, capital deepening *within* these industries stalled during this period because there was also a very large increase in labour inputs (Table 2). Outside of these industries, the pace of capital deepening was around the same as in the earlier period, with the slowdown in labour productivity growth entirely due to the slowing in multifactor productivity growth.

The deterioration in multifactor productivity growth has been most pronounced in the mining and utilities industries, with both industries experiencing a large fall in the level of multifactor productivity (Graph 2). Although the decline in the level of multifactor productivity is unusual, the reasons behind the fall are now well understood.

In the case of the mining industry, the fall in productivity is partly a natural consequence of the rapid run-up in commodity prices, which has

Table 1: Decomposition of Trend Productivity Growth
Annual average percentage change

	1973/74 to 1993/94	1993/94 to 2003/04	2003/04 to 2010/11
Selected market sector industries[a]			
Labour productivity	1.8	3.1	1.4
of which:[b]			
Capital deepening	1.3	1.3	1.8
Multifactor productivity	0.6	1.8	–0.4
Excluding mining and utilities			
Labour productivity	–	3.1	1.7
of which:[b]			
Capital deepening	–	1.3	1.3
Multifactor productivity	–	1.9	0.4

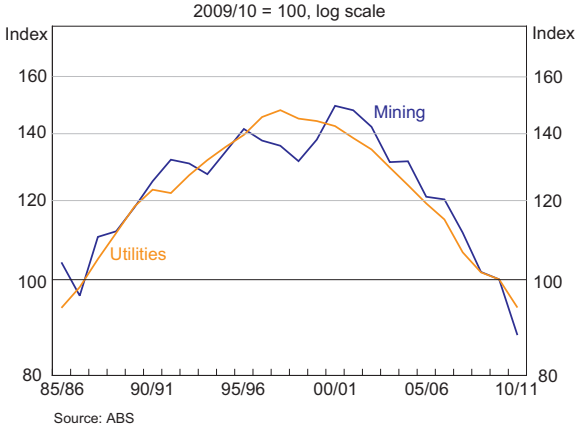
(a) Market sector excluding rental, hiring & real estate services, professional, scientific & technical services, administrative & support services and 'other services' due to difficulties with measuring capital services for these industries
(b) Contributions to labour productivity growth may not sum to totals due to rounding
Sources: ABS; RBA

Table 2: Decomposition of Mining and Utilities Trend Productivity Growth
Annual average percentage change

	1993/94 to 2003/04	2003/04 to 2010/11
Mining		
Labour productivity	3.6	–6.3
of which:[(a)]		
Capital deepening	2.9	–0.6
Multifactor productivity	0.6	–5.7
Utilities		
Labour productivity	1.8	–5.5
of which:[(a)]		
Capital deepening	2.0	–0.8
Multifactor productivity	–0.2	–4.7

(a) Contributions to labour productivity growth may not sum to totals due to rounding
Sources: ABS; RBA

Graph 2
Multifactor Productivity
2009/10 = 100, log scale



Source: ABS

increased the profitability of more marginal deposits.[3] Higher commodity prices justify more difficult and costly extraction of previously undeveloped resources, which becomes necessary over time as developed deposits are depleted. The very rapid pick-up in commodity prices has also justified an unprecedented increase in capital investment in the industry. This growth in measured capital inputs has detracted from measured productivity owing to the lag (of some years) between the initial investments, the completion of projects and the utilisation of all the new capacity. In effect, the productivity developments in the mining industry are best characterised as a movement up the industry's supply curve, rather than an exogenous shift in the supply curve related to some fundamental change in underlying productivity.

The fall in the level of productivity in the utilities industry is also related to large investments, which have been necessary to deal with some of the fundamental structural challenges facing the industry, but these investments have not necessarily resulted in higher quantities of measured output. Part of the surge in investment over recent years reflects a significant catch-up that has required rapid growth in utilities' workforces after a period in the 1990s when investment and employment in the industry were falling.

There has also been additional investment to improve the reliability of supply in the electricity and water industries, which has only made a marginal contribution in terms of additional measured output. One example is recent investment in desalination plants that, with the return to high rainfall in recent years, are not currently being utilised fully, but will provide a source of fresh water

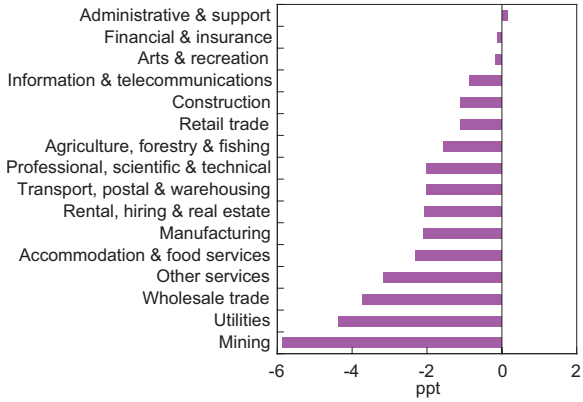
3 Topp *et al* (2008) provide a comprehensive review of the causes of the fall in mining multifactor productivity.

in the event of future droughts. Similarly, some of the additional investment in the electricity sector has been associated with the need to meet an increase in peak demand relative to base-load demand.[4] In addition, environmental considerations have required new investments in waste treatment and low carbon emission electricity generation; while these investments provide environmental benefits, they also decrease measured productivity and increase the unit costs of production. In other words, some of the decline in productivity in the utilities sector can be attributed to measurement issues; the environmental benefits and more reliable supply are not measured as part of the industry's output, but considerable resources are allocated to producing them.

The large declines in productivity in the mining and utilities industries account for a significant part of the slowdown in aggregate market sector productivity growth between the 1990s and the latter part of the 2000s. However, almost all remaining industries have also experienced a slowing in productivity growth. One way to assess the significance of the general slowdown in productivity is to calculate productivity growth rates for the market sector excluding the mining and utilities industries. Although not as pronounced as the decline in productivity growth for the market sector as a whole, the slowdown in productivity growth excluding mining and utilities is nevertheless notable, with average labour and multifactor productivity growth around 1½ percentage points lower than in the 1990s.

While much of the surge in investment in recent years has been concentrated in the mining and utilities industries, investment outside of these industries was also strong over most of the 2000s. Even though capital deepening has made a similar contribution to labour productivity growth as in the 1990s, growth in labour productivity has been dragged down by weaker multifactor productivity growth. This suggests that the general slowdown in productivity growth cannot be attributed to weak investment, but is likely to be associated with either a slowdown in the pace of adoption of productivity-enhancing technological innovations or less rapid improvement in the efficiency with which capital and labour are employed. Moreover, the broad-based slowing in multifactor productivity growth within most industries suggests that much of the slowing is likely to be associated with general developments affecting all industries (Graph 3). Consistent with this, Parham (2012) finds that only a little of the slowdown in productivity growth can be attributed to shifts in the shares of activity between high and low productivity industries.

Graph 3
Slowdown in Multifactor Productivity Growth
Change in average growth, 1993/94–2003/04 to 2003/04–2010/11*



* Rental, hiring & real estate, financial & insurance, professional, scientific & technical and other services growth measured from 1995/96
Source: ABS

Multifactor productivity outcomes in the 2000s were clearly weaker than the period of strong growth in the 1990s. However, the difference between trend growth in the 2000s and the long-run average prior to the 1990s is less marked. For the market sector excluding mining and utilities, the average growth in multifactor productivity of 0.4 per cent in the 2000s is only 0.2 percentage points lower than the average for the market sector in the period 1973/74 to 1993/94. This suggests that it is the 1990s that was the period of exceptional growth.

4 For a discussion of this and other developments in the utilities sector, see Topp and Kulys (2012).

Explanations for the General Slowdown in Productivity Growth

The above analysis suggests that there has been a broad-based slowdown in multifactor productivity growth that cannot be fully explained by the special circumstances affecting the mining and utilities industries. However, while the measured slowdown in productivity growth is significant, it is not large enough that the causes can be easily identified statistically. Two issues make it difficult to be definitive about the underlying drivers of changes in productivity: there is considerable measurement error in the estimates of productivity growth making it difficult to be precise about the timing of changes in the underlying trend; and productivity growth is the result of the interaction of many fundamental and proximate factors. Technological, structural and regulatory changes, as well as cyclical variation in factor utilisation, can all affect measured productivity, making it very difficult to identify and disentangle the various effects.[5] Parham (2012) provides a recent review of the importance of volatility and cyclical effects, compositional shifts, adjustment pressures and measurement errors for the decline in measured trend productivity growth over the 2000s.[6] At a fundamental level, productivity is determined by the available technology (including the knowledge of production processes held by firms and individuals) and the way production is organised within firms and industries. Conceptually, economists often view technology as determining the productivity 'frontier'; that is, the maximum amount that could be produced with given inputs. Factors affecting how production is organised, including policies affecting how efficiently labour, capital and fixed resources are allocated and employed within the economy, determine how close the economy is to the frontier. Trend productivity growth is then determined by the rate at which new technologies become available – how fast the frontier is expanding – and the rate of improvement in efficiency – how fast the economy is approaching the frontier.

Overall, there is some evidence that both a slowdown in the pace at which the frontier is expanding and the pace at which Australia is approaching the frontier have contributed to the decline in the rate of productivity growth relative to the historically high growth of the 1990s. However, there is little evidence that a lack of incentives to invest in physical capital has been significant in explaining the slowdown in multifactor productivity growth.

Technology, innovation and education

An important driver of growth in the production frontier in the long run is improvements in technology. Technological improvements may be acquired from overseas or developed domestically through innovation. In both cases, firms will typically need to undertake investment to purchase new capital goods and knowledge, or undertake research and development in order to achieve productivity improvements. Only in the case where new knowledge becomes freely available will firms experience a technology driven improvement in productivity without undertaking new investment. However, not all investment will necessarily lead to an improvement in measured multifactor productivity.

As already discussed, the slowdown in multifactor productivity growth has occurred despite continued strong growth in investment. In many cases, new investment involves increasing the capital stock based on existing technologies, and although this capital

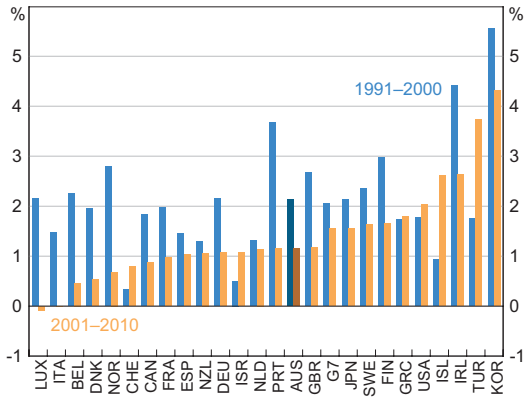
5 We do not focus on cyclical aspects of productivity in this article. As discussed in footnote 1, the ABS productivity growth cycles, on which our analysis of trend productivity growth is based, are designed to abstract from the cyclical effects of capacity and labour utilisation on measured productivity. However, cyclical changes in the unemployment rate and survey measures of capacity utilisation do not line up perfectly with the ABS productivity cycles. It is possible that some of the slowing in measured productivity reflects the lower level of the unemployment rate and higher level of capacity utilisation in the 2000s compared with the 1990s. Our estimates suggest that the drag on productivity growth from the general absorption of spare capacity over the past two decades has been relatively small, accounting for, at most, one-fifth of the slowdown in multifactor productivity growth.

6 Parham suggests that for the selected market sector industries, these four factors account for between half and three-quarters of the slowdown over the last two complete productivity growth cycles. As discussed above, for the mining and utilities industries, these factors are likely to have accounted for a larger share of the decline in productivity between the 1990s and 2000s.

deepening may improve labour productivity, it does not necessarily improve multifactor productivity. Even in cases where firms are investing in new capital goods that 'embody' technological refinements to existing technologies, such as improved computing power, these quality improvements may be accounted for by the ABS as capital deepening and not necessarily an improvement in multifactor productivity. For investment to drive gains in multifactor productivity there needs to be 'spillover' effects that generate a more than commensurate increase in output than the increase in capital.[7] In practice, this typically requires the introduction of a new technology to be associated with some fundamental reorganisation of production processes, or the development of a genuinely new technology that has benefits greater than the research costs required to develop it. For these reasons, economists generally view the likely drivers of multifactor productivity as being research and development expenditure, investment in human capital, and investments in capital equipment that can fundamentally change the way firms operate, such as information and communication technologies (ICT).

That productivity growth has slowed across a large number of developed economies in the 2000s provides some indication that there may have been a slowing in the pace at which the technological frontier is expanding. Data on productivity growth for members of the Organisation for Economic Co-operation and Development (OECD) indicate a fairly universal slowing in productivity growth in the 2000s compared with the 1990s, with 19 of 25 countries experiencing a slowdown in productivity growth (Graph 4).[8] It is difficult to be conclusive about what might have driven this common international experience,

Graph 4
International Labour Productivity
Average annual growth in period



Source: OECD

but it suggests that part of the slowdown may be related to common global factors, such as the pace of technological innovation and adoption. However, the apparent slower expansion of the technological frontier does not seem sufficient to explain all of the slowing in Australia's productivity performance. An indication of this is that the slowdown in Australia's productivity growth in the past decade has been greater than the average slowdown in OECD countries. Moreover, it is less apparent that the United States, which is typically recognised as representing the global productivity frontier, has seen a slowdown in productivity growth over the decade.[9]

One possible explanation for the surge and subsequent decline in multifactor productivity growth in Australia, and perhaps in other developed economies, over the past two decades is the pattern of adoption of ICT, which are primarily developed and produced offshore.[10] The widespread adoption of these technologies through the 1990s was largely complete by the early 2000s. Assuming that the introduction of

7 In the productivity literature these spillover effects on multifactor productivity are referred to as 'disembodied' technical change.

8 Dolman, Lu and Rahman (2006) found that the slowdown in productivity growth at that time appeared to be unique to Australia. However, with additional data it has since become apparent that many OECD economies experienced a slowdown in productivity growth in the 2000s.

9 However, see Kahn and Rich (2011) who argue that recent GDP data vintages do suggest that the United States also entered a period of lower trend productivity growth around 2004, following strong productivity growth in the early 2000s.

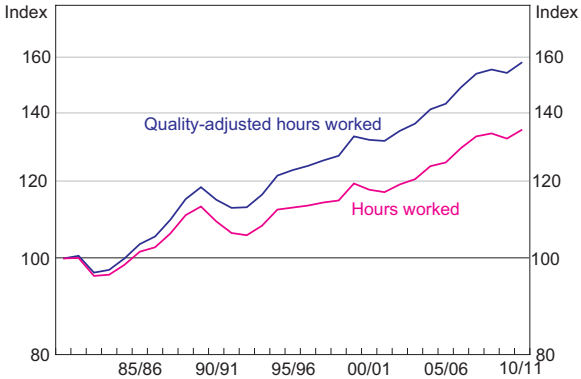
10 One ICT technology which has likely had spillover effects and was partly developed in Australia by the CSIRO is Wi-Fi.

computers created a gradual upward shift in the level of productivity of some workers (in addition to the contribution from capital deepening) this would have been reflected in strong multifactor productivity growth in the 1990s, with the contribution to productivity growth moderating in the 2000s once rates of usage had stabilised.[11] Anecdotally, it does not seem that the global pace of technological development in computing (most obviously in mobile devices) has slowed over the past decade; indeed the number of global patent grants increased over the decade (WIPO 2011). However, it is possible that more recent innovations have not led to significant reorganisation of production – and therefore improvements in multifactor productivity – as was the case with the initial introduction of computers and increased use of the internet.

While the expansion of the technological frontier is largely determined by the global rate of innovation, domestic innovation and investment in human capital can also help push out the domestic frontier. Domestic innovation is largely driven by firms' research and development (R&D) activities. However, ABS (2010) data show that there has been an increase in expenditure on R&D as a share of GDP in the 2000s, suggesting that the rate of domestic expenditure on innovation has not been a major drag on productivity growth.

One indicator of the contribution to output growth from increasing human capital, and in particular education and experience, is the ABS measure of 'quality-adjusted hours worked'. This measure has been growing at a consistently faster pace than the standard measure of hours worked since the 1980s, indicating that education and experience are likely to have made positive contributions to multifactor productivity growth over this period (Graph 5). However, the pace of growth of this measure of labour input has slowed, suggesting that a smaller contribution from improving labour quality has played some role in the productivity slowdown.

Graph 5
Total Hours Worked
Selected market sector industries, 1980/81 = 100, log scale



Source: ABS

Regulatory reform and economic efficiency

The most widely accepted explanation for the acceleration and subsequent slowing in productivity growth over the past two decades relates to the gradual waning of the impetus to productivity growth initiated by the economic policy reforms of the 1980s and 1990s (Dolman 2009; Eslake 2011). These reforms, which included tariff reductions, privatisation, liberalisation of financial markets, decentralisation of the labour market and, somewhat later, national competition policies and tax reform, are widely viewed as having contributed to a marked improvement in economic efficiency.[12] The overall effect of all these reforms was to increase competitive pressures on firms in product markets such that improvements in productivity became an imperative for economic survival, while at the same time increased flexibility in capital and labour markets ensured that economic resources were allocated more efficiently among competing firms. It is difficult to be definitive about the magnitude of the impact of regulatory reforms, as in many cases, for example with tariff cuts, the changes were introduced gradually over an extended period of

11 Note that the measurable contribution to labour productivity growth from ICT capital deepening has slowed only modestly (Dolman 2009).

12 See Productivity Commission (1999) for a detailed discussion of the effects of microeconomic reforms in the 1980s and 1990s.

time, with the impact on productivity occurring only with a lag.[13]

While some analysts have argued that these reforms should have *permanently* lifted the growth *rate* of productivity relative to the unobserved counterfactual, the experience of the past two decades suggests that the effect on productivity growth may have been *temporary*. Productivity growth appears to have been higher during a 'catch-up' period when reorganisation in response to the reforms drove improvements in economic efficiency allowing the economy to move closer to the production frontier. But over time, the effect of these reforms on the pace of productivity growth appears to have waned. In addition, some commentators, for example Eslake (2011), have argued that there has not only been a lack of further productivity-enhancing regulatory reforms over the past decade, but that the introduction of new inefficient regulations may have created a drag on productivity growth.[14]

Incentives and economic prosperity

A complementary explanation of the slowdown in productivity growth in Australia is that over the course of the long economic expansion between the early 1990s domestic recession and 2008 global recession, the incentives for firms, workers and governments to implement productivity-enhancing changes gradually weakened. In effect, broad-based economic prosperity has likely eased the pressures driving productivity improvements. Most productivity-enhancing changes involve a degree of reorganisation that can be difficult for firms and workers, and without clear incentives for change there is unlikely to be a strong focus on enhancing productivity. A related explanation for the pattern of productivity growth over the past two decades offered by Quiggin (2011) is that the strength of productivity growth in the 1990s was entirely due to greater intensity of work during this period, meaning that productivity was in effect overestimated owing to mismeasurement of labour inputs.[15]

As discussed further below, the boom in the terms of trade over the past decade has allowed national income to grow at a faster pace than productivity. This historically unusual development supported profit, tax and wage growth, and, up until the global financial crisis, strong growth in asset prices and wealth. The persistent decline in the unemployment rate over this period also contributed to a strong sense of economic prosperity compared with earlier decades, at least up until the global recession in 2008. This is the flip side of Schumpeter's (1954) thesis that material improvements in productivity are driven by a process of 'creative destruction', whereby economic activity is reorganised during periods of economic stress when more intense competitive pressure drives productivity improvements.

Productivity, Terms of Trade and Income Growth

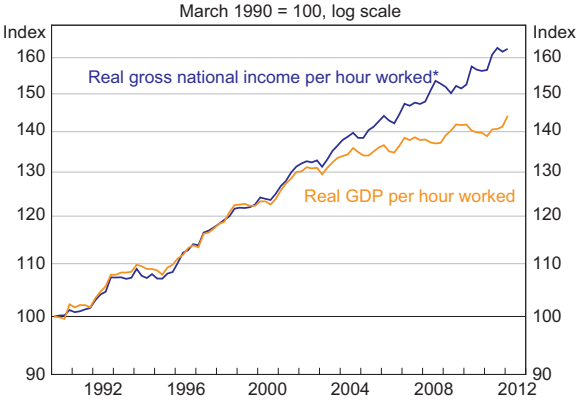
In the long run, growth in productivity is the primary determinant of growth in real income. But sustained changes in the terms of trade mean that real income growth per hour worked can diverge from productivity growth for a period of time. Over the 1990s, strong growth in productivity was the primary source of increases in real incomes. In contrast, the boom in the terms of trade over the past decade has allowed national income to grow at a faster pace than productivity (output per hour worked; Graph 6).

13 Quiggin (2011) disagrees with the consensus view and argues that the timing of the reforms was too distant from the pick-up in productivity growth in the early 1990s for policy reforms to have been a major driver of the improvement in productivity. However, Kent and Simon (2007) provide cross-country evidence that regulatory reforms can have a positive effect on productivity over the subsequent 5 to 10 years.

14 Although regulations may reduce measured productivity, the impact of a specific regulation must be assessed on both the costs and benefits resulting from its introduction. Regulations are typically introduced to remove, or reduce, some perceived negative externality, and the benefit of doing so may offset the costs resulting from decreased productivity.

15 Quiggin (2011) points to data on the share of workers working more than 50 hours per week as a proxy measure of high work intensity in the 1990s versus the 2000s. However, there is no comprehensive data on work intensity across all workers with which to test the significance of this specific effect relative to other explanations.

Graph 6
Productivity and Income
March 1990 = 100, log scale



* Real GDP adjusted for the purchasing power of changes in the terms of trade and income accruing to foreigners
Source: ABS

Indeed, income per hour worked has grown over the past decade at similar pace to the proceeding period despite the slowdown in productivity.

To understand how this has occurred, it is useful to distinguish between the drivers of the productivity developments across industries and the implications of these for domestic incomes. On the one hand, the decline in productivity in the mining industry is largely an endogenous response to higher global demand. The increase in demand has pushed the industry up the supply curve, increasing prices and export volumes. The effect of the increase in prices on export income has more than offset the fall in the industry's productivity. In other words, Australia's trade and investment partners have been willing to incur the increasingly high costs, in terms of labour and capital, required to extract resources. Lower productivity and higher mining costs have also been experienced by other resource-exporting countries as they also attempt to respond to the rapid increase in global demand, and so Australia has not been competitively disadvantaged by these developments.

In contrast, the economic cost of the slowing in productivity growth outside of the mining industry has been largely borne by the domestic economy. For the non-traded sectors of the economy, lower productivity must in one way or another be reflected in some combination of lower income for domestic producers and/or higher costs for domestic consumers. In trade-exposed parts of the economy outside of mining, a slowdown in productivity reduces competiveness against foreign producers, and so is also likely to result in a loss of real income for domestic producers, who are unable to pass on higher costs to domestic consumers owing to competition from imports.

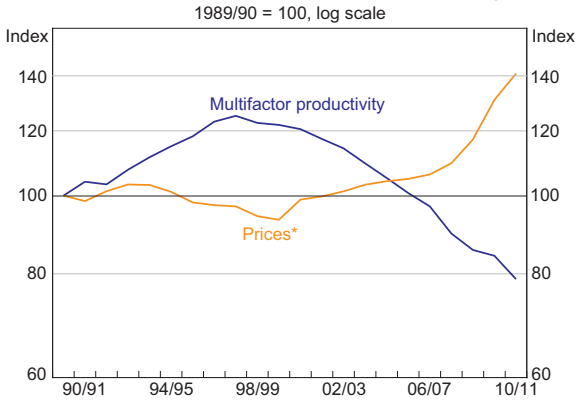
There is some evidence that the general slowdown in productivity growth outside the mining industry has resulted in higher increases in real consumer prices for non-tradables than would otherwise have been the case. In this way, the general slowdown in productivity has weighed on real income for the economy overall. At the same time, the high Australian dollar, which has appreciated in response to the strength in commodity prices, has helped to hold down real tradables prices: this is an important mechanism through which the benefits of the mining boom are spread to all consumers (Stevens 2011).

The domestic burden of lower productivity growth is most evident for the utilities sector, where the fall in the level of multifactor productivity has resulted in higher unit costs and ultimately higher real consumer prices (Graph 7).[16] Although the slowdown in productivity growth in the remainder of the non-traded sector has been less pronounced than for utilities, there is evidence that the broad-based slowdown has contributed to somewhat stronger non-tradables inflation over the past decade compared with the 1990s.[17] Non-tradables consumer price inflation averaged around 4 per cent in the period 2004/05 to 2010/11, while overall inflation averaged 3 per cent (Graph 8). This compares with non-tradables inflation of around 3 per cent on

16 It is not surprising that there is a relatively tight link between productivity, unit costs, and consumer prices for utilities as the pricing of utilities is largely regulated on the basis of 'cost plus' formulas. Plumb and Davis (2010) discuss the cost increases underpinning developments in utilities prices in detail.

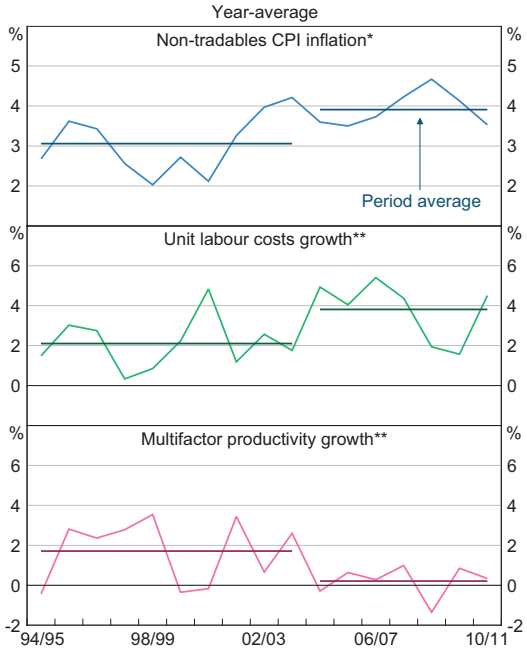
17 For a recent discussion of this point, see Lowe (2011).

Graph 7
Real Utilities Prices and Productivity



* Utilities CPI component deflated by the CPI
Sources: ABS; RBA

Graph 8
Productivity, Unit Labour Costs and Inflation



* Excluding deposit & loan facilities to June 2011
** Excluding mining
Sources: ABS; RBA

average between 1994/95 and 2004/05, and overall inflation of 2½ per cent. It is difficult to be precise about the contribution resulting from slower productivity growth, partly because the inflation data cover non-market parts of the economy for which productivity is not well measured. Nevertheless, the magnitude of the pick-up in inflation is broadly consistent with the additional growth in unit labour costs associated with the slowdown in multifactor productivity growth of around 1½ percentage points over this period.

It is not unusual in developed economies for non-tradables inflation to be higher than overall inflation, in part because productivity growth in domestic non-traded industries is typically lower than it is in global traded goods industries. It is also necessary for relative prices to adjust in response to fundamental differences in productivity developments across industries. However, within an inflation-targeting regime, it is important that the upward pressure on prices generated by a general slowdown in productivity growth does not spill over to higher overall inflation.

In general, inflationary pressures will reflect the balance of supply and demand in the economy, and so the role of productivity growth in determining the supply potential of the economy is a key limitation on the pace at which the economy, and consequently real and nominal incomes, can grow without generating inflationary pressures. To keep inflation low and stable, monetary policy needs to be attuned to persistent changes in productivity growth to ensure that growth in demand and nominal factor incomes remain consistent with the economy's supply potential, and hence with the inflation target. While a pick-up in productivity growth may allow wages and profits to accelerate without jeopardising low inflation, a slowing in productivity growth usually requires a slowing in demand and nominal income growth in order for inflation to remain low.[18]

The experience of many developed countries in the 1970s, including Australia, showed how a failure to recognise the implications for real income growth of a slowing in trend productivity ultimately

18 Trichet (2007) and Yellen (2005) discuss how a change in trend productivity growth may affect the demand and supply balance in the economy. The implications for inflation and monetary policy depend on whether the change in trend productivity is anticipated, or even recognised in real time, by private agents in the economy and by the central bank.

contributed to high inflation.[19] Conversely in the 1990s, unexpectedly strong productivity outcomes allowed monetary policy to accommodate strong growth in factor incomes while inflation remained relatively low. Over recent years, the effect of slower productivity growth on real incomes was offset by the rapid rise in the terms of trade, allowing real incomes to grow faster than trend productivity. However, over the next few years, the terms of trade are likely to decline gradually and so, on average, real incomes can be expected to grow by less than productivity. Unless there is a pick-up in productivity growth, this will imply slower growth in real incomes than in the past few decades. A slowdown in real income growth will also imply more moderate growth in nominal factor incomes if growth is to remain consistent with the Bank's inflation target.

Summary and Outlook

Following a period of rapid growth in the 1990s, the trend rate of multifactor productivity growth in the Australian economy declined in the latter part of the 2000s. The slowdown in productivity growth has been broad based across industries, with the level of productivity actually falling in the mining and utilities industries. However, this did not result in a decline in the growth rate of real incomes, with the slowdown largely compensated for by the rise in the terms of trade, which allowed real incomes to grow faster than productivity. Average inflation has only been slightly higher than in the period of strong productivity growth in the 1990s, with slower productivity growth and strong growth in nominal incomes evident in higher non-tradables inflation, while tradables inflation has remained relatively subdued.

Most analysts expect the terms of trade to decline gradually from the current high level over the next few years. In contrast to developments over the past decade, this implies that real incomes will grow slower than productivity. Consequently, unless there is a pick-up in trend productivity growth, the pace of growth of nominal factor incomes will need to slow for inflation to remain consistent with the Bank's inflation target.

Although it is not possible to gauge the extent of changes in trend productivity growth from a few quarters of data, there are signs that productivity growth has picked up over the past year. As emphasised in a number of recent Bank publications, structural change relating to a range of factors, including the high exchange rate, is increasing the competitive pressures faced by a broad range of firms across the non-mining economy (Lowe 2012). In time, the response of firms and workers to these competitive pressures is likely to contribute to some improvement in trend productivity growth. A recovery in productivity growth, if it occurs, will ease some of the upward pressure on unit costs and inflation, and allow for stronger growth in real incomes.

19 Cagliarini, Kent and Stevens (2010) discuss the implications of supply-side developments for inflation in the 1970s.

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Households' Appetite for Financial Risk

Susan Black, Lamorna Rogers and Albina Soltanaeva*

Australian households' appetite for risk appears to have declined in recent years with households having actively shifted their portfolios away from riskier financial assets. The change in the composition of financial assets has been seen across most age and income groups. The shift in households' actual risk exposures also accords with changes in self-reported preferences for risk.

Introduction

Australian households' appetite for risk has declined following the global financial crisis and economic slowdown in 2008–2009. Households have shifted their portfolios away from riskier financial assets, such as equities, and towards less risky assets, such as deposits. This change in investment preferences has been associated with declines in equity prices and increased volatility in equity returns; at the same time, rates of return on deposits have become more attractive. To the extent that the portfolio reallocation reflects a change in investors' perception of risks – due to a better understanding of the trade-off between risk and returns for different asset classes – it is consistent with households more closely aligning their preferences for risk with their asset exposures.

While investing in a less risky asset such as deposits is expected to yield less volatile returns, over the long run it is also likely to result in lower average returns (reflecting the lower risk). Previous studies suggest that equity holdings receive a significant return premium. Thus, for a given level of savings, investing in equities typically allows households to accumulate more wealth (reflecting the higher risk).[1] The investment horizon is an important consideration, however; while equity returns are expected to be higher than returns on deposits over the long run, this may not be the case over the short run, as demonstrated in recent years. A low risk/low return strategy may be more appropriate for households such as retirees who are planning on consuming some of their wealth in the near term. The academic literature has also consistently shown that, for a given level of risk, portfolio diversification maximises expected returns.[2] By investing in a range of assets that are not perfectly correlated – that is, the returns do not move together exactly – a diversified portfolio will be less risky than the weighted average risk of the assets in the portfolio.

This article discusses the change in the composition of households' financial assets in recent years, both at an aggregate level and across age and income groups. In addition, it examines changes in households' self-reported preferences for risk and how these accord with households' actual exposures to risk.

The Changing Composition of Household Financial Assets

In the lead-up to the global financial crisis, Australian households became more exposed to riskier financial assets. Aggregate data from the ABS Financial Accounts show that the share of household

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1 See, for example, Mehra and Prescott (1985), Dynan and Maki (2001) and Damodaran (2012).

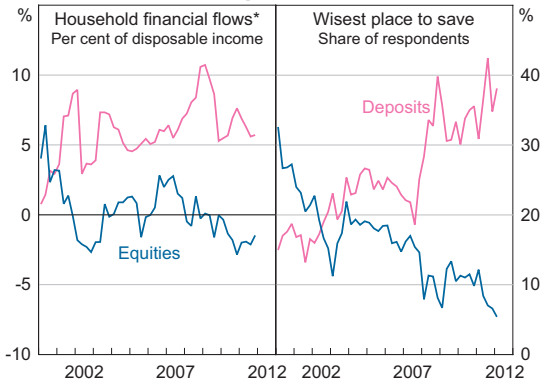
2 See, for example, Markowitz (1952), Alexander and Baptista (2010) and Mohamed (2010).

financial assets held in equities (both held directly and through superannuation) increased from around 35 per cent in 2003 to around 45 per cent in 2007. The increase followed largely from the fact that equities were providing higher returns than other classes of financial assets, and households had chosen not to rebalance their portfolios as equity prices rose.[3] Australian equity market returns averaged around 20 per cent per annum over this period, compared with average deposit rates of around 5 per cent. Likely reflecting the attractive equity returns, flows into equities (mainly through superannuation funds) were also stronger than flows into other financial assets over this period. This also contributed to the increased exposure to equities.

Following the declines in wealth associated with the global financial crisis and the economic slowdown in 2008–2009, households have adopted a more cautious approach to their finances.[4] Households' appetite for risk has declined and, accordingly, households have been actively shifting the composition of their financial asset portfolio away from riskier financial assets. Between 2008 and 2011, there were net outflows from households' direct holdings of equities of around $67 billion, while holdings of deposits increased by around $225 billion, $90 billion more than in the previous three years (Graph 1, left panel).

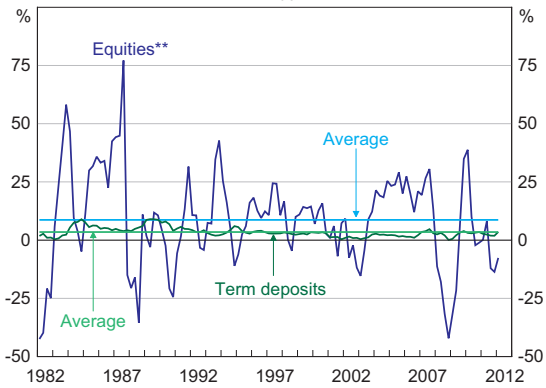
The outflows from equities were likely to have been largely in reaction to the capital losses experienced in the sharemarket in recent years and the associated high volatility of share prices. Over the past 30 years, the average annual real return on Australian equities (including capital growth and dividends) has exceeded the average annual real return on deposits by around 5½ percentage points, though the reverse has been true since 2008 (–5 per cent on equities versus 2½ per cent on deposits; Graph 2). Sharemarket volatility – measured as the standard deviation of monthly returns – increased

Graph 1
Saving Measures



* Four-quarter moving average
Sources: ABS; Melbourne Institute and Westpac

Graph 2
Real Returns*
Annual



* Nominal returns deflated by consumer price inflation (excluding interest charges prior to 1988 and adjusted for the tax changes of 1999–2000)
** S&P/ASX 200 Accumulation Index
Sources: ABS; Bloomberg; RBA

from around 2½ percentage points between 2003 and 2007 to around 5 percentage points between 2008 and 2011. While the (unconditional) expected returns on riskier assets such as equities are higher than on less risky assets such as deposits, the greater volatility in equity returns can result in actual returns being lower over certain horizons.

The investment horizon can affect households' asset allocation decision; investors with longer horizons typically invest in higher risk assets.[5] Australian

3 When the investment weights in a portfolio deviate from the original target asset allocations (i.e. the preferred level of risk) an investor may 'rebalance' the portfolio by selling some assets and buying other assets to bring it back in line.

4 For a further discussion, see RBA (2012).

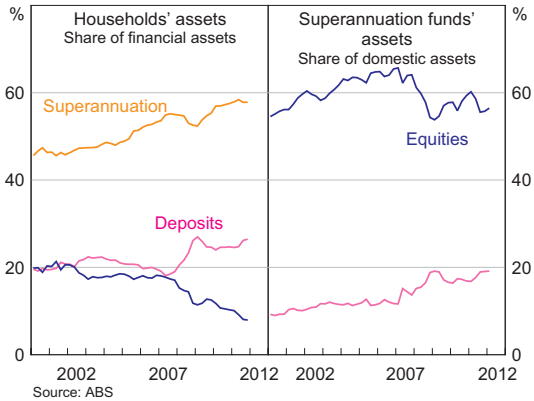
5 See, for example, Cardak and Wilkins (2009). In addition, Veld-Merkoulova (2011) found that after taking investors' attitudes towards risk into account, their age and planning horizon remain important factors in household investment decisions.

households have also benefited from diversification: the returns on aggregate household assets have been less volatile than the weighted average of the individual assets. This is because the returns on the individual assets are not perfectly correlated. For example, the returns on deposits and equities have not moved closely together historically.

As a result of the sharemarket declines and flow of household funds out of equities in recent years, the share of households' financial assets held directly in equities has more than halved, from 18 per cent prior to the global financial crisis to 8 per cent at the end of 2011 (Graph 3, left panel). In contrast, the share of deposits has increased from 18 per cent to 27 per cent. Consistent with this portfolio shift, surveys show a significant increase in the share of people nominating deposits and paying down debt as the 'wisest place' for saving and a decline in the share nominating equities and real estate (Graph 1, right panel).

Superannuation continues to account for the bulk of households' financial assets, at just under 60 per cent. Within superannuation, there has also been a shift towards deposits and away from equities (Graph 3, right panel). Although fund managers' decisions may not directly reflect household preferences, the shift has been more pronounced for self-managed superannuation funds, suggesting that households who directly manage their superannuation have indeed changed their investment preferences.[6]

Graph 3
Financial Assets

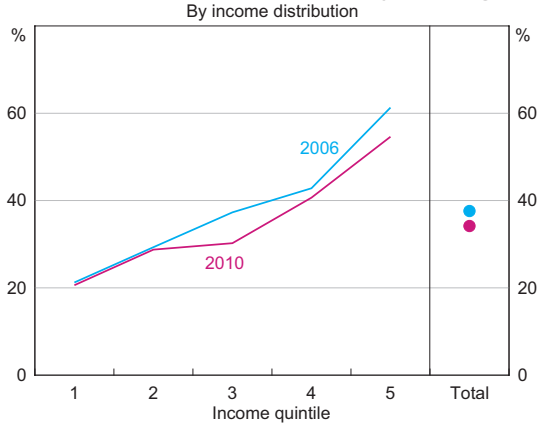


Source: ABS

Disaggregated data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey also suggest that there has been a shift away from riskier financial assets.[7] The decline in the share of households' financial assets held directly in equities was driven by both valuation effects and withdrawals; between 2006 and 2010, the proportion of households owning equities directly fell from 38 per cent to 34 per cent (Graph 4). The shift away from equities was broad based, with all age groups and most income groups reducing their exposure over this time.

The HILDA Survey suggests that higher-income and wealthier households are more likely to invest directly in equities; poorer households hold more of their wealth in deposits. This is consistent with the

Graph 4
Households with Direct Equity Holdings
By income distribution



Sources: HILDA Release 10.0; RBA

6 In addition to an increase in risk aversion and a rise in the relative returns on deposits of late, the shift towards deposits may also reflect the ageing population, especially given that a higher share of members in self-managed super funds are closer to retirement age. Upon retirement, superannuation assets become a key source of funds to meet daily spending needs, increasing the need for less risky and more liquid assets.

7 Generally, the HILDA Survey interviews the same set of households each year, mainly between August and November, with the latest published results being for 2010. A full breakdown of household wealth is available at four-yearly intervals (2002, 2006 and 2010). For a detailed discussion on the distribution of household wealth from the 2010 HILDA Survey, see Finlay (2012).

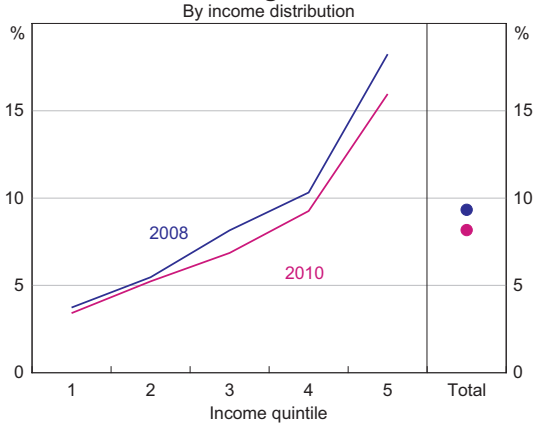
literature, which finds that share market participation increases as wealth and income increase.[8] In part, this is because these households are more able to afford the fixed costs of investing in the share market and it is easier to diversify a larger portfolio. Higher-income households are also more likely to be able to save part of their income beyond their compulsory superannuation contributions (Finlay 2012). The appetite for risk has also been found to increase with wealth, which is not surprising because wealthier investors may be better able to weather volatile returns (Cohn *et al* 1975).

Preferences for Risk

Households' self-reported preferences for risk from the HILDA Survey also indicate that they have become somewhat more risk averse: the share of households reporting a high tolerance for risk declined from 9½ per cent in the 2008 Survey to 8 per cent in the 2010 Survey (Graph 5).[9] Over this period, the share of households who responded that they were risk-averse increased by more than 2 percentage points to 41 per cent. The decline in the appetite for risk has been broad based, with a shift observed across the distribution for most age, wealth and income groups.

Because the HILDA Survey generally tracks the same set of households each period, it is possible to identify whether households responding in both the 2008 and 2010 Surveys changed their preferences for risk. Around 40 per cent of households that previously reported having a high tolerance for risk changed their preference to risk-neutral. The appetite for risk of households that identified themselves as being risk-neutral in 2008 was also more likely to have declined; around 20 per cent of these households changed their preference to risk-averse.

Graph 5
Households with a High Tolerance for Risk*
By income distribution



* Respondents who take substantial risks expecting substantial returns or take above-average risks expecting above-average returns
Sources: HILDA Release 10.0; RBA

Consistent with the literature, households reporting high tolerance for risk tend to be wealthier. Around three-quarters of households with a strong appetite for risk were also in the top half of the wealth distribution in 2010. Higher-income households are also more willing to take on risk; 16 per cent of households in the top 20 per cent of the income distribution reported having a high tolerance for risk compared with only 3 per cent of households in the lowest 20 per cent of the income distribution in the 2010 Survey (Table 1).[10] Older households tend to have the lowest appetite for risk; just over half of households with a head over the age of 65 reported being risk averse compared with 41 per cent of all households. Younger households – with a household head aged 25 to 34 years – tend to have a stronger appetite for risk; 13 per cent of these households report having a strong appetite for risk compared with 8 per cent across all households.

Another way of examining households' attitudes to risk is to look at the proportion of riskier assets in household financial asset portfolios – the risky asset ratio – which measures households' revealed

8 For example, see Wachter and Jogo (2010).

9 Households with a high tolerance for risk include respondents who say they take substantial risks expecting substantial returns and respondents who say they take above-average risks expecting above-average returns. Risk-neutral households cover respondents who say they take average risks expecting average returns; risk-averse households responded as not being willing to take financial risks.

10 In the 2008 Survey, 18 per cent of households in the top 20 per cent of the income distribution self-reported as having a high tolerance for risk compared with 4 per cent in the lowest 20 per cent of the income distribution.

Table 1: Household Preferences for Risk
Share of households in each category with particular risk preference; 2010

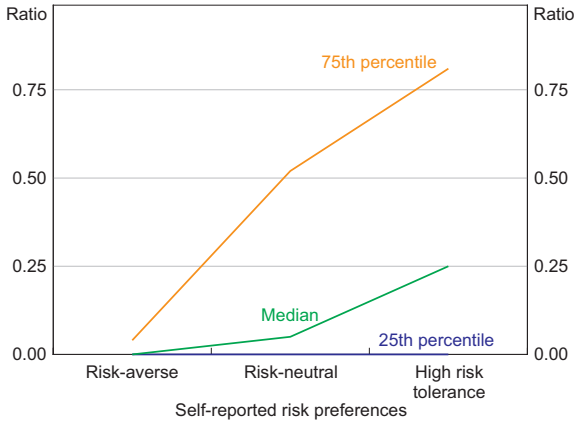
	High tolerance for risk	Risk averse
Income		
Top 20 per cent	16	28
Bottom 20 per cent	3	49
Age		
25–34 years	13	36
65 years and over	2	53
All households	8	41

Sources: HILDA Release 10.0; RBA

preferences for risk.[11] In the academic literature, riskier financial assets are typically measured as direct equity holdings and sometimes include superannuation. While much of households' exposure to risky assets comes through superannuation, this needs to be excluded from a measure of households' revealed risk preferences such as the risky assets ratio because superannuation contributions are compulsory and the decisions of fund managers may not directly reflect household preferences.

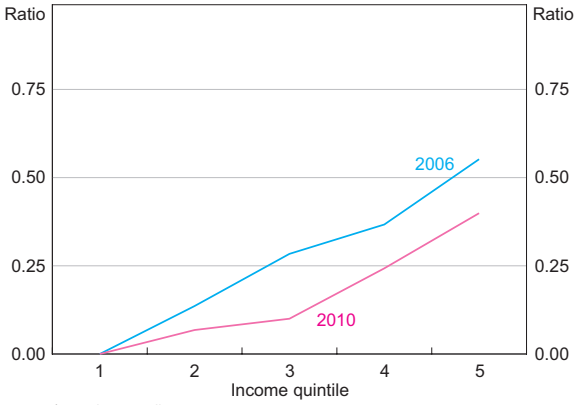
Households' actual risk exposures accord with their reported preferences for risk; the median risky asset ratio increases with households' reported appetite for risk (Graph 6). This is consistent with the academic literature that has found that the degree of risk aversion affects households' willingness to invest in risky assets and explains differences across households in terms of the composition of their portfolios: households that are more risk-averse are prepared to forego relatively higher expected returns for assets with lower volatility, and arrange their portfolios accordingly.[12] Also consistent with the literature, the risky asset ratio increases with income and wealth (Graph 7). The decline in households' appetite for risk is also evident; there has been a broad-based decrease in the risky asset ratio across wealth and income groups in recent years.

Graph 6
Risky Asset Ratio
By self-reported household risk preferences*; 2010



* Distribution of households' risky asset ratios within each risk category
Sources: HILDA Release 10.0; RBA

Graph 7
Risky Asset Ratio*
By income quintile, 2010



* 75th percentile
Sources: HILDA Release 10.0; RBA

Conclusion

Households have actively lowered their exposure to riskier financial assets in recent years following a period of relatively lower returns on assets such as equities. To some extent this portfolio shift is likely to have reflected households more closely aligning

11 Using data from the 2002 HILDA Survey, Cardak and Wilkins (2009) find that a range of variables, including liquidity and credit constraints, are important determinants of the household risky asset ratio.

12 See, for example, Gollier (2002).

their investment choices with their preferences for risk. Over the long run, the returns on a less risky portfolio are expected to be lower than on a riskier portfolio, reflecting the trade-off between risk and returns. However, actual returns on riskier assets may not be higher over shorter periods.

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Banking Fees in Australia

Sarah Rudd and Chris Stewart*

The Reserve Bank has conducted a survey on bank fees each year since 1997. The results of the latest survey show that banks' aggregate fee income rose slightly in the banks' 2011 financial years, but that growth in fee income was less than that in banks' total assets. Fee income from households declined while fee income from businesses grew, largely as a result of increases in fees on business loans and bank bills.

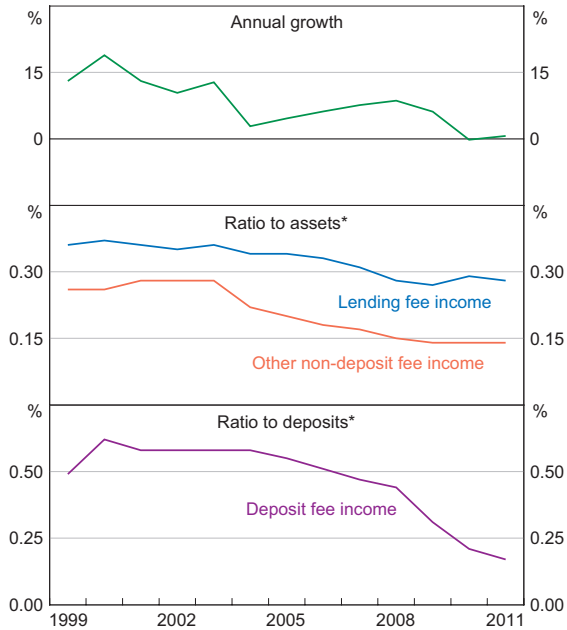
Fees from Banking Activities

The Reserve Bank's annual bank fee survey provides information on the fees that commercial banks earn from their Australian operations.[1] It focuses on fee income generated by banks in the process of taking deposits, making loans and providing payment services. Other forms of non-interest income, such as income earned from funds management and insurance operations, are excluded from the survey. This article summarises the results of the latest survey, which relate to the banks' 2011 financial years.[2] It covers 17 institutions, which together account for around 90 per cent of the total assets of the Australian banking sector.

Total domestic fee income in 2011 grew by 0.7 per cent to $11.3 billion (Graph 1, Table 1). This outcome reflects a number of developments, including:

- a decline in fee income from households, in particular relating to deposits and housing loans;
- an increase in fee income from businesses, particularly fees on loans and bank bill facilities; and
- continued falls in total deposit fee income and little change in total lending fee income.

Graph 1
Banks' Fee Income



* Adjusted for series break in 2002 due to a change in banks' reporting; financial-year average assets and deposits have been used
Sources: APRA; RBA

Households

Banks' fee income from households declined by 7.0 per cent in 2011, to around $4.0 billion (Graph 2, Table 2). The fall in household fee income was largely a result of declines in both housing loan and deposit fee income and was broad based across surveyed banks. Loan fees currently account for 71 per cent of total household fees, compared with 54 per cent

* The authors are from Domestic Markets Department.

1 The data from the survey are published in the Reserve Bank's Statistical Table F6, 'Domestic Banking Fee Income'.

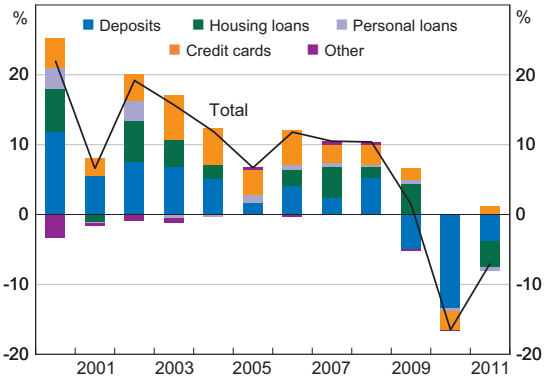
2 All data in this article are based on banks' financial years, which differ between banks, apart from Table 3, where data are as at June.

Table 1: Banks' Fee Income

	Households		Businesses		Total	
	$ billion	Growth	$ billion	Growth	$ billion	Growth
		Per cent		Per cent		Per cent
2008	5.1	10.4	5.5	7.1	10.6	8.7
2009	5.2	1.5	6.1	10.5	11.3	6.2
2010	4.3	–16.5	6.9	13.7	11.2	–0.2
2011	4.0	–7.0	7.3	5.5	11.3	0.7

Source: RBA

Graph 2
Growth in Household Fee Income
Contribution by product



Source: RBA

five years ago. Conversely, household deposit fees account for around 27 per cent of total household fees, compared with 44 per cent five years ago.

Household deposit fee income declined by 13.3 per cent in 2011, despite continued strong growth in the value of deposits. This fall was largely a result of a decline in exception fees on transaction deposit accounts. Exception fees on deposit accounts include, for example, fees charged when a customer does not have sufficient funds in an account to cover a direct debit payment. Account servicing and transaction fee income on these types of deposit accounts also continued to fall, alongside heightened competition among banks to raise deposit funding. Since peaking in 2008, fees paid by households on transaction accounts – which make up more than 90 per cent of deposit fees paid by households – have halved.

Total fee income earned on housing loans fell by 11.3 per cent in 2011, after having grown at an average annual growth rate of 11.4 per cent between 2005 and 2010. The fall in housing loan fee income occurred despite the surveyed banks' outstanding

Table 2: Banks' Fee Income from Households

	2009	2010	2011	Growth 2011	Average growth 2005–2010
		$ million		Per cent	Per cent
Deposits	1 940	1 247	1 081	–13.3	–6.0
of which: exception fees	688	299	172	–42.5	na
Loans:	3 137	2 981	2 849	–4.4	8.8
of which: exception fees	615	370	315	–14.8	na
– Housing	1 390	1 397	1 240	–11.3	11.4
– Personal	343	326	300	–7.8	4.9
– Credit cards	1 403	1 258	1 308	4.0	7.2
Other fees	97	94	91	–2.8	3.1
Total	**5 174**	**4 322**	**4 021**	**–7.0**	**2.9**
of which: exception fees	1 303	669	487	–27.2	na

Source: RBA

housing loans growing by 8 per cent. This fall was mainly a result of a decline in account servicing and 'other' fee income. Much of this decline owed to falls in exit fees charged by banks for the early termination of variable-rate mortgages. These fees were banned by the Federal Government from 1 July 2011 on new housing loans, although some banks abolished these fees prior to this date. There was also a decline in income from break fees. Break fees are charged by banks when a fixed-rate loan is terminated early by the borrower, as banks incur costs when exiting the swap transactions they undertake to hedge the interest rate risk involved in extending fixed-rate loans. With fewer customers breaking their fixed-rate loans during the banks' 2011 financial years – as the increase in variable rates made it less attractive for households to break their fixed-rate loans and there were fewer of these loans outstanding – fee income from this source fell. A slower rate of housing loan approvals also contributed to lower establishment fee income for some banks.

Total fee income earned on personal loans fell by 7.8 per cent in 2011, notwithstanding a 1 per cent rise in the stock of personal credit for surveyed banks. Fee income from credit cards rose by 4.0 per cent. This was driven by an increase in credit card account servicing fee income based on a small increase in the number of cards on issue. Banks' unit charges on credit cards were, however, little changed (Table 3).

Table 3: Unit Fees on Credit Cards[a]

				Growth 2011	Average growth 2005–2010
	2009	2010	2011	Per cent	Per cent
Annual fees ($)[b]					
No-frills cards	52	53	54	2.1	6.5
Standard cards	29	29	29	0.0	0.6
Standard rewards-based cards	80	80	80	0.0	–1.2
Gold rewards-based cards	140	151	137	–9.7	2.5
Platinum rewards-based cards	231	283	283	0.0	na
Cash advance fees[c]					
Own banks' ATM					
– $ charge	1.23	1.06	1.06	0.0	–4.7
– Per cent of value	1.6	1.8	1.8	3.6	9.2
Other banks' ATM					
– $ charge	1.38	1.06	1.06	0.0	–8.2
– Per cent of value	1.6	1.8	1.8	3.6	4.0
Overseas ATM					
– $ charge	3.63	3.63	3.63	0.0	0.0
– Per cent of value	1.7	1.7	1.8	3.7	3.3
Foreign currency conversion fee (per cent of value)	2.6	2.6	2.9	9.6	1.5
Late payment fee ($)	31	15	14	–8.5	–12.5
Over-limit fee ($)[d]	30	14	10	–27.8	–14.0

(a) Simple average of fees for credit cards with interest-free periods issued by major banks, except for the annual fee on no-frills cards, which is based on a wider sample of banks; note that changes in the sample affect the average fee
(b) Includes fees for membership in rewards programs where separately charged
(c) Most banks charge the greater of a flat fee or a percentage of the cash advance
(d) Over-limit fees are charged when a credit card limit is exceeded
Sources: CANSTAR; RBA; credit card issuers' websites

The value of transactions and cash advances also both increased over the year.

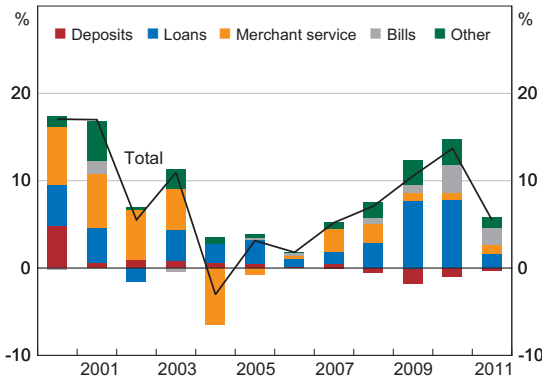
Exception fees across all types of household loans continued to fall over the year. These types of exception fees can arise when a customer makes a late payment, or exceeds a credit limit. A continued decline in credit card exception fees drove this result.

Businesses

Banks' fee income earned from businesses increased by 5.5 per cent in 2011 to $7.3 billion (Table 4, Graph 3). Most of the growth in business fee income reflected growth in fees earned on loans and bank bills, and occurred despite lending to businesses falling slightly over the year. Fee income from business loans rose by 4.2 per cent, while fee income from bank bills (which includes charges for arranging bank bill facilities and accepting or endorsing bank bills) rose by 23.2 per cent. The increase in fees on these facilities was largely due to the repricing of establishment fees and line fees, which are charged by banks to maintain credit lines regardless of use. This ongoing repricing largely reflects banks re-evaluating the credit and liquidity risks associated with these facilities, including in the context of the forthcoming Basel III bank capital and liquidity standards. In 2011, fee income earned on business loans and bank bills accounted for just under half of all fee income earned by banks from businesses, compared with around 39 per cent five years ago.

Fee income earned on business deposits fell by 3.0 per cent in the year, even though business deposit balances increased by 15 per cent. As with household deposits, banks have been competing vigorously for deposits from the business sector. The decline in fee income earned on deposits occurred for both small and large business deposit accounts. Exception fees on deposit accounts continued to

Graph 3
Growth in Business Fee Income
Contribution by product



Source: RBA

Table 4: Banks' Fee Income from Businesses

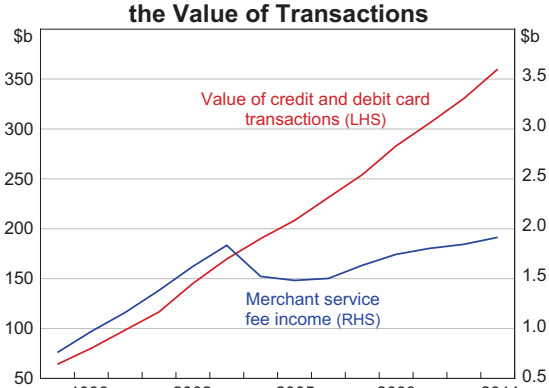
	2009	2010	2011	Growth 2011	Average growth 2005–2010
		$ million		Per cent	Per cent
Deposit accounts	711	650	631	–3.0	–4.3
of which: exception fees	122	59	48	–19.2	na
Loans	2 254	2 733	2 848	4.2	11.8
of which: exception fees	75	53	40	–24.2	na
Bank bills	365	561	691	23.2	16.1
Merchant service fees	1 796	1 839	1 910	3.9	4.4
Other	963	1 138	1 221	7.3	10.9
Total	**6 088**	**6 921**	**7 300**	**5.5**	**7.6**
of which: exception fees	197	112	88	–21.6	na

Source: RBA

fall, largely benefiting small businesses which incur around 85 per cent of total business exception fees. Business deposit fees now make up only 9 per cent of total business fees, down from 17 per cent five years ago.

Merchant service fee income rose by 3.9 per cent in 2011 (Graph 4). These fees are charged by banks for providing merchants with credit and debit card transaction services, with around 70 per cent of these fees paid by small businesses. The increase was largely attributable to higher merchant fee income from credit cards. Since the introduction of the Reserve Bank's credit card interchange reforms in 2003, total merchant service fee income has grown by 5 per cent, despite the value of card transactions more than doubling over this time.

Graph 4
Merchant Service Fee Income and the Value of Transactions



Source: RBA

Liquidity in the Australian Treasury Bond Futures Market

Bobby Lien and Andrew Zurawski*

Australian Treasury bond futures contracts are used by market participants to manage interest rate exposures. Relative to other financial instruments, the market generally has high turnover and low transaction costs. However, the global financial crisis saw a decline in liquidity, with market participants reacting to increased volatility by trading smaller parcels more frequently, and at a higher cost. More recently, liquidity in the market has improved. Intraday data suggest that liquidity is deepest following the opening of the market, and that liquidity is affected by the release of economic and financial news, particularly the announcement of the outcome of Reserve Bank Board meetings.

Introduction

An Australian Treasury bond futures contract is a derivative that provides a means of protecting against, or gaining exposure to, interest rate risk – the risk that a change in market interest rates will affect the value of assets and liabilities. In Australia, the Treasury bond futures market is the primary market for managing this risk, with turnover significantly larger than in the physical Treasury bond market. Because of the ease and low cost of transacting in the Treasury bond futures market, it is also important for the pricing of the medium- to long-term 'risk-free' rate of return in Australia – a key determinant in the price of other financial instruments.[1] In these ways, a well-functioning Treasury bond futures market provides broad benefits for Australian financial markets. This article examines developments in a range of measures of liquidity for this market, focusing on how the market functioned during the global financial crisis and the intraday patterns of liquidity.

Overview of the Market

In general, a futures contract is a standardised, exchange-traded derivative contract to buy or sell a specified asset on a future date for a price agreed today. Treasury bond futures contracts are settled with cash payments and therefore physical delivery of the Treasury bond itself is not required. The Treasury bond futures market consists of two contracts: a 3-year futures contract and a 10-year futures contract, which are traded on the Australian Securities Exchange (ASX). These contracts reference the yield on a basket of Treasury bonds with a notional face value of $100 000, a standardised coupon rate of 6 per cent per annum and an average term to maturity of 3 and 10 years. The contracts can be traded nearly 24 hours a day, separated into a day session and night session.[2]

Treasury bond futures provide an avenue to manage interest rate risk. For instance, an investor purchasing a 3-year fixed-rate corporate debt security is exposed

* The authors are from the Domestic Markets Department and would like to thank Benn Robertson for his valuable contribution.

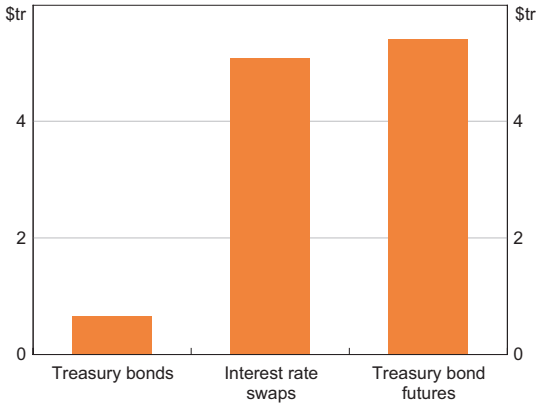
1 For details on the risk-free rate of return in Australia, see Finlay and Olivan (2012).

2 These contracts expire quarterly. At any one time, there are two quarterly contracts outstanding in each of the 3- and 10-year futures, although almost all positions are held in the contract with the earlier expiry. For more information on contract specifications, see <http://www.asx.com.au/documents/products/3-and-10-year-treasury-bonds-20120117.pdf>.

to the risk of an increase in interest rates and therefore a fall in the price of the debt security. To manage this risk, the investor can sell 3-year Treasury bond futures contracts. If interest rates of that maturity subsequently rise, the profit from the Treasury bond futures will offset the loss in the investment of the corporate debt security.[3] In a similar manner, dealers in the physical Treasury bond market can use Treasury bond futures contracts to manage interest rate risk on their inventories.

Market participants can also manage medium- to long-term interest rate risk using the physical bond market or the interest rate swaps market. However, a key benefit of derivative markets over physical markets is that contracts can be bought or sold without requiring the investors to hold or deliver the physical asset, reducing the funding requirement to establish interest rate positions. As a result, the bond derivatives market in Australia is significantly more liquid than the physical market. For example, turnover in both the futures and swaps markets exceeded $5 trillion in the 2010/11 financial year, more than eight times that in the physical market (Graph 1).

Graph 1
Annual Turnover
2010/11



Source: Australian Financial Markets Association

3 The profit from the futures contract may not fully offset the fall in the price of the debt security due to basis risk – the risk that the value of the futures contract does not change exactly in line with the financial instrument being managed.

The standardised, exchange-traded nature of Treasury bond futures also offers benefits to market participants over the interest rate swaps market. This is mainly due to the futures exchange acting as a central counterparty to all trades and trading in the market being concentrated in only two contracts. By comparison, the interest rate swaps market is an over-the-counter (OTC) market with customised arrangements. Transacting in this market is relatively costly and participants need to manage counterparty risk and replacement-cost risk separately.[4] As a result, trading in the swaps market is generally limited to large financial institutions.

Measuring Liquidity

Liquidity is a difficult concept to define and therefore measure. In general terms, a liquid market is one where transactions can take place readily, with low transaction costs and with little impact on price.[5] In theory at least, liquidity in the Australian Treasury bond futures market, like other financial markets, can be described along three key dimensions: the speed at which trades can be executed; the transaction cost of trading a given size; and the size of a trade that can be arranged at a given cost.[6] In practice, however, these dimensions are difficult to measure directly. Instead, two broad categories of liquidity measures are constructed:

- trade-based measures, which include market turnover, trade size and the number of trades; and
- order-based measures, which use order books to assess bid-ask spreads and market depth.

4 Counterparty risk is the risk that the other party in an agreement will default, and replacement-cost risk is the risk that the original agreement may have to be replaced at current market prices. Recent developments have resulted in the majority of OTC derivatives being covered by collateral agreements that assist in the management of counterparty risk. For more information, see CFR (2011).

5 In this article we focus on transactional liquidity, as distinct from funding liquidity which is the ability of an intermediary to raise finance to fund its chosen set of assets. For details, see Stevens (2008).

6 For more information on the key dimensions of liquidity, see Harris (2003).

Traditionally, market analysts have used trade-based measures to assess liquidity in financial markets. These measures do not directly capture liquidity, but rather measure transactions in the market. Hence, order-based measures are used in conjunction with trade-based measures to provide a richer description of liquidity conditions in the market.

Calculating order-based measures is more complicated and data intensive than trade-based measures because data for the order book are required. The order book is a record of trade instructions (not transactions) that have been submitted to the exchange to trade a set number of securities at a specified price or better, but which have not yet been executed. In general, a trade takes place when an order is executed against an instruction to trade at the best price currently available.

To illustrate how order-based measures are calculated, an example of an order book for the Australian Treasury bond futures market is presented in Table 1.

From data in the table below, the following measures of liquidity can be calculated:[7]

- **The bid-ask spread** is the difference between the lowest price of the sell order (best ask-price) and the highest price of the bid order (best bid-price). Hence, the bid-ask spread in this example is 0.5 basis points (96.155 – 96.150).
- **Best depth** is the average of the volume (or notional value) available at the best bid-price and best ask-price. Best depth in this example is 75 contracts [(50 + 100)/2] or $7.5 million, for contracts of $100 000.
- **Total depth** is the average of the volume (or notional value) available at each bid-price and ask-price throughout the visible order book. Total depth in this example is 225 contracts [(250 + 200)/2] or $22.5 million, for contracts of $100 000.

Liquidity in the Australian Treasury Bond Futures Market

To examine liquidity in the Australian Treasury bond futures market, intraday data from the Thomson Reuters electronic trading platform is used.[8] The following analysis is based on data for the 10-year futures contract, although similar patterns are evident in the 3-year futures contract.

Table 1: Order Book Example

Buyers (Bid)		Sellers (Ask)	
Volume	Price[(a)]	Price[(a)]	Volume
50	96.150	96.155	100
100	96.145	96.160	40
30	96.140	96.165	40
20	96.135	96.170	15
50	96.130	96.175	5
250			**200**

(a) The futures price is quoted as 100 minus the yield to maturity expressed in per cent per annum
Source: RBA

7 This example only considers the order book at a specific point in time. These measures are usually averaged across a selected interval, such as 10 minutes throughout the trading day, and then averaged across the three months of the contract to obtain a single daily average measure for each quarter.

8 The data are supplied by the Securities Industry Research Centre of Asia-Pacific (SIRCA) on behalf of Thomson Reuters.

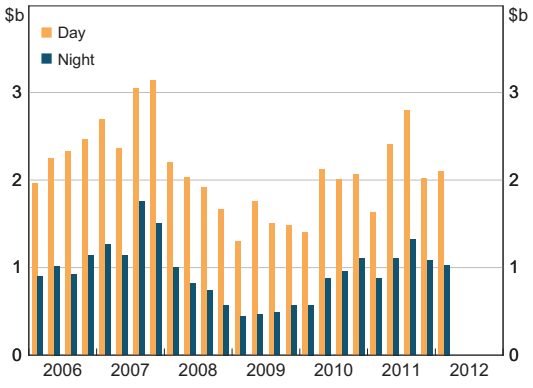
Trade-based measures

Broadly speaking, a higher turnover indicates a greater level of liquidity in the market. Nominal turnover in the day session of the 10-year futures market was $2.1 billion per day in the March quarter of 2012, averaging around twice that of the night session (Graph 2). By way of comparison, turnover in the Treasury bond futures market has averaged four times that of the ASX SPI 200 futures market in the past five years, consistent with relatively high levels of trading activity and liquidity in the Treasury bond futures market.[9] In general, turnover in both day and night sessions has followed similar patterns in the 10-year futures market, increasing in 2006 and 2007 before falling off significantly during the onset of the global financial crisis. Since its trough in early 2009, turnover has increased by around 60 per cent.

The level of turnover in the Treasury bond futures market has likely been influenced by the stock of physical Treasury bonds outstanding over time, although the nature of this interaction is not clear-cut. For instance, a low level of Treasury bonds outstanding may cause a higher level of futures turnover as market participants use the more liquid futures market to manage their exposures. Prior to the global financial crisis, the level of Treasury bonds outstanding was around $50 billion (4 per cent of GDP) and the market was seen as having relatively low liquidity, which may have increased futures market turnover. In contrast, the level of liquidity in the Treasury bonds market has improved more recently as the stock of outstanding securities has increased to around $200 billion (15 per cent of GDP), although this may have added to futures market activity as bond dealers have sought to manage larger inventories.

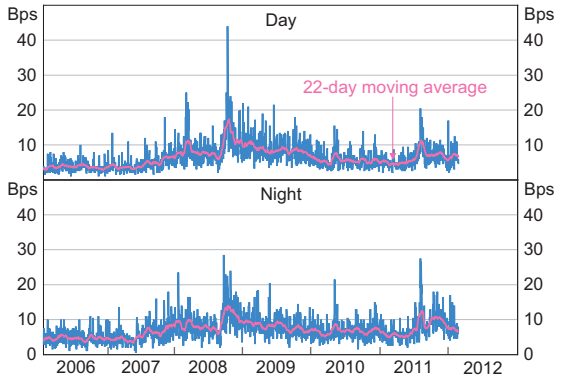
Although turnover data are a good starting point for assessing liquidity in a market, they can also reflect the influence of uncertainty rather than actual liquidity. The global financial crisis is a good example of increased uncertainty – price volatility in the Treasury bond futures market increased significantly at the onset of the crisis, with the intraday price range of the 10-year futures price roughly doubling between 2007 and 2008 (Graph 3). The precise interaction between volatility and turnover, however, is not clear, complicating a turnover-based analysis.[10] For example, increased uncertainty may lead traders to hedge their positions more frequently, causing a rise in turnover. On the other hand, elevated uncertainty

Graph 2
Nominal Turnover
10-year contract, face value, daily average



Sources: RBA; Thomson Reuters

Graph 3
Price Volatility
10-year contract, intraday price range



Sources: RBA; Thomson Reuters

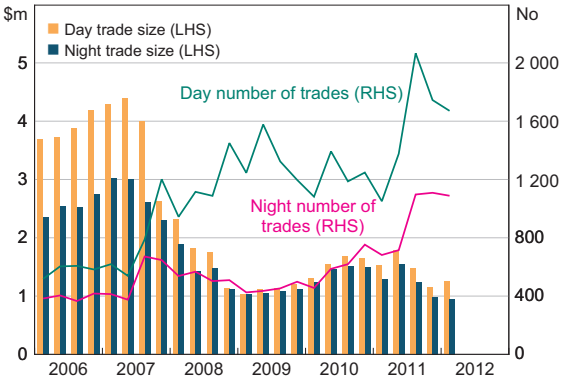
9 The ASX SPI 200 futures contract is the benchmark equity index futures contract for investors trading and managing risk in the Australian equity index market. Although turnover in this market is not directly comparable to the Treasury bond futures market, the level of turnover in the ASX SPI 200 futures market is widely considered to reflect a high level of liquidity. For details on turnover in the ASX SPI 200 futures market, see AFMA (2011).

10 For details on the relationship between volatility and derivatives turnover, see Jeanneau and Micu (2003).

may correspond with a decline in turnover due to higher risk exposures.

Disaggregating market turnover into trade size and the number of trades provides an insight into the reaction of market participants to increased volatility in the Treasury bond futures market. Over the past several years, trade size has followed a similar pattern to turnover, rising during 2006 and 2007, and falling during the global financial crisis, although by more than turnover (Graph 4). In contrast, the number of trades per day more than doubled for the day contracts during the global financial crisis. This suggests that market participants were managing their risk exposures and transaction costs more actively due to higher volatility during this period. By trading smaller parcels more frequently, traders may reduce both the risk of volatile prices moving against them and the impact their trades have on prices.

Graph 4
Trade Size and Number of Trades
10-year contract, daily average



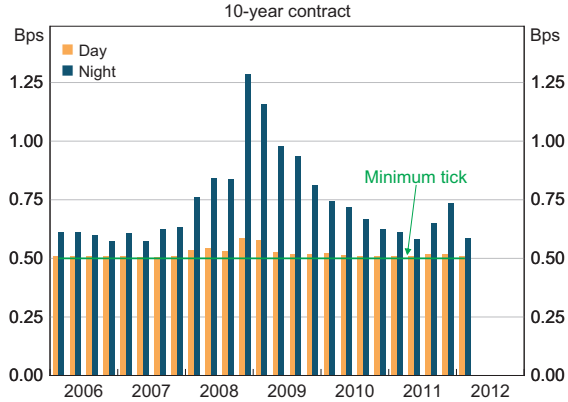
Sources: RBA; Thomson Reuters

Order-based measures

The second set of liquidity measures gives an indication of transaction costs. As discussed previously, the 'bid-ask spread' measures the difference at any point in time between the lowest price of a sell order and the highest price of the bid order in the market. A narrower bid-ask spread means that market participants can trade at a lower cost and implies a more liquid market.

An institutional feature of the 10-year futures market is that the ASX sets a 'minimum tick' of half a basis point (Graph 5).[11] During the day session of the 10-year futures market, the average bid-ask spread has rarely deviated from the minimum tick over the past several years suggesting that it has acted as a binding price floor (although it averaged marginally above the minimum tick in late 2008 and early 2009). The bid-ask spread in the night session is more indicative of liquidity conditions in the market, averaging around 0.6 basis points in 2006 and 2007 before doubling during the height of the global financial crisis. This highlights the greater liquidity in the day session relative to the night session, which is also implied by the trade-based measures.

Graph 5
Average Bid-ask Spread
10-year contract

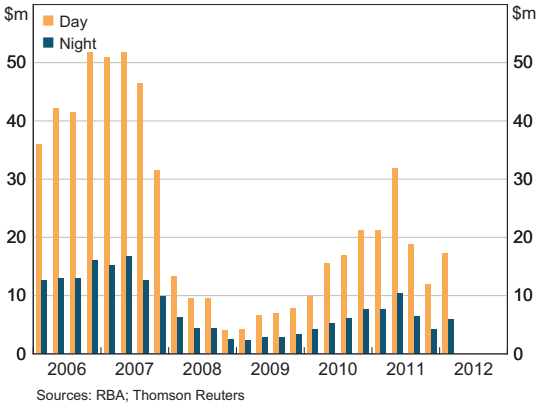


Sources: RBA; Thomson Reuters

A second order-based measure of liquidity is 'best depth', which indicates the size of a trade that can be carried out (as a single trade) without incurring a price impact. This is calculated as the average of the volume available at the best bid-price and best ask-price, with an increase in this average indicating a more liquid market. Again, according to this measure market liquidity improved over 2006 and 2007 and then declined significantly during the global financial crisis (Graph 6). Best depth in the 10-year futures

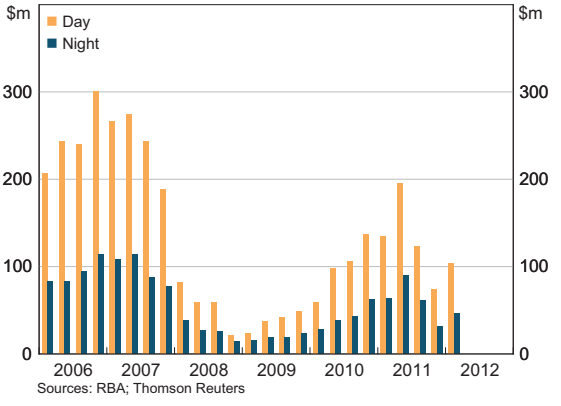
11 In contrast, the 3-year futures market has a minimum tick of one basis point. For details on the minimum tick, see Lepone and Flint (2010).

Graph 6
Average Best Depth
10-year contract, face value



Sources: RBA; Thomson Reuters

Graph 7
Average Total Depth
10-year contract, face value



Sources: RBA; Thomson Reuters

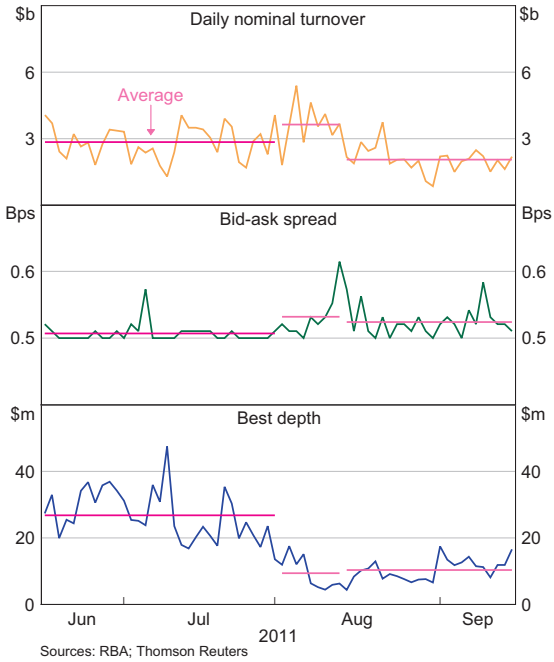
market fell from an average of around $45 million in the day session in 2007 to below $5 million in late 2008. This suggests that market participants were offering to trade a smaller number of contracts in the order book to minimise the increased risk associated with an adverse price movement in the market. Since the height of the global financial crisis, best depth in the 10-year market has increased, although it remains around a third of pre-crisis levels.

The bid-ask spread and best depth measures potentially understate the cost of large trades. Large trades may need to be transacted at prices beyond the best on offer in the visible order book and, as a result, their true cost will include a price impact. 'Total depth' attempts to take the price impact into account by measuring the average volume available at each bid-price and ask-price throughout the visible order book. This measure shows similar patterns to the other measures of liquidity, with the decline in total depth being similar to the decline in best depth during the global financial crisis (Graph 7). The reduction in total depth further suggests that investors were attempting to minimise risk as explained above. In addition, there was a larger effect on prices associated with trading large orders during this period. For the March quarter of 2012, the visible order book had a total depth of around $110 million for the day session and $50 million for the night session, approximately six and eight times greater than best depth, respectively.

The Relationship Between Trade- and Order-based Measures

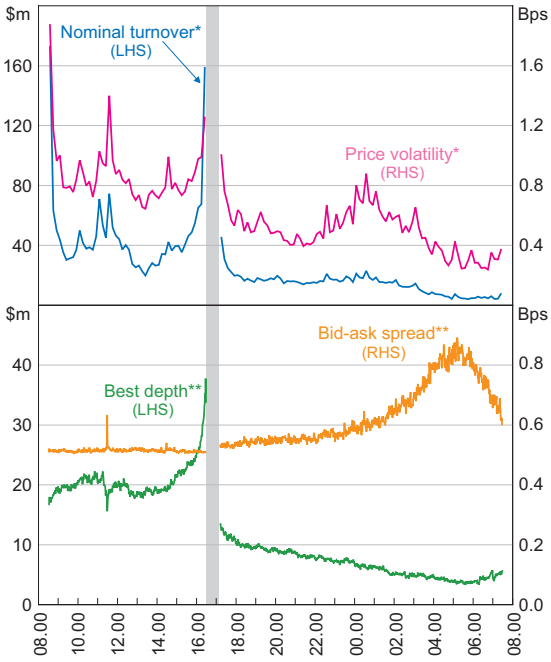
While for the most part, trade- and order-based measures provide similar conclusions about market liquidity in the Australian Treasury bond futures market, they can provide contrary results during periods of market stress. The heightened uncertainty surrounding European sovereign debt concerns and the credit rating downgrade of the United States at the beginning of August 2011 provides an illustrative example. As shown in Graph 8, during this period, trade-based measures of liquidity (daily turnover) increased while order-based measures deteriorated (bid-ask spreads widened and best depth declined). This highlights the risk of relying solely on trade-based measures to assess market liquidity – during this period the increase in trading was likely to have been the result of traders responding to new information, notwithstanding the higher cost and greater price impact of trades at such times (as implied by the wider bid-ask spreads and lower best depth).

Graph 8
Treasury Bond Futures Liquidity
10-year day contract



Sources: RBA; Thomson Reuters

Graph 9
Intraday Liquidity
10-year contract, average from 15 December 2010 to 15 March 2012



* Measured at 10-minute intervals, AEST adjusted for daylight saving
** Measured at 1-minute intervals, AEST adjusted for daylight saving
Sources: RBA; Thomson Reuters

Intraday Liquidity in the Futures Market

Liquidity is not evenly distributed throughout the trading day, but can be concentrated around certain times. Analysis of liquidity indicators on an intraday basis provides insights into the periods during each trading session when most market activity occurs. Intraday measures of liquidity can also shed light on market participants' behaviour around the release of economic data or financial news.

As shown previously, liquidity during the day session is consistently higher than the night session across all measures: intraday turnover and best depth are higher, and bid-ask spreads are lower (Graph 9). The average level of turnover and volatility are at their highest at the opening of the day session. This likely reflects the fact that at this time of day market participants are adjusting their positions in response to developments overnight and incorporating price sensitive information that the night session might not have fully captured. It also reflects trades conducted to rebalance portfolios at the opening of the market associated with replicating benchmarks. Turnover and volatility also peak towards the close of the day session, which reflects, among other things, market participants closing positions to avoid unwanted price exposures in the overnight session. Despite the market being open for nearly 24 hours a day, these intraday patterns of liquidity suggest that specialist knowledge is relatively concentrated among active traders in the day session, rather than in the night session.

Liquidity is also affected by the dissemination of economic data and financial news. This is most evident at 11.30 am Australian Eastern Standard Time (AEST) when the Australian Bureau of Statistics regularly publishes economic and financial data.

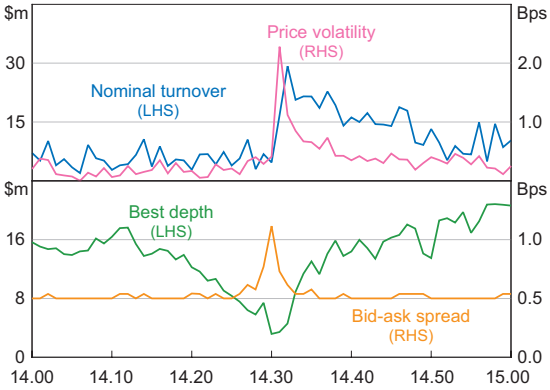
In the few minutes prior to the release of data, there is a fall in best depth and an increase in the bid-ask spread as fewer orders are offered by market participants in the order book. This reflects the uncertainty about the data release – market participants attempt to avoid taking an open position into the announcement to minimise the risk associated with any adverse effect that the new information may have on prices – and therefore the market becomes less liquid. In the few minutes following the news, best depth in the market increases to average levels and the bid-ask spread returns to the price floor set by the minimum tick. Following the release of data, there is also a sharp increase in turnover and volatility, reflecting trading based on the new information. This sharp increase in market activity typically only lasts for a few minutes following the release of data, suggesting that prices adjust quickly to new information.

Similar intraday spikes in liquidity occur periodically at 11.00 am AEST and 2.30 pm AEST. These times correspond to the announcements of the Australian Treasury Bond tender results by the Australian Office of Financial Management and the monthly announcement of the Reserve Bank's monetary policy decision, respectively. The impact of the Reserve Bank's monetary policy decision on liquidity is particularly strong, although this depends upon the degree of uncertainty regarding the announcement. On average, bid-ask spreads widen to 1.1 basis points and best depth declines to around $3 million in the minutes prior to the announcement (Graph 10). Following the announcement, there is an immediate fall in the bid-ask spread and best depth recovers to around average levels before 2.40 pm AEST. There is also a sharp increase in turnover and volatility immediately following the announcement, but they gradually return to more normal levels by 3.00 pm AEST.

Graph 10

Intraday Liquidity around Monetary Policy Annoucements*

10-year contract, average from 1 February 2011 to 6 March 2012



* Measured at 1-minute intervals, AEST adjusted for daylight saving

Sources: RBA; Thomson Reuters

Summary

Liquidity in the Australian Treasury bond futures market is important as it allows market participants to hedge or gain interest rate exposures efficiently. It supports the functioning of other Australian financial markets by helping to provide an indication of the medium- to long-term 'risk-free' interest rate. Although market liquidity is a difficult concept to define and measure, available indicators suggest that in general, liquidity in the market is high. However, liquidity did deteriorate during the global financial crisis as market participants reacted to heightened uncertainty and volatility by reducing the size of trades and best depth, and by widening bid-ask spreads. More recently, these indicators suggest that liquidity in the market has recovered from the relatively low levels reached during the global financial crisis. In terms of intraday liquidity, various measures indicate that the market is most liquid at the open and close of the day session, and respond to economic and financial news in expected ways – liquidity declines immediately before data releases due to uncertainty and then increases as the market prices in the new information.

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Central Counterparty Interoperability

Nicholas Garvin*

Many securities and derivatives markets, including most that are traded on an exchange, are served by a central counterparty (CCP). After trades are executed, the CCP inserts itself between both trading counterparties, to protect them from the risk that one defaults before the obligations are settled. CCP interoperability is an arrangement that links different CCPs, allowing participants of one CCP to seamlessly deal with participants of another CCP. This can make it cheaper for traders to participate in a wider range of financial markets, and can facilitate competition between CCPs by opening up participant networks. However, interoperability also introduces financial stability risks, primarily by creating dependencies between the linked CCPs, and so it may be unsuitable for some markets. Interoperability arrangements are currently in place between some CCPs serving European equity markets, and another type of arrangement is in place linking several US CCPs. There are currently no links involving Australian CCPs, although the evolving CCP landscape may encourage links of some form in the future.

Introduction

Over the past decade, the landscape for financial market infrastructure has undergone considerable change, driven by the combined forces of technological advance, globalisation and regulatory change. National markets are commonly no longer served by a single infrastructure provider at all the stages of the trading process between execution and settlement. Emerging in its place is a more fluid environment in which infrastructure providers are targeting specific stages of the trading process, and increasingly operating across national borders.[1] Particularly in Europe, cases are emerging of CCPs competing directly with each other, especially to process trades executed on newly established trading platforms.[2] Partly in response, CCPs are expanding their scope and coverage, through new services, consolidation with other providers, and diversification into over-the-counter (OTC) derivatives markets.

In adjusting to these developments, market participants are placing new demands on CCPs and other post-trade infrastructure providers. For instance, traders that are active on multiple trading platforms would prefer to consolidate their clearing activities, rather than incur the cost of connecting to and maintaining memberships in multiple CCPs. One solution that has emerged is linking CCPs by making them interoperable. In Europe, this has helped integrate markets that are served by different CCPs. In the United States, alternative forms of CCP links have lowered the costs of connecting to multiple CCPs.

An interoperability link between two CCPs allows a participant of one CCP to carry out centrally cleared trades with a participant of the other CCP. By doing so, it lowers the cost to traders of expanding their product range and their access to trading networks. In particular, interoperability preserves the netting benefit to participants of using a single clearing

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1 Implications of changes to the international CCP industry structure are discussed in CPSS (2010).

2 CCPs are entities that specialise in financial market clearing. Clearing is the stage in the trading process between trade execution, which is often carried out on an exchange, and settlement, which involves the final transfer of products and cash. The role of CCPs is discussed in more detail later in this article.

venue, that is, the benefit of having incoming and outgoing obligations from different trades cancel each other, and allows participants to avoid duplicating CCP membership fees, default fund contributions and other participation requirements. As well as lowering the costs of participants' market access, interoperability also helps to foster competition between CCPs, including by facilitating market entry.

Notwithstanding the potential benefits, however, CCP interoperability may also be a source of systemic risk, primarily by introducing a channel through which stress can be transmitted between CCPs. Depending on the characteristics of the underlying markets, the costs of managing these risks – to market participants, CCPs and the financial system more broadly – may outweigh the benefits. For this reason, to date interoperability has largely been limited to equity markets.

These trends in the international environment for financial market infrastructure could potentially have implications for Australian markets. Most notably, the emergence of competition at the trading level in the Australian equity market has raised the prospect of competition emerging in clearing.[3] Demand for interoperability might then emerge. In addition, cross margining, another form of CCP link that permits participants to net obligations across different markets, is planned to be introduced between the two Australian CCPs (ASX Clear and ASX Clear (Futures)) in the coming years.[4] This article discusses how interoperability and other types of links between CCPs operate, and considers their implications.

The Role of Central Counterparties

After negotiating the terms of a financial trade, traders maintain an obligation to each other – to meet the negotiated terms – until settlement is effected through the final transfer of cash and, where applicable, products such as securities. These obligations create a counterparty credit exposure between the traders, because if market values change and one party defaults, the other party may incur a loss in replacing the trade. To manage this 'replacement cost' risk, traders can monitor the financial health of their trading counterparties, request collateral to cover the exposure, and institute a reliable settlement process.

CCPs, by definition, act as central counterparties to all trades in a given market. This occurs through a process known as 'novation', whereby the contract between the original parties to a trade is replaced by two contracts: one between the buyer and the CCP; and one between the seller and the CCP. This protects each trader should the other default, because the CCP undertakes to honour a defaulting trader's obligations. In this way, CCPs also facilitate anonymous trading. Before a trade can be novated to a CCP, however, both trading parties must first become participants of the CCP, or make arrangements with agents that are participants. Participation binds the CCP and each of its counterparties to the CCP's rules, which typically set out the terms of novation and require participants to fulfil certain financial obligations and other ongoing conditions.

Novation only occurs after the traders have agreed on the terms of the trade. These negotiations typically take place according to the protocols of an organised trading facility, in which case the original counterparties may remain anonymous to each other. In markets served by a trading facility, the trading facility and CCP will commonly have an arrangement whereby novation occurs at the moment the trade occurs, sometimes referred to as 'open offer'. With CCPs increasingly extending their coverage to standardised OTC markets, however, traders may choose to negotiate bilaterally and then submit details of the trade to the CCP for novation – provided the trade meets the CCP's specified novation criteria.

3 This is discussed in CFR (2012).

4 These two CCPs are subsidiaries of ASX Limited. Both clear a range of products; in particular, ASX Clear serves Australian equities markets, and ASX Clear (Futures) serves Australian futures markets.

CCPs provide three main risk-reduction benefits to their participants and the financial system more broadly:

- First, shifting a market to CCP clearing replaces a potentially complex network of bilateral counterparty exposures with a single set of exposures in that market. This is advantageous because bilateral counterparty exposures are typically not only costly to manage, but also a potential source of interconnectedness and systemic risk.
- Second, a CCP typically maintains a comprehensive, conservative and transparent risk-management framework. It is critical that a CCP is subject to exacting risk-management standards that are overseen rigorously, since an unavoidable by-product of replacing a bilateral network with a CCP is a concentration of counterparty risk and widespread operational dependence on the CCP.[5]
- Third, channelling all trades through a CCP allows multilateral netting, whereby each participant's incoming and outgoing obligations from different trades are netted down to a single net credit or debit for cash settlement, and a single net credit or debit for each security traded. This lowers aggregate exposures in the market, and reduces the liquidity that participants need to meet settlement obligations.

A typical CCP risk-management framework involves three layers of protection against participant defaults:

- *Participation requirements and participant monitoring*. This involves enforcing requirements related to participants' good standing, and closely monitoring their financial health. It also allows the CCP to place restrictions on participants' trading activities if need be.
- *Margin requirements*. This involves requesting collateral from participants in the form of an initial and variation margin, on at least a daily basis. The initial margin covers the CCP against potential future exposures to participants, with each requirement calibrated to cover a pre-specified confidence level (typically 99 per cent or higher, based on historical prices over an appropriate time horizon) of potential adverse value changes in the participant's current portfolio. The variation margin (also known as mark-to-market margin) covers the CCP against portfolio losses that have already occurred, limiting the coverage that is required from initial margin to any price movements since the last variation margin call.
- *Additional default resources*. This may be used should default losses exceed margin held. These often include a mix of CCP capital and participant contributions to a mutualised default fund.

The Mechanics of Interoperability

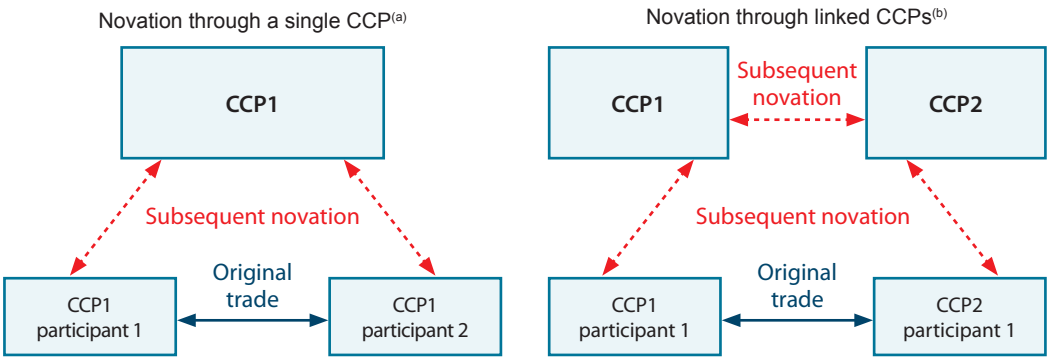
Interoperability facilitates novated trades between market participants that maintain clearing arrangements with different CCPs. To achieve this, a *link* is established between the two CCPs: the original trade contract is novated into three contracts, rather than two as occurs when a trade takes place between participants of the same CCP (Figure 1). The three contracts are between:

- the buyer and its CCP;
- the two CCPs; and
- the seller and its CCP.

Accordingly, each CCP provides a guarantee to the other that its side of the trade will be fulfilled; and each CCP provides a guarantee to its participant in relation to the performance of the other CCP.

5 Licensed clearing and settlement facilities in Australia are required to meet conditions set out in the *Financial Stability Standards*, available at <http://www.rba.gov.au/payments-system/clearing-settlement/standards/index.html>. The 2010/11 Assessment of licensed facilities against the *Financial Stability Standards* is available at <http://www.rba.gov.au/payments-system/clearing-settlement/compliance-reports/2010-2011/index.html>. Also, the international standards for financial market infrastructure risk management have recently been updated (and include a section on links between CCPs); see CPSS-IOSCO (2012).

Figure 1: Central Clearing with and without Interoperability



(a) Illustrates a trade being novated through a single CCP – after the trade occurs, the CCP transforms the original trade contract into two contracts, one between it and each participant; both participants must be members of the same CCP, as it is necessary to have continuity in the obligations that flow from one side of the trade to the other

(b) Illustrates a trade being novated through a CCP link (the link permits the CCPs to hold trading obligations to each other) – after a trade occurs between participants of separate CCPs, the trade is novated into three contracts, between each participant and its CCP and between the two CCPs; trades that occur between participants of the same CCP take place as they would without the CCP link, i.e. as in the left-hand side diagram

Source: RBA

Benefits

The particular benefits of interoperability depend on the characteristics of the markets for which the link operates. In the case of multiple CCPs serving markets for the same product, interoperability can improve competitiveness, and lower the cost to participants of being able to trade that product in all available markets. Establishing links between CCPs can also broaden market access, if CCPs initially service different products and then expand into each other's markets, and/or facilitate capital flows, if CCPs link up across different geographical regions.

Links between CCPs that clear the same product, but perhaps cover different traders and venues, essentially give participants synthetic access to other CCPs. This allows access to multiple CCPs' participant networks without the costs of maintaining multiple CCP memberships. These costs include membership fees, complying with participation requirements, meeting financial and other obligations, and maintaining technical connections. By allowing participants to hold all their positions in a single CCP, a link also avoids the loss of netting that would otherwise occur when trades are made across multiple clearing venues. Further, in jurisdictions with 'best execution' trading requirements, such as Australia, financial institutions trading on behalf of clients may in some instances require access to all trading facilities for a particular product, to guarantee that clients trading that product obtain the best terms available. In the absence of interoperability, this would also require these institutions to be able to clear through all of the CCPs serving those facilities. Where participants are not required to access all trading facilities, the costs of maintaining multiple clearing arrangements could mean that participants will be active in only a subset of the trading facilities, leading to the fragmentation of market liquidity.

Interoperability also allows more than one CCP to concurrently serve the same trading facility. In the absence of a link, traders would need to check that they were using the same CCP before confirming a trade, potentially making it difficult to undertake anonymous trading (which is often a valued part of undertaking trading through exchanges and similar platforms). Interoperability therefore allows market participants to choose their preferred CCP while continuing to trade on multiple venues. This creates stronger incentives for CCPs to improve their services.

Providing for multiple CCPs to serve the same trading facility also lowers the barriers faced by a CCP entering an established market. In the absence of a link with the incumbent CCP, an entering CCP would need to persuade the trading facility to switch from the incumbent, which would be likely to involve substantial switching costs. It should be noted, however, that unless both CCPs are already equivalently configured for interoperability, the link itself could involve significant costs to set up. This is because any link requires the CCPs to harmonise important aspects of their rules and procedures. Further, an incumbent CCP may be unwilling to compromise its monopoly position by entering into a link unless required to do so by regulation.

Finally, interoperability can also support the expansion of CCPs' product offerings, by facilitating market entry. Forming a link may present a more compelling case for a CCP to expand into products cleared by another CCP, since the link brings with it an established network of traders. Incentives to form such an arrangement are likely to be strongest where each CCP simultaneously agrees to clear the other's products – which may be similar products traded in different countries or regions – allowing both CCPs to offer their customers a wider range of products. For participants, this may lower the cost of accessing additional markets.

Risks and costs

Notwithstanding these benefits, interoperability may entail material costs which may make interoperability unsuitable for some markets. The costs relate primarily to potential financial stability risks associated with the exposures generated between linked CCPs and the costs involved in managing these risks. Since derivatives exposures typically have a much longer duration than securities exposures, the costs of interoperability are likely to be higher in derivatives markets.

The most significant component of these financial stability risks comes from the credit exposure each CCP assumes on the other. At any point in time, this amounts to the net value of all open trading positions across the link. Where a market is served by a trading facility, it is difficult for linked CCPs to regulate the scale of this exposure, since open-offer agreements require the CCP to novate all eligible trades that take place on the facility. Furthermore, whereas the credit risk associated with a participant can be actively managed, CCPs typically have less influence and information-collecting power over other CCPs, particularly those with which they compete.

This inter-CCP credit exposure could crystallise into losses if one of the CCPs were to fail, which would most likely be the result of the failure of one or more of that CCP's participants. This has a very low likelihood of occurring, since it would typically require that one or more participants defaulted with sufficiently large exposures, and in market conditions so extreme, as to create losses that exceeded all of the defaulting participants' collateral posted, plus the CCP's entire mutualised default fund.[6] However, if this did occur, the defaulting CCP's failed obligation to a linked CCP could be very large, because the number of trades cleared across the link could feasibly comprise a large proportion of the market. This could in turn threaten the solvency of the linked CCP, causing significant disruption to the financial system.

It is therefore important that any inter-CCP exposures are carefully managed. To achieve this, linked CCPs can provide sufficient collateral to each other to deliver a high degree of confidence that any default by a linked CCP would be covered without financial loss to the surviving CCP. In this case, collateral to cover inter-CCP exposures needs to be in addition to that collected by the CCP to cover direct exposures to its own participants, since it is conceivable that a linked CCP and a direct participant could default at the same time. Further, given that the magnitude

6 Clearing participant defaults are typically rare events, and most do not exceed the level of the defaulting participant's posted collateral. The only participant defaults at the Australian Securities Exchange CCPs have been those of the MF Global subsidiaries in late 2011. The collateral that the Australian CCPs were holding from these participants was well in excess of the losses on their defaulted positions.

of the inter-CCP exposure can change substantially from day to day, the collateralisation framework needs to be sufficiently flexible to ensure that any under-collateralisation is quickly remedied and that the collateral can always be sourced before its payment is due to the other CCP. One way to achieve this is for CCPs to collect the collateral from their participants by adding an extra component to their daily margin calls, based on the volume of trades flowing across the link. In this case, CCP interoperability can potentially increase participants' collateral requirements relative to participating separately in two CCPs.

Interoperability may also introduce operational and legal risks, particularly if the linked CCPs operate in different regions. Operational risks result from the linked CCPs becoming dependent on each other's systems; for example, system problems at one CCP that temporarily prevent it from processing cleared transactions could create significant uncertainty for the operations of a linked CCP. Legal risks are particularly relevant where the CCPs operate under different legal frameworks, in which differences in laws could create uncertainty in areas such as settlement finality, novation and multilateral netting. The recently published report CPSS-IOSCO (2012) 'Principles for Financial Market Infrastructures' outlines the various types of risk introduced by CCP interoperability and sets out international risk-management standards.

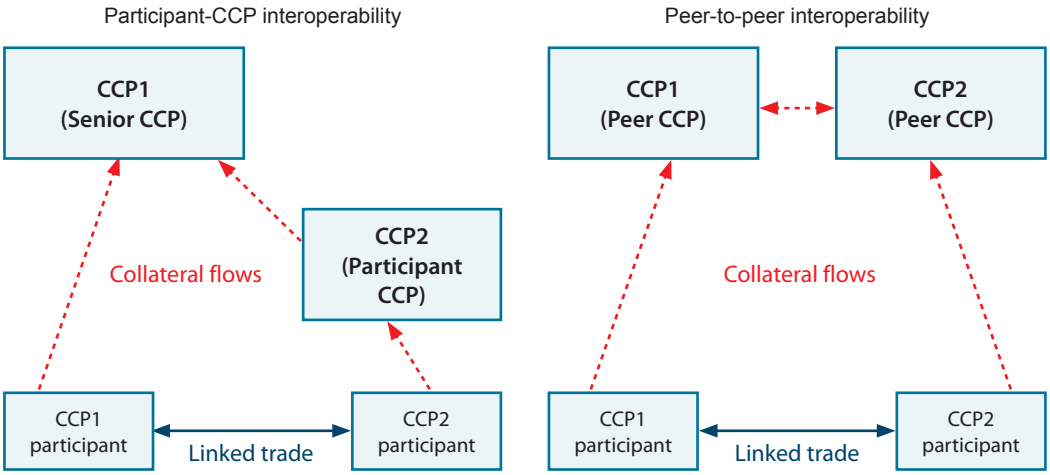
The magnitude of risk introduced by an interoperability link would be expected to be much greater for a derivatives market than a securities market, owing primarily to the longer duration of their exposures. Securities markets are typically settled around three days after negotiation, which limits the inter-CCP obligation to trades that have occurred in the past three days. Derivatives positions, on the other hand, can have durations of up to several years, resulting in significantly greater accumulation of open positions and exposures.

Interoperability models

Interoperability arrangements are commonly classified according to the symmetry of the risk-management requirements and of the CCPs' access to trade feeds. For instance, a CCP link may be set up either as a 'participant' link, or as a 'peer-to-peer' link (Figure 2):

- A *participant* link involves one CCP becoming a participant of the other, without a reciprocal arrangement. The participant CCP therefore provides collateral to the other CCP, but not vice versa. To protect itself from a default by the

Figure 2: Alternative Models of CCP Interoperability



Source: RBA

linked CCP, a participant CCP would have to make arrangements for additional default resources from elsewhere. A participant link is more likely to be established where the participant CCP has stronger incentives to establish a link than the CCP to which it is linking.

- A *peer-to-peer* link involves each CCP becoming a participant of the other, with collateral flowing in both directions (i.e. each linked CCP providing collateral to the other). The CCPs would likely have different participant obligations placed on them than regular participants; this would typically exempt the linked CCP from loss-sharing arrangements with other participants (e.g. contributions to a mutualised default fund), to reduce the direct exposures between each CCP and the other CCP's participants.

Where linked CCPs serve one or more trading facilities, the link can also be distinguished by how the trade feeds are received by the CCPs. For instance, information on trades novated through open offer could come directly from the trading facility, or indirectly through the linked CCP. The receipt of information via the linked CCP constitutes an additional source of operational dependence on the providing CCP. Accordingly, such an arrangement would be more likely to be observed in a participant link arrangement, or in the case in which the link involves the receiving CCP entering a market previously served only by the providing CCP.

The European Experience

To date, interoperability has predominantly been a European phenomenon, reflecting an effort in the European Union (EU) to foster a more integrated financial market. Market participants and regulators have encouraged interoperability as a way of lowering the costs to participants in accessing the markets served by CCPs across EU countries, which otherwise often required the use of multiple nationally oriented intermediaries. The European experience helps to illustrate the forces that led to the implementation of the existing links, and some of the impediments to their establishment.

Interoperability links and oversight

A small number of interoperability links were set up in Europe around 2003. The most prominent of these was the link between LCH.Clearnet Ltd and SIX x-clear, that currently serves two major European equities markets. It was established in 2003 to allow both CCPs to clear equities traded on the SIX Swiss Exchange. SIX x-clear initially operated as a participant CCP, although in 2008 the CCPs negotiated a peer-to-peer arrangement, and later that year the link expanded to also cover equities traded on the London Stock Exchange.

In a 2009 regulatory assessment of SIX x-clear, the Swiss National Bank and the Swiss Financial Market Supervisory Authority noted that the number of inter-CCP positions had grown significantly and had left SIX x-clear with an excessive exposure to LCH.Clearnet Ltd (SNB and FINMA 2009). The report noted that around half of the (clearing-eligible) trades on the Swiss trading facility and most trades on the London Stock Exchange were being cleared through the link, and that the collateral provided by LCH.Clearnet Ltd to SIX x-clear was no longer adequate. In 2011, SIX x-clear announced a new arrangement for collateralising inter-CCP exposures that met regulatory expectations.

The growth of newer electronic trading platforms has seen an expansion in interoperability arrangements. In particular, the entry of Chi-X Europe and BATS Europe, in 2007 and 2008, respectively, has led to the establishment of what is now a four-way link, involving European Multilateral Clearing Facility, LCH.Clearnet Ltd, SIX x-clear and EuroCCP.

Regulatory responses

Around the time that earlier links were being established, market users and regulators were calling for greater interoperability as a means of lowering the costs of cross-border access to EU financial markets. However, CCPs generally had little incentive to establish links that would open their markets to competitors. In response, regulators threatened legal reforms to mandate open access between CCPs. In

2006, this resulted in a large portion of the European CCP industry signing a Code of Conduct to establish links with other signatories upon request.

After this agreement was signed, a large number of applications were made by CCPs requesting links to other CCPs. However, since the Code was essentially voluntary, it proved difficult to enforce, particularly when some CCPs receiving applications cited technical difficulties in establishing the requested links. Notwithstanding this, given the large number of applications, regulators in the United Kingdom, Switzerland and the Netherlands put a halt to further link formation in their jurisdictions, pending assessment of the implications for risk of the complex network of CCPs that could result. These regulators subsequently set out a number of risk-management conditions for new link arrangements.

While this has led to the establishment of some new links, they have mostly involved start-up trading facilities and CCPs, rather than incumbent CCPs opening access to their markets. To promote further integration of national exchanges and their CCPs, the European Commission is currently working on strengthening CCPs' obligations to establish links for securities markets. These obligations, which will be legally enforceable, will be put in place over the next two years. Work on interoperability in derivatives markets has been postponed pending further review, which European regulators have commissioned to take place by the end of 2014.

Other Forms of CCP Links

Internationally, two other types of CCP links have emerged that are more straightforward to implement than full interoperability, though they can generate similar risks. One is cross-margining arrangements, which involve two CCPs combining parts of their risk-management arrangements to be able to grant offsets or discounts on collateral requirements to participants that use both CCPs concurrently. The other is mutual offset arrangements, which permit participants to transfer positions from one CCP to another, to facilitate trading across different time zones.

Cross margining

Cross margining refers to a margin discounting regime for participants that hold negatively correlated contracts across different CCPs.[7] These could include, for example, a short futures position and a long call-option position that reference the same underlying price. The negative correlation means that the expected price variance – which estimates the risk of adverse price movements – of the set of both contracts is notably less than that of the contracts considered separately. If both positions were held at the same CCP, the CCP would typically acknowledge this reduced risk by giving a discount on the initial margin requirements; cross margining extends this practice to contracts held across different CCPs.

To achieve this, the CCPs share information on participant positions, and cooperatively calculate discounted initial margin requirements for each cross-margined portfolio. Should a cross-margined participant default, which would likely leave gains at one CCP and losses at the other, the two CCPs share the gains and losses on that participant's cross-margined positions, and the participant's collateral.[8] This creates an exposure between the CCPs, because each CCP faces the risk that the other CCP defaults at the same time as a cross-margined participant. In this situation, if the surviving CCP suffered losses on the cross-margined positions, it could potentially have insufficient collateral to cover them.

Some cross-margining arrangements also extend the cross-CCP exposure netting functionality to variation margin payment obligations. This allows participants to make one net margin payment for

7 Cross margining sometimes also refers to margin discounts that are offered across products within a single CCP. This article specifically refers to cross margining across different CCPs.

8 Cross-margining links typically involve a cross-guarantee agreement that creates legal obligations for how the CCPs will share gains, losses and collateral should a cross-margined participant default. As bankruptcy laws typically impose restrictions in these areas, the ability or difficulty of instituting a cross-margining arrangement will likely depend on the broader legal framework in that jurisdiction.

obligations to both CCPs, which can significantly lower payment requirements; for instance, where a participant has made losses on positions held at one CCP and gains on positions held at the other CCP. However, such an arrangement typically involves the CCPs holding joint accounts into which participants can make their variation margin payments for cross-margined positions, which creates a continuous dependence between the CCPs. In contrast, under cross-margining arrangements that only allow initial margin netting and do not involve joint accounts, inter-CCP exposures only arise if a cross-margined participant defaults; if this occurs, the potential losses are limited to losses relating to the defaulting participant's cross-margined positions.

Cross margining is most common in the United States. US CCPs with cross-margining arrangements include CME Clearing (a derivatives CCP owned by CME), Fixed Income Clearing Corporation (owned by DTCC), Options Clearing Corporation, New York Portfolio Clearing and ICE Clear US; the arrangements cover futures, options and fixed income products. An international cross-margining arrangement was set up for short-term interest rate contracts between CME Clearing and LCH.Clearnet Ltd in 2000, which the CCPs terminated in 2010 citing increased maintenance costs. More recently, LCH.Clearnet Ltd, Fixed Income Clearing Corporation and New York Portfolio Clearing have announced intentions to set up an arrangement that will cover several major markets in both the United States and the United Kingdom.

Mutual offset

Mutual offset arrangements permit participants to establish a derivatives position at one CCP and close it at another. This allows a participant to trade the same position across markets, for instance across time zones. In doing so, inter-CCP exposures are created, since the CCPs must offset each transferred position with an opposite position between themselves. A mutual offset arrangement is currently in place between CME and SGX (Singapore), covering futures contracts.

The Australian Context

Although there are currently no CCP links in place in Australia, the international clearing landscape is evolving rapidly and there are several areas in which Australian stakeholders may consider CCP links as a source of efficiencies. These could include, for example: alleviating market fragmentation if competition in clearing emerges in the Australian equity market; making more efficient use of collateral across Australian CCPs (particularly if central clearing services were expanded to OTC derivatives markets); and improving access to overseas markets.

If any CCPs were to establish competition with existing Australian CCPs, market participants might look to interoperability as a way to access all trading platforms while maintaining a clearing relationship with only one CCP. Under the *Corporations Act 2001*, any interoperability arrangements between licensed clearing facilities would have to be consistent with the *Financial Stability Standard for Central Counterparties*, which would entail managing the resulting risks in accordance with regulatory expectations. In addition, since a link would be likely to affect the balance of market power, and involve substantial set up costs, it may also be necessary to establish regulatory standards around protocols for forming links.

An alternative way of forming links, cross margining, is more likely to arise between CCPs that serve different types of products. For instance, the two CCPs in the ASX Group – ASX Clear, which clears equities and options on equities, and ASX Clear (Futures), which clears futures and options on futures – plan to introduce cross margining as part of the current upgrade to their margining systems, although the plans for the link are still in early stages.[9] Furthermore, clearing of OTC derivatives may increase collateral costs of trading OTC products, which would raise the value of any collateral efficiencies that can be found; it would also widen the range of products

9 This is discussed in section 5 of RBA (2011) under 'Harmonisation and Linking of Central Counterparty Activity'.

being centrally cleared, introducing more contract combinations that could be cross margined. As with interoperability, any cross-margining arrangements would have to satisfy the *Financial Stability Standard for Central Counterparties*.

Finally, with the increasing globalisation of financial markets, it is possible that in the future a stronger trend will emerge towards international CCP links, either through interoperability, cross margining, mutual offset, or other innovations. Interoperability has already been considered as a means of reducing the potential for market fragmentation in OTC derivatives markets as multiple CCPs emerge in different countries.[10] However, since interoperability has so far been limited to less complex products, further work would be required to determine whether the risks introduced by CCP links for OTC derivative markets could be managed acceptably.

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10 For example, the use of CCP interoperability for OTC derivative markets has been discussed in CFR (2011), Slive, Wilkins and Witmer (2011) and CGFS (2011).

Banknote Quality in Australia

Arianna Cowling and Monica Howlett*

The Reserve Bank aims to keep the quality of banknotes in circulation high to ensure that they meet the needs of the public and to make it more difficult for counterfeits to be passed or remain in circulation. This article discusses the quality of banknotes in Australia and Reserve Bank initiatives that have improved the quality of banknotes in recent years.

Introduction

Under the *Reserve Bank Act 1959*, the Reserve Bank has responsibility for the production, issue, reissue and cancellation of Australia's banknotes. The key objective of the Bank in meeting this legislative responsibility is to maintain public confidence in Australia's banknotes. There are three facets to this. First, the Bank ensures that there are sufficient banknotes to meet demand. Second, it attempts to minimise the risk of counterfeiting. Finally, it strives to ensure that the banknotes in circulation meet the functional requirements of the public. More precisely, the banknotes must be acceptable to retailers, and be able to be used in banknote equipment such as automated teller machines (ATMs) and ticketing machines.

A key factor relevant to the second and third of these goals is the quality of banknotes in circulation. The higher the quality of banknotes, the more difficult it is for counterfeits to be passed. Furthermore, better-quality banknotes are more likely to be readily accepted by retailers, and are less likely to cause problems in ATMs and other banknote equipment.

This article discusses the Bank's approach to monitoring the quality of banknotes in circulation. It commences with a brief discussion of the banknote distribution arrangements in Australia and how the Bank encourages the cash industry to improve the quality of banknotes in circulation. It then presents data on banknote quality and the impact of a Bank incentive scheme.

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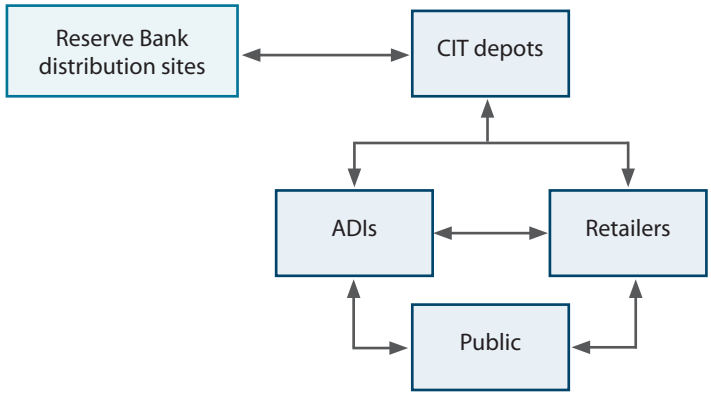
Banknote Distribution and Processing

The private sector plays an important role in the banknote distribution and processing system in Australia. The Reserve Bank is a wholesaler of banknotes and ensures that the main commercial banks have sufficient access to the Bank's banknote holdings. Other authorised deposit-taking institutions (ADIs) and retailers can purchase banknotes as required, in the secondary market. Although they do not generally hold title to the banknotes, cash-in-transit companies (CITs) carry out the majority of banknote distribution and processing activities on behalf of ADIs and retailers. As such, the CITs are the linchpin in the arrangements for improving the quality of banknotes in circulation.

CITs collect banknotes from one of the Bank's two distribution sites. The CITs then distribute these banknotes from their depots to ADIs and retailers throughout Australia (Figure 1). Banknotes that are surplus to the requirements of the public and ADIs are returned by ADIs and larger users of banknotes to CIT depots. At the depots, they are sorted according to their quality on the basis of any damage associated with regular wear and tear. Banknotes that are deemed to be fit are returned to circulation, while the remainder are returned to the Bank for verification and destruction.

Figure 1: Banknote Distribution in Australia
Physical movement of banknotes



Source: RBA

When deciding whether a banknote is fit for circulation, the CITs must consider the needs of their customers; it is in their interests to ensure that banknotes are of sufficient quality to satisfy their retail customers and are able to be used in their banknote equipment. There is a risk, however, that these private sector agents may sort to a lower quality level than the Bank considers appropriate, since it may cost them less to recirculate lower-quality banknotes than to return them to the Bank for replacement with new banknotes. Ideally, the Bank would like all banknotes in circulation to have no mechanical defects (such as holes, tears and adhesive tape) or inkwear, which is the degree to which the print on the banknote has worn.[1] The private sector, on the other hand, may be willing to accept a lower quality of banknotes than the Bank.

For these reasons, in 2006 the Bank introduced the Note Quality Reward Scheme (NQRS). The NQRS provides a financial incentive to members of the cash industry responsible for banknote distribution and processing, to encourage them to sort banknotes in a way that ensures that only high-quality banknotes are put back into circulation (see 'Box A: Note Quality Reward Scheme' for further details about the scheme).

Banknote Quality in Australia

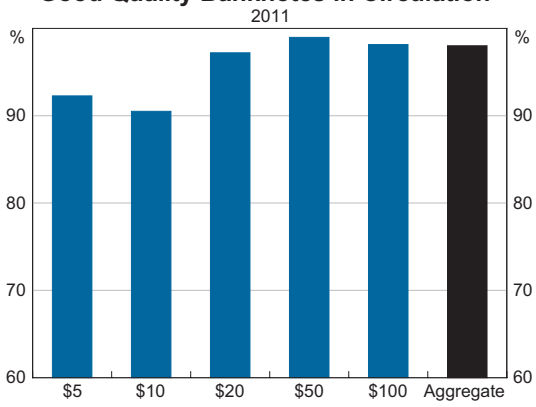
Because the Bank aims to maintain a high quality of banknotes in circulation in Australia, it must be able to measure and monitor that quality. To this end, the Bank operates a commercial cash sampling program. At the request of the Bank, CIT depots regularly set aside samples of banknotes deposited by a range of commercial customers (such as supermarkets, small businesses, post offices and bars) before any sorting takes place. The samples are sent to the Bank to measure their quality, and the data collected are used to provide an indication of the quality of banknotes in circulation.

Denominational quality

The Bank's data suggest that the quality of banknotes in circulation in Australia is high: around 98 per cent of the banknotes obtained through the commercial sampling program are categorised as good quality (Graph 1). There is, however, some difference in quality across the five different banknote denominations in circulation. In particular, the quality of $5 and $10 banknotes, while still fairly high, deteriorates more rapidly than the quality of the higher denominations.

1 See the Bank's banknote sorting guide for further details on the ways in which banknotes can become worn or damaged, and what the public can do with a heavily worn or damaged banknote. Available at <http://www.rba.gov.au/banknotes/damaged/pdf/sorting-guide.pdf>.

Graph 1
Good Quality Banknotes in Circulation*



* Based on the number of unsorted banknotes sampled from CIT depots, weighted by the number of banknotes lodged into each of those CIT depots
Source: RBA

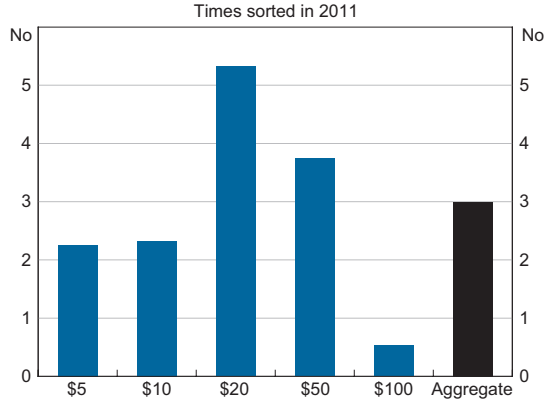
Although all Australian banknote denominations have the same features, and are produced using the same materials and to the same quality specifications, there are two main reasons why the quality of the lower denominations in circulation may differ from that of the higher value banknotes.

First, there are differences in how each denomination is used. The median value of cash payments in Australia is around $12 (Bagnall and Flood 2011), which suggests that $5, $10 and $20 banknotes are more likely to be used in cash transactions, both as a means of payment and as change. In contrast, $50 and $100 banknotes are rarely given as change. The $100 banknote, in particular, tends to be used as a store of value rather than to conduct transactions, and is not typically dispensed in ATMs. It is therefore reasonable to assume that, over time, lower denomination banknotes will be handled more frequently and hence develop more inkwear and defects.

Second, there are differences in how frequently banknotes are returned to a CIT depot, which is when any poor-quality banknotes are withdrawn from circulation. On average, $20 and $50 banknotes are estimated to pass through a CIT depot once every two or three months, whereas $5 and $10 banknotes tend to circulate within the hands of the public for almost twice as long before they pass through a depot for sorting (Graph 2). These differences are due to a combination of factors, including how each banknote denomination is used by the public and whether it is dispensed in ATMs.

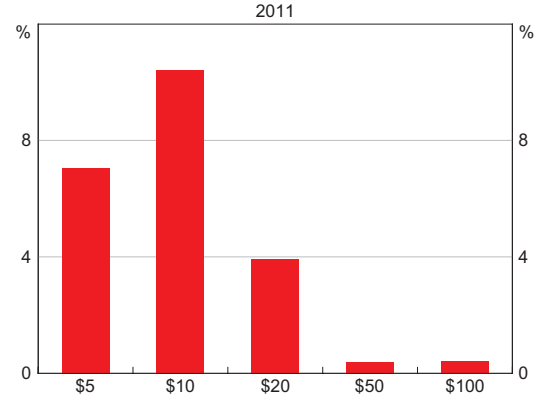
These observations are supported by evidence that inkwear is more common in lower denomination banknotes (Graph 3). As inkwear results from the gradual abrasion of the banknote print as the banknote is handled over its life, the extent of inkwear provides an indication of how many times a banknote has been handled and how long it

Graph 2
Banknote Turnover through CIT Depots*



* Turnover rate estimated by dividing the number of banknotes lodged into CIT depots by the number of banknotes in circulation
Source: RBA

Graph 3
Banknotes in Circulation with Inkwear*



* Based on the number of unsorted banknotes sampled from CIT depots, weighted by the number of banknotes lodged into each of those CIT depots
Source: RBA

has been in circulation. The fact that $5 and $10 banknotes have the highest rates of inkwear suggests that these denominations are handled more frequently and are not returned to CIT depots as often for removal from circulation.

Similar trends in denominational quality have been observed overseas. In New Zealand, for example, the $5 banknote has been identified as being the poorest quality denomination in circulation. A public survey commissioned by the Reserve Bank of New Zealand found that the majority of retailers and consumers surveyed were dissatisfied with the quality of $5 banknotes (Nielsen 2011). The Bank of England has also stated that its lowest denomination, the £5 banknote, is generally of lower quality than the higher denominations of banknotes in circulation. Similar factors to those seen in Australia, such as more frequent transactions made with low denominations, and the lower turnover of denominations that are not dispensed by ATMs, are believed to be the primary influences on banknote quality (Bailey 2009; Cleland 2011).

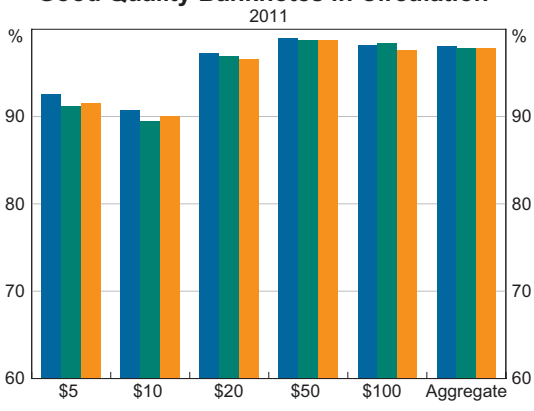
Regional quality

Another of the Bank's objectives is to ensure that banknote quality is high across Australia, regardless of proximity to large population centres. Combining the Australian Bureau of Statistics (ABS) Remoteness Structure with the Bank's commercial cash sampling data indicates that the quality of banknotes in the major cities is marginally higher than in regional and remote areas, but the proportion of good quality banknotes is consistently high across Australia (Graph 4).

Impact of the Note Quality Reward Scheme

The private sector plays a significant role in sorting banknotes in circulation in Australia. Under the current distribution arrangements, cash industry participants determine the way in which they sort banknotes into those fit for circulation and those that need to be returned to the Bank for destruction.

Graph 4
Good Quality Banknotes in Circulation*



* Based on the number of unsorted banknotes sampled from CIT depots, weighted by the number of banknotes lodged into each of those CIT depots, and the ABS Remoteness Structure classifications

Sources: ABS; RBA

There is a risk, however, that a participant will sort banknotes to a lower quality standard than the Bank considers appropriate to achieve its policy objectives. For this reason, the Bank introduced the NQRS in September 2006 to encourage higher sorting standards in the cash industry. Private sector participants in the NQRS are the CITs and the main commercial banks.

Even if the majority of banknotes in circulation are of high quality, there is a risk that a small number of poor-quality banknotes can adversely affect the public's general perception of banknote quality. In order to minimise this risk, the Bank's NQRS focuses on raising the standard of the poorest quality banknotes. Accordingly, for banknotes sampled under the NQRS, the Bank measures the average quality of the worst 15 per cent of banknotes in a sample – a measure known as the sample 'Quality Score'. The magnitude of the payment or penalty applied to the NQRS participants is determined by this Quality Score.

Since the NQRS was introduced in September 2006, average Quality Scores, and by implication the sorting thresholds used by participants, have improved for all five denominations (Graph 5). It took less than one year for the average Quality Score

for $5 and $10 banknotes to move from the neutral to financial reward zone; other denominations also saw a rapid improvement in their average Quality Score. This improvement has been sustained for several years, with average Quality Scores sitting well within the range required to receive a financial reward.

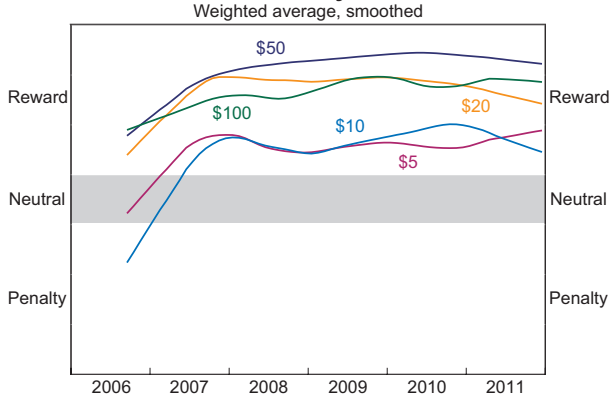
As CIT depots account for around 80 per cent of banknote sorting under the NQRS, the standards to which they sort can have a considerable impact on banknote quality.[2] Since the introduction of the NQRS, there has been a considerable shift in the distribution of CIT depot sample Quality Scores toward the higher end of the quality scale. In fact, the distribution of the Quality Scores for the 60 or so regularly sampled CIT depots has improved for all denominations (as shown for the $5 and $50 banknotes in Graph 6).

Another way to measure how effectively CIT depots sort banknotes is to compare data on the quality of banknotes sampled from the depots before and after sorting. The Bank's commercial cash sampling data measure the quality of banknotes entering each CIT depot before sorting, while NQRS data measure the quality of banknotes at each depot after sorting; differences between the two data series provide an indication of how effectively CIT depots sort banknotes and, by extension, the value added by the NQRS.

The greatest improvement in Quality Scores at the CIT depots sampled, from unsorted to sorted banknotes, is seen in the lower denominations. The sorted $5 Quality Scores at around 75 per cent of CIT depots sampled are sufficiently good to receive a reward under the NQRS (Graph 7). Before sorting, only 30 per cent of the depots have $5 Quality Scores in the reward range. For the $50 denomination, the improvement in Quality Scores due to sorting is not as significant, but is still a clear improvement. The larger spread in Quality Scores for the $5 denomination reflects a larger variance in the quality of $5 banknotes, both before and after sorting.

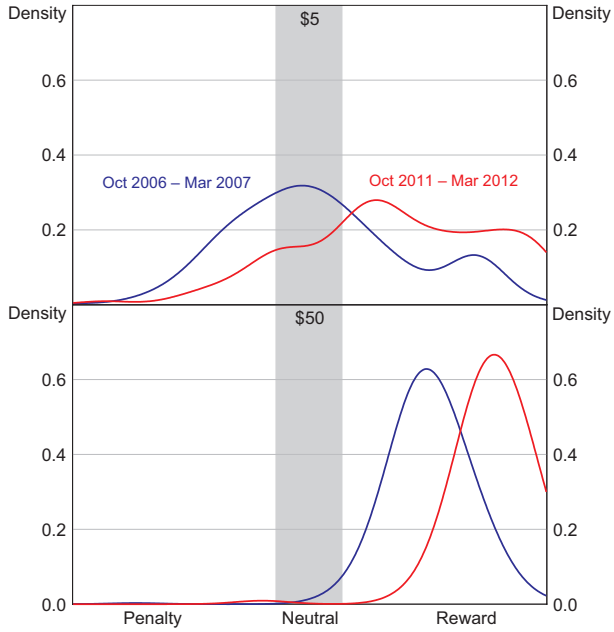
2 The main commercial banks account for the remaining 20 per cent of banknotes sorted under the NQRS.

Graph 5
NQRS Quality Scores
Weighted average, smoothed



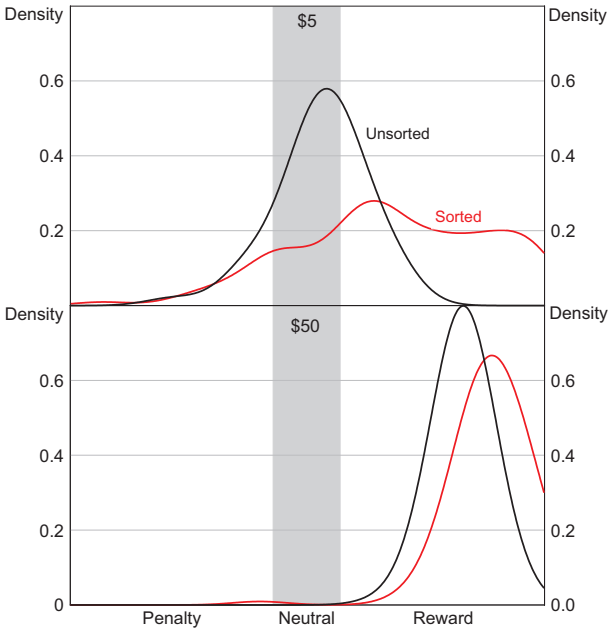
* Based on the number of sorted banknotes sampled from CIT depots, weighted by the number of banknotes lodged into each of those depots; the time series has been smoothed using the loess method
Source: RBA

Graph 6
Density of CIT Depot Quality Scores*
Sorted banknotes



* Based on sorted banknotes sampled from CIT depots; the probability density functions are estimated using kernel density estimation
Source: RBA

Graph 7
Density of CIT Depot Quality Scores*
October 2011–March 2012



* Based on unsorted and sorted banknotes sampled from CIT depots; the probability density functions are estimated using kernel density estimation
Source: RBA

Conclusion

The vast majority of banknotes in circulation in Australia are of very good quality. Nevertheless, because most banknote sorting is conducted by private sector agents and, in particular, CIT depots, the Bank regularly monitors the standard of their sorting. The Bank has been able to provide incentives to cash industry participants to encourage them to only put good-quality banknotes back into circulation after sorting. This helps to maintain the quality of banknotes in circulation which, in turn, helps to maintain a high level of public confidence in Australia's banknotes.

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Box A
Note Quality Reward Scheme

Prior to introducing the Note Quality Reward Scheme (NQRS), the Reserve Bank evaluated a number of options for improving banknote quality sorting by the private sector. The Bank's objective was to introduce a scheme that would ensure a sustained improvement in the quality of all banknote denominations across Australia, promote enduring behavioural changes in the banknote handling industry, and encourage the evolution of banknote sorting technology at cash-in-transit (CIT) depots.

The first option considered was a quota-based scheme, under which the Bank would specify the number of unfit banknotes to be periodically returned to the Bank. The second was an infrastructure-based model, which would have involved the Bank prescribing the type of sorting equipment to be installed and operated at CIT depots. The third model considered was a scheme of payments and penalties designed to encourage CIT depots to invest in sorting technology that complemented their broader business strategies. The Bank decided that the first two options would not promote the desired long-term behavioural changes in the banknote handling industry, nor would they encourage the development of the sorting technology used at CIT depots.

Under the third model, which became known as the NQRS, the Bank regularly samples and measures the quality of banknotes that have been sorted by scheme participants. Because the focus of the NQRS is on improving the standard of the poorest quality banknotes in circulation, the average quality of the worst 15 per cent of banknotes in each sample is calculated. This statistic is known as the sample 'Quality Score'.

Performance credits and debits are allocated depending on the Quality Scores of the banknotes sampled. A credit is paid for a sample with a good Quality Score and a debit is levied for a sample with a poor Quality Score. The magnitude of the financial payment or penalty is proportional to the Quality Score of the banknote sample. There is also a 'neutral' Quality Score range, where no credit or debit is applied. This system of credits and debits was agreed between the Bank and the industry, and reflects agreed minimum quality standards.

Although the Bank does not have direct control over the cash handling industry's banknote sorting, it has used the NQRS to encourage participants in the private sector to invest in banknote sorting equipment. The investment in this equipment plays an important part in maintaining the quality of banknotes in circulation in the long term.

Internationalising the Renminbi

Lynne Cockerell and Michael Shoory*

The Chinese authorities have introduced reforms over the past few years aimed at increasing the use of the renminbi (RMB) in international trade and investment. This article outlines the recent developments, focusing in particular on the offshore market for RMB and the RMB trade settlement scheme. These initiatives have been supported by the signing of bilateral local currency swap agreements between the People's Bank of China (PBC) and other central banks, including the Reserve Bank of Australia.

Introduction

Recent reforms introduced by the Chinese authorities have sought to increase the use of the RMB in international trade and investment. In contrast to a few years ago, it is now possible for any trade transaction with China to be contracted in RMB. As a result, over the past year, the equivalent of US$360 billion or roughly 10 per cent of China's international trade was settled in RMB. While the development of the offshore market for RMB has been a key part of the reform strategy, capital controls restrict the flow of funds between the onshore and offshore markets, thereby preventing full convertibility.

Recent Progress on Reforms

The recent reforms can be seen as part of the broad economic reform agenda that has been ongoing for more than three decades. Over this period, measures undertaken to develop the financial sector have included: the entry of new domestic banks and non-bank financial institutions; the reopening of the Shanghai and the opening of the Shenzhen stock exchanges; the development of the interbank lending, bond and currency markets; the introduction of international regulatory standards; and a general improvement in financial infrastructure.[1] It has also included some easing of capital controls, with the Chinese economy opening up to foreign direct investment (FDI) in the early 1980s and to certain portfolio investments through the Qualified Foreign Institutional Investor (QFII) scheme from 2003.

The exchange rate system has also evolved over the past few decades.[2] The 'dual' exchange rate system, which developed in the late 1980s and allowed both an official and a more market-determined exchange rate to coexist, was replaced in 1994 by a single official rate under a managed floating regime (Graph 1).[3] This regime was replaced by a peg against the US dollar in 1997. In 2005, the Chinese authorities announced that they would manage their exchange rate against an undisclosed basket of currencies. This marked the beginning of a period of generally steady appreciation of the RMB against the US dollar,

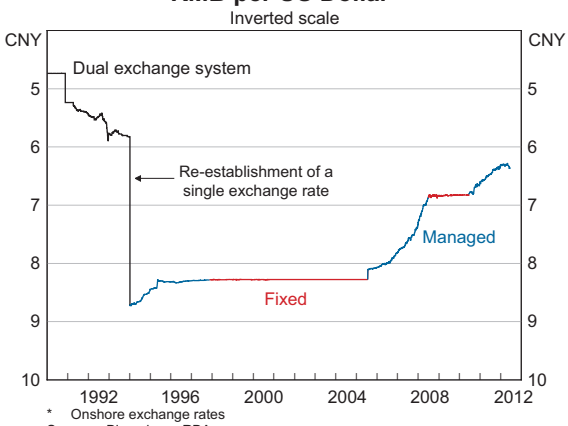
* The authors are from International Department.

1 In the late 1970s, almost all commercial banking was undertaken by the PBC. But in the late 1970s and early 1980s, most of this business was handed over to the newly created 'big four' banks: the Bank of China, the China Construction Bank, the Agricultural Bank of China and the Industrial and Commercial Bank of China.

2 An article by PBC Deputy Governor Yi Gang (2008) provides a description of these developments.

3 The renminbi (RMB) is the name of the Chinese currency, while yuan refers to the units of the currency. The RMB is available in two markets: CNY (Chinese yuan) denotes the exchange rate available in the onshore (Mainland China) market; and CNH ('H' for Hong Kong) denotes the exchange rate available in the offshore (predominantly Hong Kong) market. The local currency in Hong Kong is the Hong Kong dollar.

Graph 1
RMB per US Dollar*



* Onshore exchange rates
Sources: Bloomberg; RBA

except for a two-year pause from around mid 2008 associated with the global financial crisis.

The current reform agenda has an increased emphasis on currency reform. Both the Twelfth Five-year Plan of the Chinese State Council, which covers 2011–2015, and a recent PBC report[4] highlight the intention to steadily open up the domestic financial market to the rest of the world and gradually liberalise the capital account. The reform agenda has three main streams, as shown in Table 1 which provides a timeline of reform measures. The use of pilot programs, as well as regional and local initiatives, continues the style of approach inspired by the Chinese political leader Deng Xiaoping, which he described as 'crossing the river by feeling the stones'.

The first reform stream, which was the initial focus of the recent reforms, involves promoting the use of the RMB for trade and, relatedly, developing an offshore market for RMB (i.e. outside Mainland China). The initial pilot RMB trade settlement scheme introduced in July 2009 was relatively limited in scope, allowing approved Mainland exporters and importers in five Chinese cities to conduct trade denominated in RMB with trading partners in Hong Kong, Macau and the ASEAN countries.[5] In mid 2010, the scheme was opened up to include participation by trading partners anywhere in the world, although domestic participation in the scheme was still restricted. Since then, the remaining restrictions on domestic participation have been removed and now any trade with Mainland China can be invoiced in RMB.

The offshore accumulation of RMB under the RMB trade settlement scheme has created demand for offshore investment opportunities in addition to deposits, which in turn has made RMB trade settlement more attractive.[6] Moreover, the ongoing development of the offshore RMB market encourages the international use of the RMB, while allowing the authorities to both relax onshore capital controls and deregulate the domestic financial system more gradually than otherwise.

The second reform stream concerns inward and outward capital flows. While relatively strict controls remain in place, there has been a notable easing in these controls since late last year. This is particularly true with respect to inward flows, as evidenced by the streamlining of the approval process for using RMB raised offshore for foreign direct investment onshore. While the strictest controls still relate to portfolio investment schemes, the authorities are considering broadening the range of both offshore investors and onshore investments included under such schemes. The enhanced ability for funds raised in the offshore bond and equity markets to be used for onshore investment should ultimately support the development of the offshore market, while also

4 PBC (2012); a brief summary of the report is published on the PBC website, available at <http://shanghai.pbc.gov.cn/publish/fzh_shanghai/2974/2012/20120428104657157116808/20120428104657157116808_.html>. A separate PBC report (Sheng *et al* (2012)) outlined the case for capital account liberalisation and proposed a three-stage, 10-year plan. The first stage (1–3 years) would involve the liberalisation of direct investment flows, especially those related to Chinese FDI abroad. The second stage (3–5 years) would involve relaxing controls on commercial lending for trade, which the report suggests would also broaden the channels for inbound RMB flows. The final stage (5–10 years) would involve carefully opening up real estate, stock and bond markets to cross-border flows, following the principle of first relaxing controls on inflows, followed by outflows, and in each case gradually allowing quantitative controls to be replaced by price-based management.

5 The Association of Southeast Asian Nations (ASEAN) includes Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand and Vietnam.

6 Prior to these recent developments, an elementary offshore market for RMB began to emerge in 2004 when banks in Hong Kong were permitted to offer personal RMB deposit accounts.

Table 1: Main Developments in Recent RMB Reform

1. Trade settlement and offshore market	
RMB trade settlement	
Jul 2009	Initial pilot scheme between five Mainland cities and Hong Kong, Macau and ASEAN
Jun 2010	Expanded scheme for trade between 20 Mainland provinces and rest of the world
Mar 2012	Expanded to cover all trade with China
Offshore RMB market	
Feb 2004	Hong Kong banks permitted to offer RMB personal accounts to residents
May 2009	HSBC and Bank of East Asia are first foreign banks to gain approval to issue offshore RMB (dim-sum) bonds
Feb 2010	Foreign firms allowed to issue RMB (dim-sum) bonds
Jul 2010	All corporates allowed to hold RMB accounts and RMB effectively made convertible in offshore market
Aug 2010	McDonald's issues first dim-sum bond by a multinational non-financial corporate
Apr 2011	The first offshore RMB-denominated IPO (by Chinese property investment trust, Hui Xian)
Oct 2011	Baosteel becomes first non-bank Chinese company to issue dim-sum bonds directly
Jan 2012	First approval for a Mainland company to borrow RMB directly from an offshore bank
Jun 2012	HKMA launches RMB liquidity facility to Participating Banks[(a)] in Hong Kong
2. Capital flows	
Inward flows	
Jan 2003	Qualified Foreign Institutional Investor (QFII) scheme for foreign investment in listed Mainland bonds and equities
Aug 2010	Scheme to allow foreign central banks, offshore RMB clearing banks and Participating Banks to invest RMB raised offshore in the Mainland interbank bond market
Oct 2011	Rules formalised to allow approved foreigners to invest RMB raised offshore directly in Mainland firms, including through the provision of RMB cross-border loans
Dec 2011	RMB Qualified Foreign Institutional Investor (RQFII) scheme allowing RMB raised offshore to be invested in listed Mainland bonds and equities
Apr 2012	QFII and RQFII quotas expanded
May 2012	Rules formalised for onshore non-financial corporations to issue offshore RMB bonds
Outward flows	
Apr 2006	Qualified Domestic Institutional Investor (QDII) program launched, allowing domestic institutions to convert RMB into foreign currency and invest in overseas equities and bonds.
Jan 2011	Mainland firms allowed to apply to take RMB offshore for overseas direct investment (ODI) in foreign firms
3. Onshore market	
Apr 2012	PBC widened the daily trading band for the USD/CNY exchange rate to 1 per cent above or below the reference rate
By 2014	Chinese International Payments System (CIPS) to be developed

(a) Participating Banks are those banks with an agreement with the Bank of China (Hong Kong) (BOCHK); they have direct access to the offshore interbank RMB market and are able to undertake cross-border RMB settlement via the BOCHK

Sources: various official sources, media and market reports

enhancing the depth and sophistication of onshore markets.

The third reform stream concerns onshore markets. It has included the recent widening of the RMB's daily trading band against the US dollar. In mid April, the band was widened from ½ per cent to 1 per cent above and below the reference rate (which is announced daily by the PBC). This was motivated by the growing ability of domestic participants to manage exchange rate movements and reflected the desire to accommodate greater flexibility in the exchange rate in the future. Other recent reforms include the introduction of products designed to increase the ability of Chinese firms to hedge their foreign-currency exposures and an increase in the number of currencies listed in the interbank market (which since last November includes the Australian dollar). The Chinese International Payments System (CIPS) is also being developed and it is expected to facilitate direct RMB settlement between the offshore market and the Mainland in the future. A detailed plan has also been recently published to develop Shanghai as an international financial centre by 2015. The plan includes: further development of derivatives markets; further opening up of Shanghai's financial markets to foreign investors, including enabling foreigners to issue RMB bonds and potentially listing them on the Shanghai stock exchange; and an intention to strengthen taxation, legal and regulatory standards in line with international practice.

The two key initiatives undertaken under the first of these streams – that is, promoting the use of RMB in real activities (starting with its use as an invoice currency for trade), and developing an offshore RMB market – are explored in more detail in the remainder of this article.

The Structure of the Offshore RMB Market

To date, the development of the offshore RMB market has been centred on Hong Kong, with the Chinese authorities making use of its unique position, as both a Special Administrative Region of China and an established international financial centre, to promote the use of RMB outside of Mainland China.

The offshore RMB market has been largely segregated from the onshore market, resulting in two fairly distinct pools of RMB. The Bank of China (Hong Kong) (BOCHK), however, provides an important link between the two markets, since it is permitted to undertake cross-border transactions subject to specified controls.[7] Permitted cross-border flows between the onshore and offshore markets have thus far been largely related to the RMB trade settlement scheme, although this may change as restrictions on cross-border flows are eased (Table 1). An accumulation of RMB offshore has occurred as RMB-denominated imports into China have generally outweighed RMB-denominated exports from China under the scheme. This has likely largely reflected the incentive for foreigners to acquire and hold RMB when the RMB exchange rate has been expected to appreciate. RMB can also flow to and from the Mainland via some investment schemes, although it is unclear how extensively these have been used to date, given the existence, in many cases, of quotas and approval lags (Table 2).

The BOCHK, as the primary link between the two markets, is one of only two designated offshore RMB clearing banks (the other is the Bank of China, Macau). Specifically, the BOCHK is able to convert between RMB and other currencies in the Shanghai interbank market, operates the RMB real-time gross settlement (RTGS) system in Hong Kong and is directly connected to the Mainland equivalent, China National Advanced Payments System (CNAPS), enabling it to settle RMB payments across the books of the PBC on the Mainland. The role of the BOCHK is unique in that, besides being a participant in the Mainland interbank market, it operates the offshore interbank market for RMB in Hong Kong, in which only Participating Banks can directly transact. These

7 In the late 1970s, when it took over some of the commercial business from the PBC, the Bank of China (in Mainland China) was given the mandate to specialise in transactions related to foreign trade and investment (Allen *et al* 2012).

Table 2: RMB Flows between Mainland China and the Offshore Market

	Trade settlement	Investment	Transfers	Other
Flows to offshore market *(offshore RMB pool increases)*	Chinese importers paying offshore exporters via BOCHK	Approved overseas direct investment	Receipt of payments of profit, transfer of equity, or liquidation of an investment by foreigner.	Chinese tourists taking RMB to Hong Kong[(a)] Hong Kong residents converting between RMB and Hong Kong dollars (up to CNY20 000 per day)
Flows to Mainland China *(offshore RMB pool decreases)*	Offshore importers paying Chinese exporters via BOCHK[(b)]	Investment in Mainland interbank bonds by approved Participating Banks/central banks Investment in listed stocks/bonds under RQFII scheme Approved foreign direct investment[(c)]	Hong Kong residents remitting to Mainland account of the same name (up to CNY80 000 per day) RMB proceeds from dim-sum bond and equity issuance[(d)]	Tourists obtaining RMB outside of China for use on the Mainland RMB loans to an onshore enterprise from an offshore parent

(a) Some estimates have put this figure at US$15 billion for 2011
(b) Offshore RMB pool is unchanged if importers pay via BOCHK quota
(c) Pre-approval from PBC not required; however, approvals from other regulators may still be required
(d) Mainland firms require approval from onshore regulators; for offshore investors, RMB proceeds from bond and equity issuance can be used for specified investment schemes; otherwise approval is granted on a case-by-case basis
Sources: various official sources, media and market reports

Participating Banks are predominantly banks in Hong Kong that have an agreement with the BOCHK, although it is also possible for banks outside of Hong Kong to either become Participating Banks or access the system through commercial relationships with existing Participating Banks.

As a designated offshore RMB clearing bank, the BOCHK is able to buy and sell RMB in the onshore market on behalf of offshore customers, provided that the funds are for RMB trade settlement. Because the conversions take place in the onshore market, RMB is converted at the onshore (CNY) exchange rate, providing arbitrage opportunities when the offshore (CNH) exchange rate diverges from the CNY rate (see below).

The amount of foreign currency that the BOCHK is allowed to convert in the onshore market is limited by a quota. This quota was increased after being exhausted in October 2010 and, reportedly, increased again after being exhausted in September 2011. Importantly, however, exhausting the quota does not necessarily prevent further RMB trade settlement from taking place. Offshore RMB funds are available via other means: transactions can be settled using RMB held onshore (thereby not involving the BOCHK or the offshore market at all); and, if necessary, the Hong Kong Monetary Authority (HKMA) and other central banks can provide RMB to banks for RMB trade settlement under currency swap agreements with the PBC.[8] In June 2012, the HKMA also launched an RMB liquidity facility, which Participating Banks in Hong Kong can access in the event of a temporary shortfall of RMB liquidity. The RMB would be obtained by the HKMA through its swap agreement with the PBC.

8 HKMA's swap with the PBC was activated in October 2010, when the BOCHK reached its quota due to strong demand for RMB from offshore participants, although it is unclear if the swap line was ever actually used.

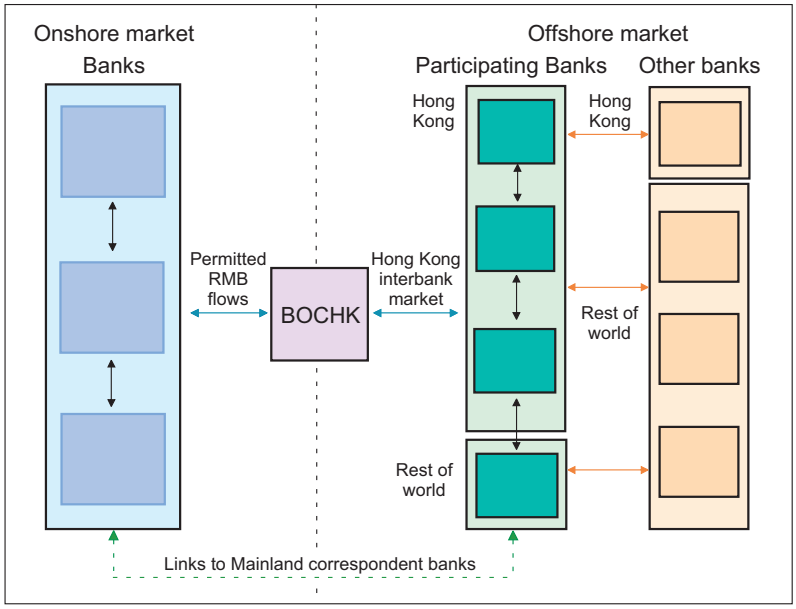
In principle, there are no Chinese regulations preventing the setting up of RMB accounts and the trading of RMB products outside of Hong Kong. However, most offshore settlement and all cross-border settlement (through the BOCHK) currently occurs in Hong Kong. To accommodate these arrangements, the hours for the RMB RTGS platform will be extended by the end of June to allow Europeans to use the Hong Kong infrastructure for settling RMB transactions during the trading day in Europe, and also to cover the morning session in North and South America. Moreover, since Participating Banks are generally located in Hong Kong, adjustments to regulatory requirements in Hong Kong have been important for the development of the offshore market. In particular, Participating Banks are now able to deposit RMB with the PBC via a fiduciary account service provided by the BOCHK. Most recently, the HKMA has eased RMB risk management limits and has relaxed limits on the RMB net open position that banks in Hong Kong can hold, which should increase the flexibility of banks in managing their offshore RMB liquidity and should increase the supply of RMB available in the offshore market.

RMB Trade Settlement

The RMB trade settlement scheme has been integral to the development of the offshore RMB market. The scheme holds some potential attractions to foreign trading partners: an ability to acquire and hold RMB (which has generally been expected to appreciate); the possibility of negotiating a better price when invoices are denominated in RMB rather than US dollar terms; a natural hedge if both exports and imports are denominated in RMB; and for exporters, access to small- and medium-sized Chinese firms that may be unwilling or unable to contract in foreign currency.

In practical terms, RMB trade settlement is now possible in most countries, although, ultimately, it must involve a bank that is able to settle transactions in the interbank market in Mainland China and convert currency in the onshore foreign exchange market. As such, there are two channels through which RMB trade settlement can take place: via a Mainland correspondent bank or the BOCHK. Participating Banks typically can access both of these channels (see Figure 1). While there are a limited number of Participating Banks outside of

Figure 1: Structure of the Offshore RMB Market and RMB Trade Settlement



Source: RBA

Hong Kong, it is only necessary that banks wishing to settle RMB transactions for trade settlement have an arrangement with an existing Participating Bank (which for many is their Hong Kong affiliate).

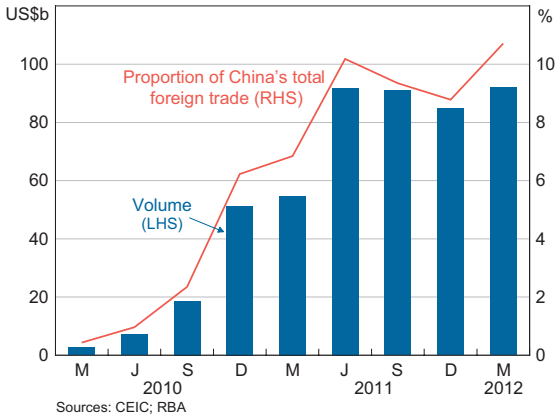
There are, however, important differences between these two channels, particularly in terms of the implications for the offshore market and the future use of the RMB funds. When the offshore bank of a foreign exporter settles trade with a Chinese firm via an account with a Mainland correspondent bank (dotted green line, Figure 1), the RMB remains onshore and subject to Chinese regulations, and the size of the RMB pool offshore is unaffected. However, if the offshore bank settles the trade via an account with the BOCHK, the RMB can be invested in offshore deposits or offshore RMB-denominated (dim-sum) bonds, converted to foreign currency, or invested in the Mainland via an approved channel (blue arrows, Figure 1). The offshore bank of a foreign importer who settles in RMB for goods from China can purchase or borrow RMB in the offshore market (at the CNH rate), in which case the offshore RMB pool will fall. Otherwise, the offshore bank can purchase RMB from the BOCHK at the onshore (CNY) rate (subject to the quota) or purchase or borrow RMB from a Mainland correspondent bank (in which case the offshore pool again is unaffected).

In Australia, RMB banking services are provided by a number of banks. These services typically include RMB bank accounts, RMB trade settlement and access to most other RMB products available in Hong Kong. Liaison suggests that RMB trade settlement involving Australian-based firms has been occurring, albeit to a limited extent, since at least late 2010.

Developments in RMB Trade Settlement and the Offshore RMB Market

Reflecting the take-up of the scheme, RMB trade settlement expanded rapidly over 2010 and the first half of 2011, to reach around 10 per cent of China's total foreign trade (Graph 2). At least initially, the scheme was reportedly dominated by foreign firms

Graph 2
RMB Trade Settlement



Sources: CEIC; RBA

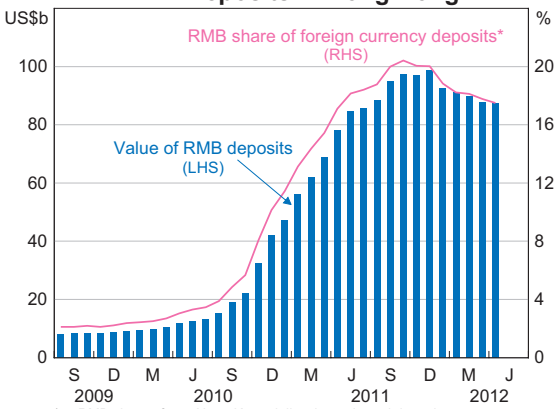
receiving RMB as payments for their exports to China, likely reflecting the incentive to hold RMB offshore given the expectation for RMB appreciation at the time (although expectations for appreciation have recently fallen) and reinforced by flows attempting to take advantage of the small premium that then existed in the offshore exchange rate.

Since the inception of the scheme, around two-thirds of RMB trade settlement has been with Hong Kong. The next largest shares are with Singapore and Taiwan, which is not surprising given their close trade relationships with China and their early inclusion in the scheme. Australia's share is similar to that of the United Kingdom's, at around 1 per cent of total RMB-denominated trade since mid 2009.

Consistent with the expansion of the RMB trade settlement scheme, and the associated outflow of RMB from the Mainland, RMB deposits in Hong Kong have risen significantly over the past few years, from around US$15 billion in July 2010 to almost US$90 billion currently (Graph 3).[9] This rapid accumulation initially reflected both the growth of RMB trade settlement and the relative lack of alternative options in the developing offshore market. The recent decline in deposits corresponds to a certain extent with the increased ability to transfer RMB between the onshore and offshore

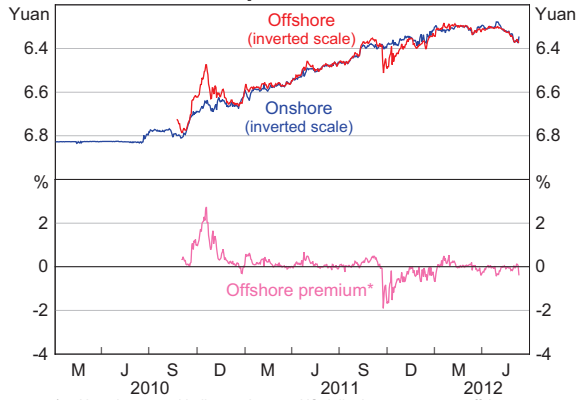
9 Around 70 per cent of these deposits are currently held by corporate customers.

Graph 3
RMB Deposits in Hong Kong



* RMB share of non-Hong Kong dollar-denominated deposits
Sources: Hong Kong Monetary Authority; RBA

Graph 4
RMB per US Dollar



* Negative spread indicates that one US dollar buys more yuan offshore than onshore
Sources: Bloomberg; RBA

markets. While the offshore deliverable RMB foreign exchange market has grown substantially in terms of size and liquidity since mid 2010, with average daily turnover of around US$4 billion last year, this is still below turnover in the dominant offshore non-deliverable forward RMB market (which settles in US dollars) and the onshore market (estimated in 2010 at US$23 billion and US$10 billion per day, respectively).[10] A sign of the maturation of the deliverable RMB market has been the quoting of a CNH fix by the Treasury Markets Association since mid 2011. This has been supported in recent months by the quoting of interbank interest rates by eight major banks in Hong Kong.

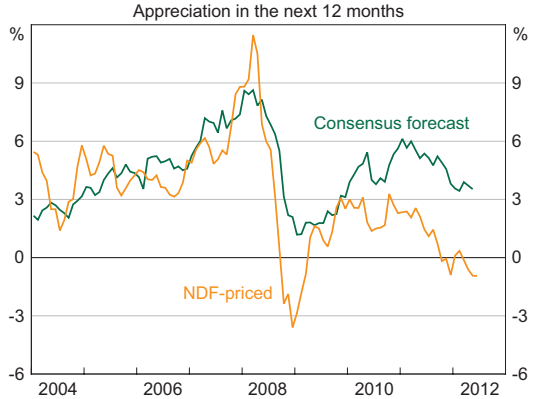
There has been some tendency for the offshore (CNH) exchange rate to converge to the onshore (CNY) exchange rate in recent years. Up until late last year, there was typically a small premium in the CNH rate – that is, one US dollar bought less yuan offshore than onshore – reflecting the expectation of some near-term appreciation of the CNY rate (Graph 4). The tendency for convergence over the past few years has been made possible by the ability to use trade flows, particularly between affiliated companies in the Mainland and Hong Kong, to arbitrage between the two exchange rates. However, increased concerns about the euro area debt crisis and the outlook for the US economy late last year resulted in a temporary reversal of this premium as offshore investors undertook a broad-based liquidation of emerging market investments, including those in the offshore RMB market. As a result, the offshore (CNH) exchange rate traded at a sizeable discount to the onshore rate for the first time. Trading conditions in the offshore market were further strained by the incentive this discount provided for RMB to flow back onshore to take advantage of a stronger onshore rate. As noted previously, these pressures led the BOCHK's quarterly quota for conversion between RMB and foreign currency to be exhausted for a second time in September 2011.

The small discount in the offshore exchange rate since the beginning of the year is consistent with reduced expectations for exchange rate appreciation in the onshore market. This has coincided with little net change in the onshore exchange rate, and is likely to have been influenced by the official announcement that greater two-way flexibility in the onshore exchange rate might be warranted in the future. However, following development of the offshore RMB market, the non-deliverable forward (NDF) market for RMB has become subject to some arbitrage opportunities in the offshore market, thereby making it a less pure

10 See McCauley (2011) for details.

prediction of market expectations of changes in the onshore exchange rate. This likely explains much of the recent divergence between exchange rate expectations implied by the non-deliverable forward market and expectations derived from surveys of market participants, such as the Consensus Economics survey (Graph 5). Nevertheless, these survey measures also suggest that expectations for appreciation of the CNY exchange rate have recently fallen.

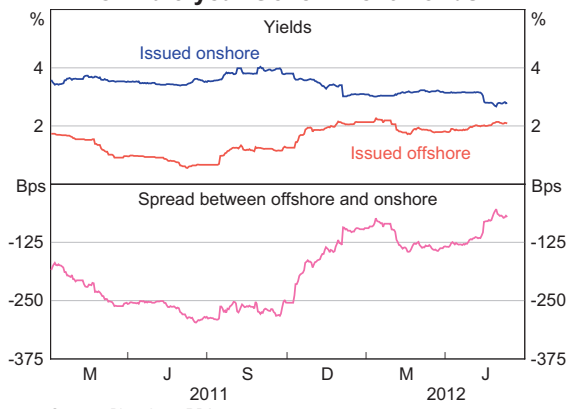
Graph 5
Forecasts of RMB Appreciation
Appreciation in the next 12 months



Sources: Bloomberg; Consensus Economics

Offshore deposit and lending rates remain distinctly below their onshore counterparts. While a 1-year term RMB deposit onshore currently earns 3.5 per cent, the same funds deposited offshore receive 0.6 per cent. Yields on Chinese government bonds in the offshore market have also traded at a notable discount to comparable bonds in the onshore market, which in part has reflected the willingness of investors to hold funds in the offshore market at a lower rate of return due to expectations of exchange rate appreciation over the past few years. It has also reflected a lack of alternative investment opportunities in the offshore market, with many bond issues oversubscribed several times. However, significant development of the offshore RMB bond market over the past few years, together with some decrease in expectations of exchange rate appreciation more recently, have seen the gap between yields on comparable Chinese government bonds in the offshore and onshore markets narrow considerably (Graph 6).

Graph 6
China 5-year Government Bonds



Sources: Bloomberg; RBA

While the (still) relatively low yield on dim-sum bonds should make the offshore market attractive for RMB fundraising, issuance has been limited by the remaining restrictions on the ability of firms to transfer RMB to the Mainland.[11] Late last year, the process of repatriating RMB funds raised offshore from bond issuance and other sources was made easier, including, as already mentioned, for foreigners seeking to use offshore RMB for direct investment onshore (see Tables 1 and 3 for more details). In December, the 'RQFII' scheme was announced, which allows RMB sourced from the offshore market to be invested in the onshore listed equity and listed bond markets. This scheme is the counterpart to the Qualified Foreign Institutional Investor (QFII) scheme that allows foreign currency to be used for the same purpose. In April this year, the existing quotas for both QFII and RQFII were more than doubled in size, to around US$90 billion in total. In May, a formal approval process was introduced to enable onshore non-financial corporations to issue RMB bonds in Hong Kong. Outside of these schemes, approval to transfer RMB to the Mainland is generally granted by the PBC on a case-by-case basis.

11 Foreign firms issuing RMB bonds in the offshore market have no restrictions on the offshore use of the proceeds.

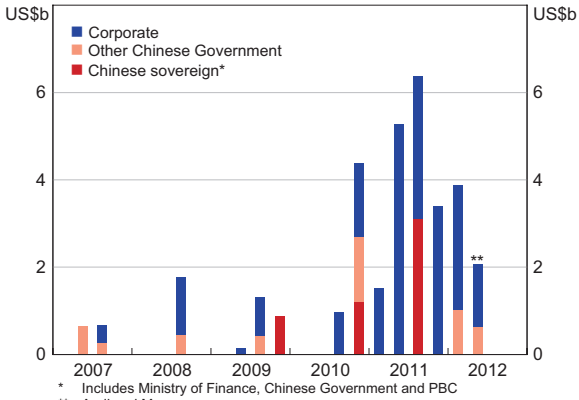
Table 3: Chinese Foreign Investment Programs

Name	Direction/ currency	Notes	Details
Portfolio investment			
QFII	Inward; foreign currency	Foreign institutions invest in listed (but not interbank) bonds and equities. Wide range of investors including private banks, corporations and central banks.	Since Jan 2003; US$80 billion (total quota); 163 investors[a]
QDII[b]	Outward; foreign currency	Domestic institutions convert RMB to foreign currency to invest in overseas bonds and equities	Since Apr 2006; US$75 billion (total quota); 96 investors
Other RMB[c]	Inward; RMB	Foreign central banks, offshore RMB clearing banks and Participating Banks permitted to invest RMB (including RMB raised offshore) in Mainland interbank bond market	Since Aug 2010; size unknown
QFLP[d]	Inward; foreign currency	Foreign private equity funds and companies invest in private equity-based funds in certain cities	Since Jan 2011; US$1.5–3 billion quota per city
RQFII	Inward; RMB	Foreign funds/institutions invest RMB raised offshore in Mainland equities and bonds	Since Dec 2011; US$11 billion (total quota); 21 investors
Direct investment			
FDI[e]	Inward; foreign currency	Allowed in all provinces, but certain industries are excluded	Since 1980; around US$240 billion gross FDI in 2011
	Inward; RMB	Foreigners invest RMB raised offshore directly in Mainland firms. National Ministry of Commerce approval required for investments exceeding CNY300 million, or directed to certain industries.	Rules for existing scheme formalised Oct 2011; US$24 billion FDI since start of 2011
ODI[e]	Outward; foreign currency	Requires approval from Mainland authorities and is dominated by state-owned enterprises	Since 1979; around US$64 billion gross ODI in 2011
	Outward; RMB	Mainland firms apply to take RMB offshore and invest directly in foreign firms. Hong Kong branches and correspondent banks of Mainland banks can also obtain RMB onshore and lend to Mainland firms for ODI.	Since Jan 2011; US$5 billion ODI since start of 2011

(a) As at end April 2012, around US$26 billion in quotas had been approved
(b) Qualified Domestic Institutional Investors
(c) No formal name for scheme
(d) Qualified Foreign Limited Partners
(e) Foreign direct investment and overseas direct investment, respectively; no formal names for schemes
Sources: CEIC; China Securities Regulatory Commission; Hong Kong Monetary Authority; People's Bank of China

In addition to easing restrictions on the transfer of RMB funds raised offshore back onshore, the Chinese authorities have supported the development of the offshore RMB-denominated (dim-sum) bond market through sovereign and other Chinese Government issuance. The variety of dim-sum bond issuers has diversified substantially; prior to mid 2010, it was generally Mainland banks (such as the China Development Bank) and sovereign authorities, whereas it now includes several financial firms (e.g. HSBC) and non-financial foreign firms (including McDonald's, Caterpillar and Volkswagen), and Mainland non-financial corporates (e.g. Baosteel). Reflecting this, total issuance of dim-sum bonds has increased from US$1.3 billion in 2007 to US$16.5 billion in 2011, equivalent to around 2 per cent of bond issuance undertaken in the onshore interbank bond market (Graph 7). However, dim-sum bond issuance has slowed moderately this year, and has been around US$6 billion in 2012 to date. Since the start of 2011, around 60 per cent of corporate dim-sum bond issuance has been accounted for by Mainland Chinese firms, with 10 per cent from Hong Kong and the remaining 30 per cent from foreign firms. In April this year, HSBC launched the first dim-sum bond outside of Hong Kong in London, providing further indication of the growth and diversification of the market.

Graph 7
Offshore RMB Bond Issuance



* Includes Ministry of Finance, Chinese Government and PBC
** April and May
Sources: Dealogic; RBA

It is also possible for RMB-denominated initial public offerings (IPOs) to be conducted offshore. The first one was conducted for real estate investment trust Hui Xian in April 2011. However, there has yet to be a second RMB-denominated IPO offshore, despite Hong Kong Exchanges & Clearing Ltd (HKEx) promoting the concept by launching a RMB Equity Trading Support Facility to improve liquidity for RMB shares on the secondary market. Demand for RMB investment opportunities has seen the emergence of other RMB-linked products in the offshore market, including RMB-denominated exchange-traded funds (ETFs), insurance products, foreign exchange options and commodity-linked products. The Chicago Mercantile Exchange has signed an agreement with the Bank of China (in Mainland China) to enable it to use RMB in settling commodity trades and the London Metal Exchange is considering similar arrangements. HKEx has announced plans to issue RMB futures later this year. Corporate RMB loans are also available; the outstanding value of RMB loans reached around US$5 billion as at the end of 2011.

Other International Developments

In line with the general multipronged approach to reform, the Chinese authorities have also sought to promote and support the increased use of RMB through bilateral agreements. Notably, the PBC has signed bilateral local-currency swap agreements with at least 16 central banks in addition to the HKMA (Table 4). In March this year, the RBA and the PBC signed a swap agreement that allows for the exchange of up to A$30 billion or CNY200 billion.

The primary purpose of these agreements is as a back-up source of liquidity to support trade denominated in local currency. As an example, if a domestic Australian importer were temporarily unable to obtain sufficient RMB to pay for RMB-denominated imports, its Australian bank could ask the RBA to lend it the necessary RMB secured against collateral for a short period of time. The Australian importer's bank could then

Table 4: PBC Bilateral Local-currency Swap Agreements

Date signed	Country	Value (CNY billion)	Value (US$ billion)[a]
Mar 2009[b]	Belarus	20	2.9
Mar 2009[b]	Indonesia	100	14.6
Apr 2009[b]	Argentina	70	10.2
Jun 2010	Iceland	3.5	0.5
Jul 2010	Singapore	150	22.1
Apr 2011	New Zealand	25	3.8
Apr 2011	Uzbekistan	0.7	0.1
Jun 2011	Kazakhstan	6.5	1.0
Oct 2011	South Korea (extended)	360	56.6
Nov 2011	Hong Kong (extended)	400	63.0
Dec 2011	Thailand	70	11.0
Dec 2011	Pakistan	10	1.6
Jan 2012	United Arab Emirates	35	5.5
Feb 2012	Malaysia (extended)	180	28.6
Feb 2012	Turkey	10	1.6
Mar 2012	Mongolia (extended)	10	1.6
Mar 2012	Australia	200	31.6

(a) Calculated based on USD/CNY exchange rate at the time of signing
(b) Since these agreements are usually for three years, unless they have been extended, they are now expired
Sources: People's Bank of China; other official sources and media reports

meet the importer's RMB obligation by transferring those funds to the Chinese exporter's bank. At the end of the agreement, the importer's bank would need to obtain RMB in order to repay the RBA. This arrangement should offer increased confidence to both Australian firms wishing to contract their trade in RMB terms and their banks in arranging settlement.

In December 2011, China signed an agreement with Japan that included a commitment to develop direct trading between the yuan and yen (which came into effect on 1 June 2012) and to promote the issuance of RMB-denominated bonds by Japanese companies. In addition, multilateral agreements have been reached to promote the use of local currencies in regional trade relationships and in lending between nations. For example, the BRICS (Brazil, Russia, India, China and South Africa) nations agreed to encourage their respective development banks to lend to the other countries in local currency. China, Japan and South Korea have also agreed to use their foreign exchange reserves to invest in each others' sovereign debt.

Furthermore, the Chinese authorities have undertaken measures to encourage investment of foreign reserves in RMB; however, until the RMB is fully convertible, these holdings will not be recognised as part of a country's official reserve assets under the International Monetary Fund's definition. As part of the December 2011 agreement, the Japanese authorities committed to purchase US$10 billion worth of Chinese government bonds (with the official approval obtained early this year). Approval has reportedly also been granted to the Thai and Austrian authorities to invest in the onshore interbank bond market, while the HKMA's quota for

investing in the onshore interbank bond market was recently doubled to just under US$5 billion. Authorities in other countries have obtained small QFII quotas to invest in the onshore listed markets, with approvals granted to Kuwait, Malaysia, South Korea and Thailand. The PBC also recently signed an agency agreement with the World Bank to enable the International Bank for Reconstruction and Development and the International Development Association to invest in the Mainland interbank bond market.

Similarly, the Hong Kong authorities have sought international cooperation in supporting the development of the offshore market. This has included the HKMA and HM Treasury (UK) establishing a private sector forum to explore 'synergies' between the markets, particularly looking at clearing and settlement systems, market liquidity and the development of new RMB-denominated products. It has also included the incorporation of RMB into payments systems, such as its recent inclusion in the pilot platform for post-trade cross-border clearing and settlement of debt securities between Europe, Hong Kong and Malaysia.

Conclusion

The RMB trade settlement scheme and the offshore RMB market have expanded rapidly over recent years as the Chinese authorities have sought to promote the international use of RMB in trade and investment. The structure of the offshore market has enabled the internationalisation of the RMB to precede to some extent the liberalisation of onshore capital controls. However, since late last year, the reform agenda has expanded to encompass some easing of restrictions on the capital account, including onshore foreign investment opportunities and the further development of onshore financial markets. These have been interpreted as interim steps to a more fully liberalised capital account sometime in the future.

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Small Business Finance Roundtable: Summary of Discussion

The Reserve Bank hosted a small business finance roundtable on 22 May 2012. The purpose of the roundtable was to better understand how the small business sector is financed and where there might be information gaps. The attendees included small business owners, sector representatives, financial institutions, academics, data providers and policymakers.[1] While the roundtable focused on the financing of the small business sector, it also considered a number of other issues including the characteristics of small businesses and the challenges facing the sector. The discussion papers presented at the roundtable are listed at the end of this article and can be found on the Bank's website (www.rba.gov.au).

The Definition of Small Business

A wide range of criteria are used to define small businesses, including legal status, number of employees, revenue and loan size. While there was some overlap in the definitions, they identify quite different groups of small businesses. The number of decision-makers in the business was an alternative criterion put forward by some participants, although little information is currently collected on this basis. Overall, attendees noted that the sheer diversity of the small business sector made the adoption of a single standard definition of limited use. Rather than striving for consistency, definitions should be tailored to the purpose at hand.

Motivations, Behaviour and Characteristics

Attendees stressed the personal nature of small businesses. There is often little differentiation between the household and the business, with business issues, such as succession planning, becoming household issues and vice-versa.

As a result of these strong links to the household, small businesses do not operate like scaled-down versions of large businesses. The decision-making is often much more akin to that of a household, with decisions made directly by the owners rather than through formal managerial systems. Goals will also differ, reflecting owners' differing motivations for starting the business and lifestyle choices.

While some small businesses wish to grow, this is not true for many businesses. Instead, a substantial share of small businesses aim for limited or even no growth. For example, many owners want to keep the business at a manageable scale; prefer to remain focused on the actual businesses' activities rather than its administration; are comfortable with only a certain amount of risk; or are happy with a certain lifestyle.

These differing motivations are consistent with small businesses having a greater dispersion of gearing ratios than large businesses. In particular, while many of those that aim to grow use debt, others have little use for debt. The strong links between small businesses and households also accords with the finding that while small businesses tend to have less debt than large businesses, households that own small businesses tend to have higher debt than other households.

1 The RBA also conducts a regular business liaison program and has hosted an annual small business finance panel since 1993.

Interactions with Financial Institutions and Government

Interactions with financial institutions

The personal nature of small businesses is often reflected in their financing arrangements, with financing evolving with the business. Initially, financing is predominantly tied to the owners' personal situation. As the business develops, financing becomes more closely linked to the performance of the business. This progression in financing also reflects the types of finance available to small businesses. As small businesses apply for more advanced forms of funding, more detailed financial plans and statements are required. For those without backgrounds in commerce, such reporting is potentially a real barrier to obtaining finance.

The interaction between small businesses and financial institutions is also influenced by lenders' ability to accurately estimate and price risk. For example, banks are generally not well placed to offer debt funding for some start-up businesses given that the inherent risks require an equity-like investment and return. At the same time, owners may be unwilling to cede the control that such equity-like finance entails, as many are motivated to start a small business in order to have more control.

Participants also discussed ways in which the loan application process could be improved. In particular, there was an appreciation that lenders often had a better idea about the macroeconomy and the outlook for various industries than potential small business borrowers. Consequently, the provision of more information by lenders on why applications were rejected could, for example, allow small business owners to address flaws in their business case. Feedback from lenders to small businesses may also help to prevent firms in new and innovative industries from being grouped inappropriately into existing industries. The general consensus of both borrowers and lenders was that it was unclear how lenders could speed up loan application times given the significant risks for both the lender and borrower. In particular, participants noted that while lenders' investments in automation have sped up the loan approval process in cases where the decision is obvious, they have had less effect on the time taken for decisions that are less clear-cut. Some small businesses noted that they preferred to be turned down immediately, rather than experiencing a protracted process.

Price and non-price conditions on intermediated financing

The pricing of finance was not generally viewed as a major impediment to small businesses' activities currently. The fact that small business credit has been little changed for a number of years was instead largely attributed to a lack of demand. To the extent that small businesses had concerns, participants pointed to non-price conditions, such as covenants and disclosure requirements. Of these, business owners were most concerned by covenants. Covenants have been tightened following the onset of the global financial crisis and have not eased markedly. While covenants are used by lenders to lessen the risk of the loan, they can be problematic for high growth firms. A high growth firm might, for example, temporarily reduce its sales activities – suppressing current profits – as it focuses on investments that might boost future sales. In some cases this might lead to breaches in covenants or its lenders having concerns about the credit quality of the business and, in turn, the business having concerns over the stability of its external funding.

Participants also discussed why finance for small business was more expensive than finance for large businesses or individuals, and why it has become more expensive since 2008 both in absolute and relative terms. A number of factors suggest that lending to small business is more risky than other forms of bank lending. In particular, small businesses were more likely to default and created larger losses (for a given sized loan) when default occurred.

Funding cost pressures were the main reason for the rise in the price of small business finance

since the onset of the global financial crisis. Several possible explanations were put forward as to why small business finance had become relatively more expensive than other loans. One was that, pre-2008, insufficient risk had been priced in to small business lending. The relative price rise thus reflects a recognition of the higher level of risk involved in small business lending. Another explanation was that the exit of several lenders post-2008 had lessened competition more in the small business market than in other markets.

Participants noted the practice of small businesses using housing loans rather than business loans, despite the greater levels of risk involved. The lower price (and capital charge from the lenders' perspective), and the smaller administrative burden, were given as reasons for this trend. It remains to be seen, however, how dissimilar the risks of such lending are relative to that of conventional residential mortgage lending over the longer term.

Government interaction

Some participants suggested that governments should focus on removing impediments to small business activities. One impediment was the fixed costs of regulatory compliance, which may place a higher burden on small businesses than large businesses. Similar concerns were voiced regarding the fixed costs associated with enforcing contracts. These enforcement costs can disadvantage small businesses to the extent that they have fewer resources on which to draw. Mention was also made of the weaker bargaining position of small business in drawing up contracts.

Outlook for the Sector

A number of medium- and long-term challenges for small businesses were discussed. In the medium term, lower demand and confidence, as well as higher costs, were pointed to as significant challenges. Concerns over the lack of skilled workers were also noted, as small businesses do not have the economies of scale to make formal training affordable. The multi-speed economy was also discussed. There was agreement that to characterise the economy as 'two-speed' was an oversimplification and that there was a spectrum of performance in the economy. Indeed, it was noted that the divergence between industries and regions is not high by historical standards, though it may grow in the medium to long term.

The increase in house prices relative to income over recent decades, and the ageing of the population, were highlighted as potential challenges over the longer term. On the first point, households' equity in their homes is an important determinant of their access to funding for small business ventures. An increase in house prices relative to income increased previous generations' housing equity, and hence potential access to funding. In contrast, younger generations of potential entrepreneurs are unlikely to benefit from this same process. Further, higher house prices have contributed to younger generations delaying their housing purchases, meaning that they may have less ability to start a small business as they lack the collateral to take out a loan. On the second point, the ageing of the population might slow activity in the small business sector given older individuals tend to have a higher level of risk aversion and are less likely to start new businesses or attempt to expand existing businesses. Several possible responses were suggested by participants, including a rise in venture capital (possibly funded by Australia's superannuation system), more transfers between generations, or a general increase in the cost of business debt as a larger share is extended on an unsecured basis.

Papers Presented at the Roundtable

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The Glass Half Full

Glenn Stevens, Governor

Address to the American Chamber of Commerce (SA) AMCHAM Internode Business Lunch
Adelaide, 8 June 2012

It is very good to be back in Adelaide. Thank you for the invitation.

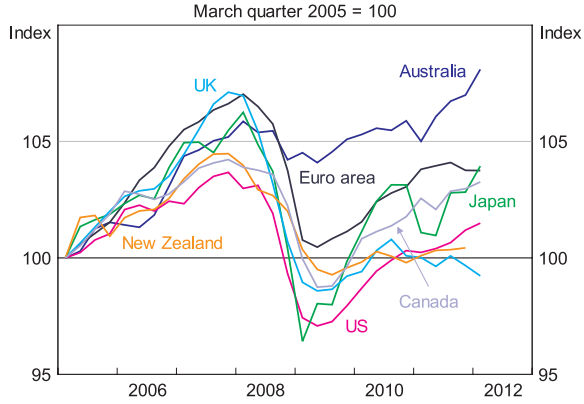
As we meet here, economic discussion in Australia has reached a rather curious position. Consider the background. Australia avoided a deep downturn in 2009, when most countries did not. A large number of businesses and jobs were saved by that outcome – though we will never know how many.

Almost as a matter of arithmetic, the ensuing upswing was always going to be of the moderate variety. Rapid cyclical growth usually comes after a serious slump (and when it doesn't, it comes just before one). After small downturns, less spectacular growth is the usual experience. So it has proved on this occasion.

Even so, three and a half years after the depths of the crisis in late 2008, this unspectacular growth has nonetheless seen real GDP per capita well and truly pass its previous peak. This is something yet to be achieved in any of the other nations shown here (Graph 1).

According to data published this week by the Australian Statistician, real GDP rose by over 4 per cent over the past year. This outcome includes the recovery from the effects of flooding a year ago, so the underlying pace of growth is probably not quite that fast, but it is quite respectable – something close to trend. Unemployment is about 5 per cent. Core inflation is a bit above 2 per cent. The financial system is sound. Our government is one among only a small number rated AAA, with manageable debt. We have received a truly enormous boost in national income courtesy of the high terms of trade. This, in turn, has engendered one of the biggest

Graph 1
Real GDP per Capita
March quarter 2005 = 100



Sources: ABS; Statistics New Zealand; Thomson Reuters; US Census Bureau

resource investment upswings in our history, which will see business capital spending rise by another 2 percentage points of GDP over 2012/13, to reach a 50-year high.

To be sure, we face considerable structural adjustment issues arising from the mining expansion, and from other changes in the world economy. These are not easy to deal with (though they are not insurmountable). And we live in a global environment of major uncertainty, largely because of the problems of the euro zone. Nonetheless, an objective observer coming from outside would, I think it must be said, feel that Australia's glass is at least half full .

Yet the nature of public discussion is unrelentingly gloomy, and this has intensified over the past six months. Even before the recent turn of events in Europe and their effects on global markets, we were grimly determined to see our glass as half empty.

Numerous foreign visitors to the Reserve Bank have remarked on the surprising extent of this pessimism. Each time I travel abroad I am struck by the difference between the perceptions held by foreigners about Australia and what I read in the newspapers at home.

I harbour no illusion that this can suddenly be lifted by anything I say today. But it is, hopefully, worthwhile to offer a few facts, and some perspective and analysis of the situation.

The Multi-speed Economy

Much of our public discussion proceeds under the rubric of the so-called 'two-speed economy'. It's become very much the description of the moment, and not only in Australia. One picks up the same theme in many other countries. Indeed it is a description of the global economy. Growth in the advanced industrial countries continues to be sluggish, and in some cases output is going backwards. Within Europe, Germany has been doing well, while other nations face huge economic challenges. Meanwhile growth in the 'emerging world' has been pretty robust apart from the effects of natural disasters. So in popular terms, we might say that there are varying lanes on the global growth highway: fast, slow, very slow. There are a few economies in the breakdown lane.

Turning to Australia, we have long had a multi-speed economy. For example, it has been a very long-running trend that population growth tends to be faster in Western Australia and Queensland than in Tasmania or South Australia. Typically, certain industries such as housing construction show the expected differences due to population growth.

Moreover while we debate the rise of mining and the much heralded 'decline of manufacturing', we might note that it has been a very long running trend that output and employment in manufacturing has grown more slowly than in the economy as a whole, and that output of various kinds of service provision has grown faster. That has been happening for at least five decades, and in most countries in the developed world. In the case of Australia's manufacturing sector, this decline reverses an earlier rise. In fact, the respective shares of mining and manufacturing in Australia's GDP at present are about where they were in 1900.

It is obvious at present that the mining expansion is quite concentrated both in its industrial and geographical dimensions, and economic indicators do reflect that. But the mining sector is not the only sector growing. If the recent data are taken at face value, the non-mining economy has grown at about 2 per cent over the past year. Mining employment is indeed growing quickly – interestingly enough according to the available data, the increase in mining employment exceeded the fall in manufacturing employment over the past year. But the largest increase of all was in the sector called 'health care and social assistance', in which employment rose by about the size of the combined fall in manufacturing and retailing employment over the same period. And while there are clearly differing drivers by industry and by region, there are mechanisms that even out at least some of these differences. Spillovers do occur both in the private sector and via the tax and expenditure system.[1] Remarkably, in the face of the understandable concern about job losses in particular regions and industries, the dispersion of unemployment rates by statistical region is no larger today than has usually been the case over the past 20 years. Hence, while there are clearly multiple speeds, the total speed seems to have been one of reasonable growth and low unemployment.

The Behaviour of Households

But there is another aspect of the 'multi-speed' experience, which I suspect explains a good deal of the dissatisfaction we see, and it has to do with the behaviour of the household sector. Some parts of the economy that depend on household spending are still experiencing relatively weak conditions, compared with what they have been used to. But this isn't because the mining boom spillovers have failed

1 See Lowe P (2012), 'The Forces Shaping the Economy over 2012', RBA *Bulletin*, March, pp 85–90.

to arrive. It is, instead, the result of other changes that actually have nothing to do with the mining boom *per se*, but a lot to do with events that occurred largely before the mining boom really began.

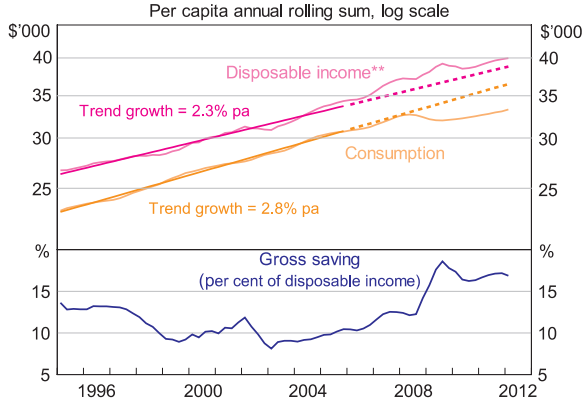
The story is summed up in the two charts shown below. The first shows household consumption spending and income, both measured in per capita terms, and adjusting for inflation (Graph 2).[2] In brief, household spending grew faster than income for a lengthy period up to about 2005. The arithmetically equivalent statement is that the rate of saving from current income declined, by about 5 percentage points over that period.

It was no coincidence that households felt they were getting wealthier. Gross assets held by households more than doubled between 1995 and 2007. The value of real assets – principally dwellings – rose by more than 6 per cent per annum in real, per capita terms over the period (Graph 3).

Only a small part of this was explained by an increase in per capita expenditure on dwellings. The bulk of it came from rising prices. Moreover, a good deal of borrowing was done to hold these assets and household leverage increased. The ratio of aggregate household debt to gross assets rose, peaking at about 20 per cent. There was definitely a large rise in measured net worth, but relative to aggregate annual income, gross debt rose from 70 per cent in 1995, to about 150 per cent in 2007. Correspondingly, by 2007 the share of current income devoted to servicing that debt had risen from 7 per cent to 12 per cent, despite interest rates in 2007 being below those in 1995.

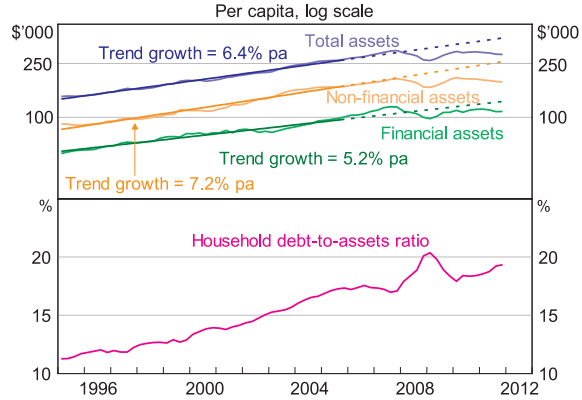
It is still not generally appreciated how striking these trends were. I cannot say that it is unprecedented for spending to grow consistently faster than income, because it had already been doing that for the 20 years prior to 1995. That is, the saving rate had been on a long-term downward trend since the mid 1970s. But it is very unusual in history for

Graph 2
Real Household Income and Consumption*
Per capita annual rolling sum, log scale



* In 2009/10 dollars; deflated using the household final consumption expenditure implicit price deflator
** Disposable income is after tax and net interest payments
Sources: ABS; RBA

Graph 3
Real Household Assets*
Per capita, log scale



* In 2009/10 dollars; deflated using the household final consumption expenditure implicit price deflator
Sources: ABS; RBA; RP Data-Rismark

people to save as little from current income as they were doing by the mid 2000s. And it is very unusual, historically, for real assets per person to rise at 6 per cent or more per annum. It is also very unusual for households actually to withdraw equity from their houses, to use for other purposes, but for a few years in the mid 2000s that seemed to have been occurring.

Of course, Australia was not alone in seeing trends like this. There were qualitatively similar trends in several other countries, particularly English-speaking

2 These are updated versions of charts I first used one year ago. See Stevens G (2011), 'The Cautious Consumer', RBA *Bulletin*, September, pp 77–82.

countries that experienced financial innovation. The international backdrop to this period was the so-called 'great moderation', in which there was a decline in macroeconomic variability. There were still business cycles but downturns were much less severe than in the 1970s or 1980s, inflation was low and not very variable, which meant that nominal interest rates also were generally low and not very variable, and compensation for risk became very modest.[3]

This 'moderation' came to an end with the crisis beginning in 2007. And with a few years of perspective, it is increasingly clear that Australian households began to change their behaviour at that time, or even a little before. The rate of saving from current income stopped falling probably around 2003 or 2004, and began to increase (we now know), slowly at first as the income gains from the first phase of the resources boom started in about 2005 or 2006, and then more quickly in 2008 and 2009.

Real consumption spending per head initially remained pretty strong in this period, reaching a peak in 2008. It then declined for a year or so, before resuming growth in the second half of 2009. That growth has, however, been much slower than had been observed previously. In the nearly three years from mid 2009 through to the March quarter 2012, real consumption per head rose at an annual pace of about 1½ per cent. This is more than a full percentage point lower than the growth rate from 1995 to 2005. But this sort of growth is, in fact, quite comparable with the kind of growth seen in the couple of decades leading up to 1995. It is in line with the quite respectable growth in income. But the gap between the current level of consumption and where it would have been had the previous trend continued is quite significant. If we then consider the growth of foreign online sales and so on, and the fact that consumers seem more inclined to consume services – experiences, as opposed to goods – we can see this is a significant change for the retail sector.

No doubt reinforcing this trend towards more circumspect, but more typical, behaviour is that the earlier strong upward trend in real assets per head has abated over recent years. In fact, real household assets per head today are about the same as they were five years ago, with a dip during the crisis, a subsequent partial recovery and then a slow drift down over the past couple of years. Both dwelling prices and share prices – the two really big components of wealth – have followed that pattern .

At some point, wealth will begin to increase again. After all, people are saving a reasonable amount from current income and placing the proceeds into various assets (especially, of late, deposits in financial institutions). That is, they are building wealth the old-fashioned way. Ultimately these flows will be reflected in higher holdings of real and financial assets, at least once debt levels are regarded as comfortable. Asset valuation changes can, of course, dominate saving flows in shifting wealth over short periods and they are inherently unpredictable. So no one can predict the course of these measures of wealth over any particular short period. But wealth will surely resume an upward track, sooner or later.[4]

3 There was, of course, a nagging problem of periodic financial panics. But several of these seemed to be managed without serious lasting damage. The Asian financial crisis was devastating for the Asian countries involved, but the global economy was not badly affected. The Russian crisis of 1998 – described, remarkably, by one experienced observer at the time as the worst since the 1940s – was similarly handled without serious fall-out. The bust of the dot-com bubble was associated with an economic downturn in the early 2000s but this too was, by historical standards, quite mild. Perhaps people began really to believe that major downturns were always avoidable and that higher leverage therefore was safe. If so, they had a major fright from 2007 onwards.

4 In considering these trends in wealth and household spending behaviour, we could ask which way causation ran – did changing wealth drive changing spending patterns, or was it the other way around? The answer is almost certainly that causation ran both ways. If rising asset values creates a sense of greater wealth and people feel less need to save from current income to achieve any goal they might have for their assets, they can spend more from current income. But in spending more, and being prepared to borrow more, they also tend in the process to affect asset values for both real and financial assets, which then reinforces the trend in wealth, and so on. So it is not possible, in a very simple analysis such as the one presented here, to disentangle all that. But it seems the two trends have been related, and mutually reinforcing, in both directions. Both the strong rise in spending and the strong rise in gross assets (and leverage) ended some years back now.

When it does, however, it is unlikely to be at 6 or 7 per cent per year in real, per capita terms. I would guess that over the long term, something more like 3 per cent would be nearer the mark.

I think this is a profoundly important point and worth emphasising. The decade or more up to about 2007 was unusual. It would be quite surprising, really, if the same trends – persistent strong increases in asset values, very strong growth in per capita consumption, increasing leverage, little or no saving from current income – were to re-emerge any time soon. That is, the gap between consumption today and the old trend level on the chart is not going to close. I noted to another audience about three years ago that the prominence of household demand in driving growth in the 1990s and 2000s was unlikely to be repeated.[5] If there were business strategies that assumed a resumption of the earlier trend, they will surely be disappointed in time, if they have not been already.

There were several parts of the economy that benefited from that earlier period, and that are finding the going much tougher now. Retailing was obviously one, but so was banking. Banks and other financial institutions enjoyed rapid balance sheet and profit expansion as they lent to households and some businesses. But they can see that period has now finished. Businesses that serviced rapid turnover in the dwelling stock (such as real estate agents, mortgage brokers) are seeing those revenue streams considerably reduced, and are having to adjust their strategies and capacity to suit changed conditions. For example, the rate of dwelling turnover is about one-third less than it was on average over the previous decade, and about half its peak levels. This is affecting state government stamp duty collections as well as the real estate sector.

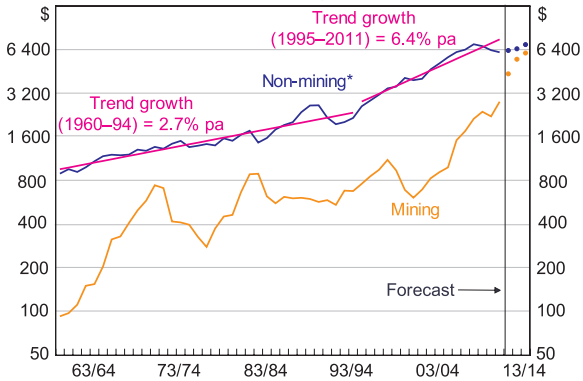
We can also see some echoes of these changing trends in household demand in business investment spending.

5 Stevens G (2009), 'Challenges for Economic Policy', RBA *Bulletin*, August, pp 10–16.

This chart shows business investment, split into mining and non-mining, and measured in real, per capita terms, so as to be consistent with the earlier charts (Graph 4). Investment has been on a stronger upward trend since the mid 1990s than it had been for a number of years before that. In particular, business investment in real per capita terms has grown, on average, by over 6 per cent per annum since 1995, more than double the average pace over the preceding 35 years. Moreover a lot of this was in the non-mining sector, and it began before the present run up in mining investment really got going. Some of this growth reflected the same 'consumer facing' growth sectors mentioned above. Of the four sectors that had the fastest growing investment spending over that period, three were finance, one called 'rental hiring and real estate services', and retail trade. Some of these sectors are slowing their investment rates now .

Meanwhile, mining investment has recently been rising at an extraordinary pace. In 2005, mining investment was near its long-run average of around 2 per cent of GDP. By mid 2014 we expect it to reach at least 9 per cent of GDP. If that occurs, mining investment will be about as large as business investment in the rest of the private economy combined. As a result of that, total business investment will reach new highs this year, and next.

Graph 4
Real Business Investment
Per capita, log scale



* Excludes livestock and orchards
Sources: ABS; RBA

Hence, there is a very large build-up in the nation's capital stock occurring. If it is well managed and soundly based, that ought to allow the possibility of further growth in output and incomes. The investment phase of the mining boom will start to tail off in a couple of years' time, after which the shipments of natural resources should step up significantly .

We might expect by then as well that some other areas of investment spending that are weak at present will be picking up. More generally, I suspect we will discuss the nature of investment quite a bit in coming years as we grapple with structural change in the economy and powerful shifts in the population's needs (think of investment in the aged-care sector, for example, or public infrastructure needs). We will also be looking for productivity pay-offs from the various investments .

But the key message for today is that the multi-speed economy is not just about the mining sector squeezing other sectors by drawing away labour and capital and pushing up the exchange rate. It *is* doing that, but slower growth in sectors that had earlier done well from unusually strong gains in household spending would have been occurring anyway, even if the mining boom had never come along. It is these changes in behaviour by households, in asset markets and in credit demand, that I think lie behind much of the disquiet – dissatisfaction even – that so many seem to have been expressing. But this would, as I say, have occurred with or without the mining boom. In fact, without the mining boom and its spillovers, we would have been feeling the effects of those adjustments rather more acutely than we do now. The period of household gearing up could have ended in a much less benign way.

Implications for Policy

What are the implications of these trends for economic policy, and particularly monetary policy? Does it have a role in helping the adjustment?

One thing we should not do, in my judgement, is try to engineer a return to the boom. Many people say that we need more 'confidence' in the economy among both households and businesses. We do, but it has to be the right sort of confidence. The kind of confidence based on nothing more than expectations of ever-increasing housing prices, with the associated willingness to continue increasing leverage, on the assumption that this is a sure way to wealth, would not be the right kind. Unfortunately, we have been rather too prone to that misplaced optimism on occasion. You don't have to be a believer in bubbles to think that a return to sizeable price increases and higher household gearing *from still reasonably high current levels* would be a risky approach. It would surely be a false basis for confidence. The intended effect of recent policy actions is certainly not to pump up speculative demand for assets.[6] As it happens, our judgement is that the risk of reigniting a boom in borrowing and prices is not very high, and this was a key consideration in decisions to lower interest rates over the past eight months.

Hence, I do not think we should set monetary policy to foster a renewed gearing up by households. We can help, at the margin, the process of borrowers getting their balance sheets into better shape. To the extent that softer demand conditions have resulted from households or some businesses restraining spending in an effort to get debt down, and this leads to lower inflation, our inflation targeting framework tells us to ease monetary policy. That is what we have been doing. The reduction in interest rates over the past eight months or so – 125 basis points on the cash rate and something less than that, but still quite a significant fall, in the structure of intermediaries' lending rates – will speed up, at the margin, the process of deleveraging for those who need or want to undertake it.

6 As in 2009, the challenge is 'how to ensure that the ready availability and low cost of housing finance is translated into more dwellings, not just higher prices'. See Stevens G (2009), 'Challenges for Economic Policy', RBA *Bulletin*, August, pp 10–16.

In saying that, of course, we cannot neglect the interests of those who live off the return from their savings and who rightly expect us to preserve the real value of those savings. Popular discussion of interest rates routinely ignores this element, focusing almost exclusively on the minority of the population – just over one-third – who occupy a dwelling they have mortgaged. The central bank has to adopt a broader focus. And to repeat, it is not our intention either to engineer a return to a housing price boom, or to overturn the current prudent habits of households. All that said, returns available to savers in deposits (with a little shopping around) remain well ahead of inflation, and have very low risk.

So monetary policy has been cognisant of the changed habits of households and the process of balance sheet strengthening, and has been set accordingly. As such, it has been responding, to the extent it prudently can, to one element of the multi-speed economy – the one where it is most relevant.

What monetary policy cannot do is make the broader pressures for structural adjustment go away. Not only are the consumption boom and the household borrowing boom not coming back, but the industry and geographical shifts in the drivers of growth cannot be much affected by monetary policy. To a large extent, they reflect changes in the world economy, which monetary policy cannot influence. Even if, as a society, we wanted to resist the implications of those changes other tools would be needed .

In fact Australia does better to accommodate these changes, and to think about what other policies might make adjustment less difficult and quicker for those adversely affected. It is in this area, in fact, that we need more confidence: confidence in our capacity to respond to changed circumstances, to respond to new opportunities, and to produce goods and services which meet market demands. It is also to be hoped that some of the recent positive data outcomes will give pause to reflect that, actually, things have so far turned out not too badly .

Conclusion

We face a remarkable period in history. The centre of gravity of the world economy seems to be shifting eastwards – towards us – perhaps even faster than some of the optimists had expected. Granted, that is partly because the relative importance of Europe seems to be shrinking, perceptibly, under the weight of its internal problems. But even if the Europeans manage the immediate problems well, there is no mistaking the long-run trend.

That this comes just as a very unusual period for household behaviour in Western advanced countries (including Australia) has ended, has been a remarkably fortuitous combination for Australia. Certainly it means we have the challenge of adjusting our behaviour and our expectations to new drivers for growth and new imperatives for responsiveness, but we do so with growing incomes, low unemployment and exposure to Asia. That is infinitely preferable to the sorts of adjustments that seem to be the lot of so many others at present.

The Australian community has understood that we can't base growth persistently on falling saving and rising debt and that is forcing changes to business models. But it has to be said that the return of a certain degree of thrift actually strengthens our medium-term position. If we can marry that to a focus on incrementally improving the way we do things – lifting productivity – there is actually a lot to look forward to. For Australians, the glass is well and truly half full.

Innovation, Stability and the Role of the Payments System Board

Glenn Stevens, Governor

Address to the Australian Payments Clearing Association 20th Anniversary Symposium
Sydney, 28 May 2012

I have not spoken publicly on payments system matters for some time, but it would be hard to find a better moment and a more appropriate event to take up the issue once more. This symposium of course marks 20 years of the Australian Payments Clearing Association (APCA) , which was set up as a vehicle to coordinate decision-making in relation to clearing and settlement following the recommendations of the Brady and Martin Reports in the years prior. It effectively replaced the Australian Clearing House Association, which was largely focused on cheques – the dominant payment system of the time.

Sharing the stage with APCA in the early days was the Australian Payments System Council, which had been established in the 1980s as an advisory body to the government aimed at promoting and influencing the development of payment systems. The Council was wound up when the Payments System Board was established in 1998, following the recommendations of the Wallis Inquiry.

APCA itself has evolved over the years. New clearing streams have been added and it has moved more into an industry representation role. Its make-up has also evolved; for instance I note that it was originally chaired by a representative of the Reserve Bank, an arrangement that ended in 1998.

All this change over an extended period is a sure sign that there has long been recognition of how critical governance arrangements are to payments systems.

The same debates that have occurred in Australia on these issues are repeated around the world. In fact, while the institutional arrangements for payments vary enormously from one country to another, it is remarkable how similar the debates are in each of those countries. I will be dealing with some of those issues today.

The other reason that it is a good time to be speaking about payments is that, as I am sure many of you are aware, the conclusions of the Reserve Bank's Strategic Review of Innovation are due to be released very soon. In fact, they will be out within the next couple of weeks. I cannot pre-empt the detailed findings, but I will share with you some of the major themes. Naturally, most people will focus on the implications for the payments industry. But the conclusions will also have implications for the way that the Payments System Board goes about its business in relation to retail payments issues. That is as it should be. The Board is not a static entity either and its role evolves over time.

My focus today, then, will be both innovation and the role of the Payments System Board. But with regard to the latter, I will talk not just about challenges in the retail payments sphere, but also about the other role of the Board that is probably less known to most of the people in this room – that is, the regulation of financial market infrastructure in order to preserve financial stability. This takes up a sizeable and increasing part of the Board's time.

Payments Innovation: Why is it Important?

Why all the focus on payments innovation? It might, on its face, seem strange for the Reserve Bank to have devoted a considerable amount of time and effort to reviewing innovation in the payments system.

For one thing, Australia has received great dividends from allowing, in most cases, commercial imperatives to drive the process of delivering new products, including payment products. We of course take a more cautious approach when it comes to matters of risk in the financial sector and we have seen how important those considerations are over the past few years. But in general, the notion that a regulator should be involved in matters of innovation might be seen as inconsistent with the regulatory philosophy in Australia. Certainly the Payments System Board has been reluctant to 'pick winners'.

The other reason that it may seem slightly anomalous for the Reserve Bank to be preoccupied with payments innovation is that we see a great deal of it around us and every sign that there is significantly more around the corner. If we think about the rapid rise of PayPal, the spread of chip and now contactless card payments, and the enormous amount of energy that is being focused on mobile payments at the moment, there is clearly no shortage of innovation in payments.

There is, however, a problem, and one about which the various players in the payments space themselves have become increasingly concerned. It is that the innovation in the customer-facing technology is moving at a pace much greater than the underlying infrastructure. This is a problem because innovation in a network industry is not like innovation in other industries. No matter how much time, effort and money a financial institution puts into its own systems and the ways in which customers interface with those systems, the payments service it can provide is only as good as the arrangements that allow payments to pass between institutions. These arrangements are in the cooperative space; not even the most innovative payments provider has the capacity to control these on its own.

It is easy to see how this could act as a constraint on innovation. Cooperative decision-making between competitors is notoriously difficult. The implications of different business mixes, strategies and investment cycles can easily derail cooperation, not to mention the constraints of committee-based decision-making. These are classic coordination issues, where some external impetus may be required to initiate change.

Even if coordination problems could be overcome for an innovation that is in the public interest, institutions collectively might find it difficult to make a business case to invest. Once again, this largely seems to be a quirk of the payments industry. Payment systems are 'two-sided markets'. In other words, the market must satisfy two distinct sets of customers; for instance, a point of sale payment system can be successful only if it is adopted by both consumers and merchants. In two-sided markets the price faced by each set of end users may be altered so that the party with the greatest decision-making power faces a low price. This is most evident in the credit card market, where consumers typically face a low or negative price while merchants face a relatively high price. The flow of interbank fees to support this has traditionally made issuing cards profitable for financial institutions. Because payment systems often do not simply operate on a user-pays model, establishing a business case can be more difficult than in other industries, even where there is a clear demand from end users.

This means there is a case for some kind of mechanism to overcome coordination problems and to ensure that any disconnect between the public interest and the business case is properly managed. But any intervention by a regulator like the Payments System Board of the Reserve Bank must of course be carefully considered.

The Payments System Board will be addressing the issue from two different perspectives. First, it will be expressing some views about the governance

arrangements within the industry, with the aim of giving those the best possible prospects of successful collective decision-making and appropriate consideration of the public interest. More details on that will be included in the conclusions of the Review.

Second, the Board believes that in order to overcome coordination problems, it will need to take a stronger role in setting some general goals for the payments system, so as to help provide an appropriate focus for the innovation efforts of the various players. There will need, in the Board's view, to be greater interaction between the Board and the industry to establish and work towards shared goals. Our assessment of experience both in Australia and overseas is that superior industry outcomes have been achieved when there has been a policy influence promoting public interest goals. Examples range from reform of the ATM system in Australia to the establishment of the Faster Payments Service – for real-time retail payments – in the United Kingdom. Therefore, you can expect the conclusions of the Review to have more to say about a more constructive engagement between the Board and the industry in relation to payments innovation.

The Board will not be picking winners, nor generally will it dictate the technical details of systems. The Payments System Board is a policymaking body. It would not seek to impose the technical details of solutions, unless it was aware of a very clear public policy basis for preferring one approach over another. In most cases, it is for the Board to provide guidance as to what outcomes it believes are required in the public interest, but not specific solutions. The latter are clearly the domain of industry experts, with their knowledge of the technical and business constraints. But it is important that they be informed by the Board's broader policy goals.

The Board's thinking about those goals has been informed by two considerations.

First, early in the Strategic Review of Innovation, the Board identified a number of attributes that were valued by end users, as well as some that are important in payments system design. These included such things as: the timeliness of payments; accessibility; ease of use; ease of integration into other processes (such as business systems); and safety and reliability. Examining the services the payments system offers in terms of these attributes strongly suggests the areas where greater innovation in the payments system is needed, and where the underlying infrastructure might be imposing constraints on innovation.

Second, the Board has considered developments in retail payment systems around the world. An understanding of what is available elsewhere and whether those things are valued and adopted by the users of payment systems is a very important commonsense test when considering what our own system ought to look like. This effort has in part been aided by interactions with many parties over the course of the Strategic Review, along with the work of the Committee on Payment and Settlement Systems of the Bank for International Settlements, which has conducted an examination of innovation in retail payment systems.

On the basis of this information, the Board sees the need to focus on the infrastructure capabilities of retail payment systems, rather than the specific products that are offered. Appropriate infrastructure can only be delivered cooperatively, but success in that delivery will allow payments providers to compete vigorously over the products and services they offer to customers. That should be true, not just for deposit-taking institutions, but for other innovative players that have something to offer in the provision of retail payments. I talked before about customer-facing innovation outpacing innovation in core infrastructure. What the Board is interested in is lifting the constraints imposed by that infrastructure.

As to the specific areas on which the Board is focused, to those who have followed this process, and the documents that have been produced along the way, it will be no secret that one area on which the Board has focused is the timing of payments. It is very clear

that both individuals and businesses are demanding greater immediacy and greater accessibility in all facets of their day-to-day activities. This includes payments. People expect to be able to book an airline ticket and choose their seat at any time of the day or night. They expect to be able to download music or a book while they are sitting on the bus. Our payments system supports these transactions by allowing the payment to be initiated, and goods or services exchanged, even though the funds will not be available to the merchant until some time later. This delivers the immediacy to the transaction itself, as people have come to expect.

On the other hand, if a business or an individual wishes to *receive* funds into an account at a financial institution, that same immediacy is not available. For instance, if a business wishes to make timely use of the proceeds from a large shipment, or an individual is in need of emergency assistance from a government agency, options are very limited. This is because the infrastructure that underpins retail payments assumes that making funds available the next business day is sufficient. This has served acceptably well to date, but, with systems for real-time transfers available in countries ranging from the United Kingdom to Mexico, Australia's approach is starting to look a bit dated. It is our belief that availability of real-time transfers would fill some important existing gaps, but would also open up enormous potential for innovation on top of that system. This would contrast with the current situation, where a significant amount of effort is being put into finding workarounds for the current constraints of our systems.

Another element of the timeliness of payments is the availability of the payments system out of standard banking hours. Some systems, such as card payment systems, give the impression of operating 24 by 7, but in reality no funds move between financial institutions out of hours, constraining the services that can be offered to end users of the payments system. Some would argue that anything more is unnecessary and that consumers and businesses are not unduly inconvenienced by this. But we receive enough complaints about this to suggest that expectations are changing. It is not that long ago that it was accepted that if a person wanted to ensure that they had enough cash to see them through the weekend, they had to make sure that they visited their bank branch by closing time on Friday. But we would all see that as completely unacceptable these days and I think we have reason to hold the rest of our payments system to the same standards.

One question that we have come back to during the Strategic Review is what sort of payments system architecture would best allow us to deliver the features that we think are going to be demanded by payments system users in the years to come, including improved timeliness. Australia has had a long-running practice of operating payment systems that are based on both bilateral business agreements between participants and the bilateral exchange of payments between those participants. This model presents a number of problems, not least the complexity and cost of adding a new entrant, which must establish similar arrangements with each existing participant.

Some of the significant changes we have seen in the payments system over the past few years have represented partial moves away from those bilateral arrangements. This includes the move to the industry community of interest network for clearing payments and the creation of eftpos Payments Australia Limited to centralise governance of the eftpos system. These changes denote recognition of the constraints of bilateral payment systems. While the Reserve Bank does not advocate walking away from some of the well-established and low-cost bilateral systems we have, we can see a strong case for any new architecture that is established to meet emerging needs to be based on centralised architecture; that is, a hub and spokes, rather than bilateral, model.

So these are some of the things that will gain attention in the conclusions of the Strategic Review

of Innovation when they are released in the next couple of weeks. I do not mean to suggest that the issues identified by the Review will be solved quickly, but I think we – the industry and the regulator – owe it to the users we serve to embark now on the process that will get us on to the right path. As a first step, in the months following the release of the conclusions of the Review, I expect there to be a healthy dialogue with the industry on the sorts of goals that the Payments System Board has in mind for the payments system, along with more focused discussions on some specific solutions.

Other Work of the Payments System Board

I have been talking about the innovation review and the way it will alter, in some respects, the role played by the Payments System Board in the future. But it is also worthwhile to talk briefly about other developments that also have an impact on the direction of the Board more generally.

The reality is that the Board's mandate of promoting stability, efficiency and competition requires it to play quite different roles in respect of two quite different sets of players in the financial system. Most people in this room would think of the Payments System Board as the body that capped credit card interchange fees and worked with the industry to achieve reforms in the ATM system. There is another set of players out there who think of the Payments System Board as the body that seeks to ensure the stability of key financial market infrastructure, or 'FMIs', such as securities settlement systems and, increasingly importantly, central counterparties – which stand between financial market participants in order to better manage risk. Much of this role came to the Board later than its initial payments mandate, when the *Corporations Act 2001* adopted licensing arrangements for all clearing and settlement facilities in 2001. As important as the Board's work on payments system efficiency is, the stable operation of FMIs has a direct bearing on financial market and financial system stability. Oversight of FMIs therefore demands a significant proportion of the Board's time. It is also this work that is expanding most rapidly.

In fulfilling its responsibility for the stability of financial market infrastructure, the Board has historically focused on the high-value payments system – the Reserve Bank Information and Transfer System – with which people in this room are more than familiar, along with the debt and equities settlement systems operated by the ASX and the equities and derivatives central counterparties also operated by the ASX. In addition, the Reserve Bank has for some years been part of an international cooperative oversight arrangement for the global foreign exchange settlement system, Continuous Linked Settlement (CLS).

Two developments mean that the Bank's and the Board's workload in this area is increasing. First, while most financial market infrastructures serving Australian markets are currently operated by one entity, cross-border competition is increasing, particularly for central counterparty clearing services. It is likely that the Bank's oversight responsibilities will increase and become more complex as it has to deal with new entities offering services in the Australian market.

The other development affecting the Board's role is the global push to strengthen financial regulation in the wake of the global financial crisis. That includes the push for OTC derivatives to be cleared through central counterparties and reported to trade repositories, as embodied in the G-20 commitments from Pittsburgh in 2009. All this means financial market activity that is important to Australia will be increasingly reliant on centralised financial market infrastructure.

The logic of this reform is that it will reduce and simplify bilateral exposures between counterparties. But it will also increase the systemic importance of the financial infrastructure, because we will in effect be creating a small number of 'single points of failure'. Hence the resilience of that infrastructure will be critical, and the obligation of the official sector

to provide proper oversight to ensure that resilience will correspondingly increase.

These trends have been recognised in a number of areas that will affect the Payments System Board's work in the period ahead.

- The international standards used by central banks and securities regulators around the world as the cornerstone for oversight of FMIs have been comprehensively rewritten to reflect the lessons of the crisis and the increased importance of central counterparties and trade repositories. The revised standards were released just last month and it will be a substantial task for the Bank to reflect those changes in its own regulatory framework.
- The Council of Financial Regulators has made a number of recommendations regarding the framework for regulation of FMIs in Australia, including that the Reserve Bank – along with the Australian Securities and Investment Commission – be given the power to, *in extremis*, 'step in' and operate an FMI in the event that it suffers financial or persistent operational problems. The Bank has long had this capacity in regard to Austraclear, because of the systemically important nature of that system for the operation of the domestic money market. Domestic work in this area is occurring in parallel with international efforts to develop principles for the recovery and resolution of FMIs. Over the coming year, the Board will need to devote increasing attention to establishing how step-in and other recovery and resolution tools for FMIs would operate in Australia.
- Following further work by the Council of Financial Regulators, the Treasury is consulting on a legislative framework to support mandating of central clearing, exchange trading or reporting of OTC derivatives transactions, should this be warranted. Initially, however, the Council intends to rely on existing market and regulatory incentives to promote central clearing. The Payments System Board is likely to have a central role in the new regime, such as overseeing new central counterparties entering the market to clear these products, as well as input into decisions about when mandates for central clearing might be appropriate.
- It is inevitable that the Bank will become increasingly involved with cooperative oversight arrangements for financial market infrastructure that operates on a global basis.

The upshot of all this is that the financial stability element of the Payments System Board's role is only going to increase. This is a continuation of a trend that has been under way for some time, and to which we have already responded with a significant boost in the resources we devote to these issues within the Bank. The work of the Payments System Board on the regulatory framework complements the Bank's broader focus on financial stability, which is of course overseen by the Reserve Bank Board.

Conclusion

There is a clear sense within the Payments System Board that our work over the next few years will in some respects take us into some different activities. The work for which the Board has mostly been known has focused on addressing problems or distortions in individual systems, albeit with knowledge that these distortions had significant effects on other parts of the system. The solutions have tended to be focused on the rules of those systems. Payments innovation requires something quite different because it is more clearly about solving coordination problems, which by their nature are likely to be ongoing and do not necessarily occur within the confines of an existing system. Addressing this issue will require a change in the nature of the conversation between the Board and the industry. That conversation began with the innovation roundtable earlier this year, and will continue in the period ahead, stimulated, hopefully, by the release of the conclusions from the innovation review. At the same time, the Board's mandate in relation to financial stability remains a key focus, and the global response to the financial

crisis dictates that we take on a greater, and probably more complex, role as the global focus shifts to centralised financial market infrastructure.

This doesn't mean that the Board will be paying less attention to the payments system efficiency matters for which it is perhaps best known. Much as we might want to live in a world where that type of regulation is not necessary, unfortunately the issues do not become any fewer or any less complex, and the Board is committed to continuing to meet its legislated responsibilities in this area. In fact, one challenge from innovation is that old tensions about competition might emerge in new ways. The Board will need to remain just as vigilant in these areas in the years to come.

Economic Conditions and Prospects

Glenn Stevens, Governor

Address to the Credit Suisse 15th Asian Investment Conference
Hong Kong, 19 March 2012

Thank you for the invitation to join this conference here in Hong Kong.

Asia remains one of those parts of the world where prospects for growth are exciting, and where people expect – for good reason – the future to be better than the past. Yet for the past six months or more, global attention has been riveted on the 'old world' – continental Europe – where many have feared the best was in the past.

The Reserve Bank of Australia has taken a very close interest in the events in Europe. At the purely analytical level, the sheer magnitude and complexity of the problems that have arisen will be a fertile area of study for students of economics and other disciplines for decades to come.

Of course the adoption of the euro was not solely, maybe not even primarily, an economic decision, but it nonetheless had economic consequences. In several very important respects the euro area's first decade was a remarkable success. But there were important structural stresses underneath and some of these have suddenly become more visible in the past few years. Now the euro's future depends on whether the commitment of the Europeans extends to building more of the economic substructure consistent with the single currency, which will entail both fiscal and supply-side reforms. It is of course quite difficult to lay foundations when the house has already been erected on the site, but that is the job ahead in Europe.

I think the evidence is that European policymakers understand the importance of their response and are going to great lengths to implement it. Progress has been made. But there is a long way to go yet. During that long journey, there will surely be numerous episodes of heightened anxiety, any one of which could erupt into a more extreme crisis if one or more of the key actors makes a serious mistake.

In terms of the practical impact of these events, at present we can say that the euro area has been in recession for some months. Some individual countries have been in a deep downturn for much longer than that, but I am speaking here of the euro area in aggregate. The recession is expected by official forecasters in Europe, and bodies like the International Monetary Fund, to be a relatively mild one, though all would acknowledge that it is impossible to be sure, as is usually the case with such episodes.

We see three potential channels of effects from these events to Australia.

The first is a direct trade link. Australia's exports of goods and services to Europe are actually quite modest (Table 1). By far the biggest trade relationships these days are with Asia. Hence, a bigger impact of the euro crisis on Australia would come indirectly via trade with Asia.

It is pretty clear that growth across much of East Asia moderated in 2011 and that there has been some effect of the slower euro area economy on Asian exports.

There have been other forces at work too – the Japanese tsunami a year ago had significant effects on production chains around Asia. These effects had

Table 1: Australian Exports of Goods and Services by Destination
2010

	Value US$ billion	Share Per cent
East Asia (excl China and Japan)[(a)]	61	23
China	59	23
Japan	42	16
European Union[(b)]	25	10
India	18	7
United States	13	5
New Zealand	10	4
Other	32	12

(a) Includes ASEAN member nations, Hong Kong, Korea and Taiwan
(b) EU 27 including the United Kingdom
Sources: ABS; RBA

probably not completely disappeared when the floods in Thailand had another significant impact, which may still be affecting the data. So detecting the effects of weaker European growth against the backdrop of the supply disturbances to trade patterns following these natural disasters might be a little like trying to pick up one conversation in a crowded room: there's a lot of background noise.

But most of the high-frequency data on trade and production did not seem to show the slowing intensifying as we went into 2012. It is too early yet to say that a new strengthening is under way. But we do not seem to be seeing the signs of a rapid fall in trade that we saw in late 2008.

A reference to 2008 brings me to the third channel through which we think about the effects of the European crisis. And it is perhaps the most unpredictable and potentially most damaging kind: the financial link. It would not be the direct exposures of Australian institutions to the most troubled countries of Europe that would be of concern, because those are quite small. It would be the more general impact on global markets of a European problem. What we saw in late 2008 was effectively a closure of funding markets for financial institutions for a period, after the failure of Lehman Brothers. These sorts of events affect virtually all countries, because the impacts on credit conditions, trade finance, share prices, and household and business confidence – all of which lead to precautionary behaviour – occur almost instantaneously everywhere.

There was a period late in 2011 where there was a genuine fear that this could happen again. Funding markets tightened up and effectively closed for many European banks. Interbank activity more or less ceased in Europe. The cocktail of sovereign credit concerns, large bank exposures to those sovereigns, possible bank capital shortfalls and prospective large debt rollover needs of banks, not to mention the unpredictable dynamics of the Greek workout, had everyone very much on edge. The effects were felt globally. The actions of the European Central Bank have alleviated the immediate funding issues for banks. Tensions eased a good deal, and this has been reflected in reopened term markets, falls in sovereign spreads for countries like Italy and Spain, and a rise in equity prices. We have also heard reports that some European participants in trade finance in Asia that had been pulling back in the last quarter of 2011 have begun to seek some business again recently.

Yet much more needs to be done to put sovereigns and banks onto a sound footing longer term. Interbank activity remains constrained and

unsecured funding remains expensive for banks. It is noteworthy that large corporates can borrow more cheaply than can banks with higher credit ratings, such is the odium investors attach to banks (though this is not confined to Europe). Much also has to be done on the supply side to generate growth in Europe, for without growth the fiscal arithmetic will always be challenging, if not impossible. The road to sustainability on these multiple fronts is a long one, which is why, as I say, there will be more periods of anxiety in the months (and years) ahead.

While everyone has been fixated on Europe, the United States economy has avoided a 'double dip' recession, and continues grinding out a modest expansion. In recent times, the pace of jobs growth in the United States has picked up and other labour market indicators are showing signs of improvement.

The United States has its own challenges of course, not least that it must sooner or later have some fiscal consolidation and that may slow growth. America's inherent dynamism and capacity to innovate, however, which is matched by few other societies, has to be seen as a positive over the longer term.

Then there is China. The slowdown in Chinese growth – from 10 per cent to a mere 8 per cent! – is a major talking point, and some see it as portending a major crash. But some slowing was required to reduce inflation and, therefore, put growth on a more sustainable path. One can certainly think of ways in which China could have a 'hard landing' at some point. It is very difficult for anyone to know (doubly difficult, I think, if trying to know while sitting in a trading room in New York or London). But if the Chinese economy does slow 'too much', one could expect that the Chinese authorities will have both the will and the capacity to respond, the more so now that inflation has moderated.

China will have cycles like other economies, but it seems likely that the Chinese economy will grow pretty strongly *on average* for a while yet. It will be a very large economy. Even at the new growth target of 7½ per cent, a lower target than in the past five years (all of which were, of course, exceeded), Chinese GDP will equal that of the United States, in purchasing power parity terms, in about a decade. It will exceed that of the euro area within the next few years.

There are issues of rebalancing the sources of growth in Asia, to which I shall return shortly. But the main point for now is that the global economy is faced at present with a year of sub-trend growth in 2012, according to international forecasters. This is a subdued but not disastrous outcome. And Asia in particular is well-placed to do fairly well, given sensible policies. Downside risks certainly do remain, and are easier at this point to imagine than upside ones. At this point though they remain risks, rather than outcomes.

What then about Australia? At the moment, the viewpoints of those inside Australia differ somewhat from those of people outside Australia.

Viewed from abroad, judging by what people say, observers see an economy that experienced only a relatively mild downturn in 2008–2009, that made up the decline in output within a few months, and that has continued to expand, albeit at only moderate pace, since then. They see an economy that has not experienced a significant recession for 20 years, that has strong banks and little government debt – and that debt remains AAA rated. Some observers worry about high levels of housing prices and household debt. This is understandable given the problems that have occurred in some other countries. But then others point out that the arrears rate on mortgages, at 60 basis points, is quite low, and that the rate of new construction of dwellings in recent years has been low relative to population needs.

Foreign investors see a country that remains quite open to them, and that, reflecting its economic circumstances, offers rates of return that are high by international standards, even though they are low by Australian historical standards. They understand the potential returns on the mineral and energy wealth stored in or around the Australian continent, and

that our terms of trade have over the past year been higher than at any time for more than a century. There has been increased appetite for Australian dollar-denominated assets, particularly sovereign debt, and the Australian dollar has risen strongly, to be at its highest level in three decades.

Those at home see this as well. As consumers, they have responded to the higher exchange rate with record levels of international travel. As producers, however, they also see, with increasing clarity, that the rise in the relative price of natural resources amounts to a global and epochal shift, which carries important implications for economic structure in Australia, as it does everywhere else. Some sectors of the economy will grow in importance as they invest and employ to take advantage of higher prices. Other sectors will get relatively smaller, particularly in the traded sector, as they face relatively lower prices for their products and competition for inputs from the stronger sectors. The exchange rate response to this shift in fundamentals is sending very clearly the signal to shift the industry mix, though this would occur at any exchange rate. The shift in relative prices is a shift in global prices that is more or less invariant to the level of the Australian dollar.

In other words, while the global shift in relative prices is income-enhancing for Australians overall, it is also structural change-inducing. A former leader once quipped that 'microeconomic reform' was such a common topic in Australian discussion that even the parrots in pet shops were talking about it. I think the same is increasingly true of structural change: it is a term that will be on everyone's lips over the next few years.

Structural adaptation is hard work. Few volunteer for it. But we have little choice but to do it, not just to make the most of the new opportunities that have been presented, but to respond to the changed circumstances that some industries face as a result. In this sense, Australia, though blessed with many natural endowments, is in the same position as most other nations. We have to adapt to changing times. This perhaps helps to explain the sense of concern in some parts of the Australian community and the tendency to focus on the difficulties, rather than the opportunities, which come with our situation.

This difference in perceptions between foreigners and locals is quite unusual. For most of my career, the difference has tended to be in the opposite direction. We always seemed to struggle to get foreign observers and investors to give us credit for performance we thought was pretty reasonable. And it is only little more than a decade ago that Australia was being described as an 'old economy'. Now perceptions have changed, at least in a relative sense.

The shift in global portfolio allocation that seems to be associated with this is potentially very important. In a more risk-averse world, the supply of genuinely low-risk assets seems smaller. Countries that have offered a reasonably stable economic environment and relatively sound public finances – of which Australia is one – are attracting greater flows of official capital now than they did a decade ago. This has recently been adding to the upward pressure on the exchange rate, independently of the rise in the terms of trade.

As is so often the case in economics, there are two sides to this. On the one hand, the additional rise in the exchange rate pushes our cost structure in the tradable sectors of the economy up relative to other countries. This is a contractionary force and adds further to the already considerable pressure for structural change.

On the other hand, it amounts to a reduction in the cost of international capital for Australian borrowers, particularly government borrowers. At the margin, this has to make the task of ensuring fiscal soundness a little easier. Even for private borrowers the unusually low level of long-term rates for the official sector offsets a good deal of the widening in spreads due to perceptions of higher private credit risk (that being, of course, a global phenomenon).

A greater flow of cheaper capital to a country is an advantage. It is important, of course, that it is

used wisely. When risk appetite is strong, and risk assessment by lenders too loose, such conditions can result in problems. For example, it has been argued that the flow of capital to the United States looking for low-risk assets was channelled by the US financial system into structured products that had the illusion of high quality, but which ultimately resulted in the subprime mortgage crisis.

At this point, however, we do not seem to have that problem in Australia. If anything, households, businesses and governments are looking, to varying degrees, to reduce their debt. The financial sector is quite risk averse in its lending practices, particularly towards some of the business sectors that might be willing to take on additional debt. In such circumstances, the competitiveness-dampening effect of the higher exchange rate on the traded sector that results from the portfolio shifts may, for some period of time, outweigh the expansionary effect of a lower cost of capital.

The economic background to this shift is an economy where a range of indicators had been tending to suggest that growth was running close to average. Key business surveys, for example, have suggested average performance compared with the past 20 years; the rate of unemployment has been little changed at what remains, by the standards of the past three decades at least, a reasonably low level. On the other hand, recent national accounts data suggest growth in the non-farm economy somewhat below trend over 2011.

Overall, recent economic performance in Australia is not too bad, particularly when compared, over a run of years, with a number of other advanced economies.

But neither is it so good that it cannot be improved. The full range of policies – macroeconomic and structural – need to play their part in seeking that improvement.

Monetary policy can play a role in supporting demand, to the extent that inflation performance provides scope to do so. But monetary policy cannot raise the economy's trend rate of growth. That lies in the realm of productivity-increasing behaviour at the enterprise, governmental and inter-governmental levels. Improving productivity growth is just about the sole source of improving living standards, once the terms of trade gain has been absorbed. This is increasingly being recognised in public discussion, but it is important we do more than just debate it.

Nor can monetary policy obviate the pressure for the production side of the economy to change in response to altered relative prices. These changes in relative prices are essentially given to us by the world economy; they are not driven by any policy in Australia.

So in Australia, reorienting our economy, adapting to structural changes and improving productivity performance are challenges we face. But we are hardly alone in facing adjustment challenges. More generally, reorienting economies in the Asian region, and around the world, remains a major challenge.

Changes in the right direction have been occurring. Countries in this region have been prepared increasingly to develop and follow domestic policy frameworks that guide their behaviour in sensible ways (for example, inflation targeting). They have been prepared to accept some more movement in exchange rates, and to seek more domestic-led growth in demand. China in particular has seen the ratio of domestic demand to GDP rise over the past few years, reversing much of an earlier decline.

More of this will be required, however, over time, for at least three reasons.

First, it is not a sustainable model to expect developed world households to consume ever higher volumes of the output of Asian factories with borrowed money. That model cannot return, which means that the imperative to find domestic sources of growth is not just a cyclical one.

Second, the eventual sheer size of the Asian economy is such that it will have to absorb more of its own output as it continues to grow. Continental-size economies such as the United States and the euro

area have long done so. Here it is important to note that for East Asia outside of China and Japan, the decline in domestic demand relative to GDP that understandably occurred during the crisis of 1997–1998 largely remains in place, more than a decade later.

Third, and most important, it will surely be the most enriching strategy for the people of this region to turn more of their own savings to developing their own physical and human capital. Yet at present trillions of dollars are lent by taxpayers in Asia to some highly indebted advanced world governments at yields that seem extraordinarily low. It seems very unlikely that there are not better risk-adjusted returns in Asia than that.

So for all of us, the challenges are those of adaptation to changing circumstances and new opportunities. A fascinating journey lies ahead. We in Australia will be facing our own adjustment imperative. We will also be taking more than a casual interest in developments in the region in this 'Asian century'.

Developments in the Mining and Non-mining Economies

Philip Lowe, Deputy Governor

Address to the ADC Future Summit
Melbourne, 14 May 2012

Thank you very much for the opportunity to speak today. It is a pleasure to be in Melbourne again.

As you are all no doubt aware, the Australian economy is currently going through some major structural adjustments. It is adjusting to a once-in-a-century boom in mining investment and the terms of trade, and to a very high exchange rate. It is also adjusting to a return to traditional patterns in household spending and borrowing after more than a decade in which both consumption and debt grew much faster than household income.

These changes are occurring in an economy that has, over recent times, performed much better than other advanced economies. The unemployment rate in Australia remains low, output is continuing to expand, inflation is contained, the banking system is strong and public finances are in much better shape than in other advanced economies. Yet the structural changes that are taking place are creating a sense of unease for many in the community, particularly among those who are not benefiting directly from the mining boom.

So this morning, I would like to touch on three interconnected issues, all of which are related to structural change.

The first of these is the recent GDP growth and inflation outcomes and what they tell us about the evolving balance of demand and supply in the economy.

The second issue, and one that the Bank staff have been grappling with for some time, is the different growth paths for the mining-related and non-mining-related parts of the economy. A particular question here is what rate of output growth in the non-mining-related part of the economy is likely to be consistent with low inflation during the once-in-a-century investment boom that we are now experiencing.

And the third issue that I would like to touch on is the recent decisions on monetary policy and the Reserve Bank's latest forecasts.

GDP Growth and Inflation

A year ago, the Reserve Bank's central forecast was for aggregate output in Australia to increase by around 4¼ per cent over 2011. Our forecast for aggregate demand growth was a bit higher than this, with some of the very strong growth in demand being met by even stronger growth in imports.

As things turned out, the outcome for aggregate demand was pretty close to the expected outcome – at an above-trend rate of 4½ per cent compared with the forecast 4¾ per cent. In contrast, growth in aggregate output – at a below-trend rate of 2¼ per cent – was slower than we had expected.

When we look at why output growth over 2011 was not as strong as forecast, well over half of the difference is accounted for by unexpectedly weak growth in exports, particularly of coal. It has taken

longer than was originally expected to remove water from the flooded coal mines and for firms to take advantage of increases in port and rail capacity. As a result, despite all the talk about Australia's resources boom, the volume of resource exports increased by only 1 per cent over 2011. A much stronger outcome than this is likely both this year and next.

But exports are, by no means, the full story. Other factors were also at work, with more of the strong growth in domestic demand being met through overseas production – rather than domestic production – than was originally expected. An important factor here has been the composition of the growth in demand.

As I mentioned a moment ago, growth in *aggregate* demand was pretty close to what was expected. However, the *composition* of that growth contained a few surprises. In particular, while the Reserve Bank had long expected a very large lift in investment in the resources sector in 2011 – and this indeed occurred – the increase was even larger than had been forecast. As one indication of the very strong outcome, the ABS estimates that engineering investment increased by almost 50 per cent over 2011. On the other hand, growth in demand not directly related to mining investment was not as strong as was forecast.

The biggest surprise was probably in terms of home building. We had expected dwelling approvals to pick up gradually over 2011, but this pick-up did not eventuate. One possible explanation for this is that it is one of the side effects of a return to more traditional savings and borrowing behaviour by households. This change in behaviour is having ripple effects through the economy, including through a lowering of expected capital gains on housing. This has made developers, financiers and households less willing to commit to new construction despite rising rental yields, lower prices relative to income and ongoing growth in population. While, at some point, the improving fundamentals should generate a pick-up in home building, the recent forward-looking indicators do not suggest that this is imminent.

Another area that was weaker than expected was private business investment outside the resources sector. This partly reflects the decline in business confidence over the year, with a number of factors, including renewed concerns about the fiscal problems in Europe, adding to uncertainty. Public demand was also weaker than was expected. In contrast, consumption growth – at around 3½ per cent – was in line with our forecasts, with total consumption increasing broadly at the same rate as household income.

This composition of demand growth – with its heavy weight on mining-related investment, which tends to be very import intensive – has contributed to very strong growth in aggregate imports. Or put a little differently, it has meant that the strong growth in aggregate demand that we have seen has, at least to date, not boosted domestic production in the same way as might have occurred in the past. As a result, there has been less pressure on domestic capacity than earlier expected.

One consequence of this is that the inflation pressures that were evident in the beginning of 2011 have moderated. At the beginning of last year, underlying inflation looked to have reached a low point of about 2¼ per cent and was starting to rise and was expected to be close to 3 per cent by the end of 2011. As things turned out, inflation did pick up in the June quarter last year, but it then began to moderate, with the latest readings for underlying inflation over the year to the March quarter being in the lower part of the medium-term target range of 2–3 per cent.

Not surprisingly, the prices data reflect the particular composition of aggregate demand that has been witnessed over recent times. In parts of the resources sector, costs remain under upward pressure, with very strong demand for some intermediate inputs and for a range of occupations, predominately in engineering and science, but also in accounting, legal and human resources. In contrast, in a number of other parts of the economy, the subdued demand growth is putting downward pressure on prices. In

the latest CPI, there were, for example, declines in the prices of most goods, the price of domestic holidays, and for the price of new dwellings. These are all areas where demand growth has been soft and firms' margins are under downward pressure.

So, to summarise, the overall picture is one in which aggregate demand has grown strongly, and is expected to continue to do so. However, a higher-than-average share of that growth in demand is being met through imports, not only because of the high exchange rate but also because of the heavy weight of resource sector investment in overall demand. Partly as a result of this, as well as the direct effects of the exchange rate appreciation on the prices of imported goods, the recent inflation outcomes have been subdued.

The Mining and Non-mining Economy

I would now like to turn more directly to the second issue – that is, the size and growth rates of the mining-related and non-mining-related parts of the economy.

While for many decades, the ABS has published separate data on farm and non-farm GDP, it does not publish separate data for mining and non-mining GDP. The ABS does, however, publish gross value added of the mining sector. This is currently equivalent to a little less than 10 per cent of the output of the economy as a whole. But this figure does not include the very significant inputs into the mining sector produced by other domestic industries, and given this we have found it helpful to consider broader measures of the mining-related economy.

The main approach we have used is to start with the expenditure components of GDP, summing resource exports and investment in the resources sector and then subtracting the imported component of that investment. To this, is added resource production for domestic consumption, less the imported inputs that go into that production. This gives an estimate of total expenditure on resources production and investment that is satisfied by domestic activity. To complement this analysis, we have also used the input-output tables published by the ABS to understand the linkages from demand for mining output and investment to activity in other domestic industries. Not surprisingly, this analysis shows that mining investment draws significantly on construction activity, which in turn generates activity in industries such as business services, manufacturing, transport and wholesale trade.

This work suggests that the resources sector accounts for around 16 to 17 per cent of current GDP. Of course, different approaches and assumptions could generate either a higher or lower number, although most alternatives deliver estimates in the 15 to 20 per cent range.

The approach that we have adopted here includes the output of workers who indirectly provide inputs to the mining sector. Defined this way, mining-related employment accounts for around 8 per cent of total employment, although only around 2¾ per cent of the workforce is employed directly in mining and resource processing. The rest of the 8 per cent are involved in a wide range of activities related to the mining boom, including construction, utilities, project management, legal services, surveying, leasing, etc.[1]

Based on these figures, mining-related activity is estimated to have expanded by around 12 per cent over the past year and similar growth is expected over the next couple of years. If this expected growth eventuates, the mining-related sector's share of GDP will continue to increase and there will be strong jobs growth both directly in resource extraction and processing and in a wide range of ancillary activities. Indeed, it would not be surprising if, over the next

1 These figures exclude the boost to Australia's real *income*, as opposed to *output*, from the rise in the terms of trade. If this rise had not occurred and instead the terms of trade over recent years were equal to their average during the 1990s, real income in Australia would be around 15 per cent lower than it currently is. This is a very big effect and it is in addition to the current boost to output that is occurring because of the investment phase of the boom.

few years, growth in mining-related employment, broadly defined, was as high as one-half of the total growth in the Australian workforce.

If these broad forecasts for the mining-related sector come to be realised, then employment growth in the non-mining-related part of the economy averaging around ¾ to 1 per cent a year is likely to be needed to maintain the unemployment rate around its current level. The rate of growth in output in the non-mining-related economy would then depend upon the rate of productivity growth. If, for example, growth in labour productivity were to average 1 to 1¼ per cent per annum, then non-mining output might be expected to grow by around 2 per cent per year on average. This is above the recent rate of growth of the non-mining economy – which we estimate to be a bit less than 1 per cent – but below the long-term average of a bit over 3 per cent.

There are, of course, a wide range of other scenarios and these calculations are best thought of as a guide to what broad configuration of output growth might be possible given the supply-side constraints. Inevitably, there are a number of uncertainties, foremost among which are the future rate of productivity growth in the non-mining economy and the ability of the labour market to effectively match workers with the new employment opportunities that are being created. These are both issues that we will need to watch carefully over the period ahead as we continue to assess the balance between supply and demand in various parts of the economy.

The overall conclusion from this work is that given the huge pipeline of mining investment and the current relatively low unemployment rate, it is likely that conditions will continue to vary significantly across industries for some time to come. This work also serves as a reminder that improving productivity growth remains the key to strong output growth in the non-mining-related parts of the economy. It also suggests that there is some scope for non-mining-related demand to grow a little more quickly than has been the case in the recent past.

Monetary Policy

I would like to draw all this together, with a few remarks about monetary policy and the Reserve Bank's latest forecasts.

In the first half of 2011, our judgement was that strong growth in demand, together with evidence that inflation had picked up, required mildly restrictive financial conditions. As the year progressed though, and it became evident that this strong demand growth was not putting the expected pressure on domestic capacity and thus prices, the Board eased monetary policy, lowering the cash rate in both November and December. And then following the recent CPI data which provided confirmation of the subdued inflation pressures, the Board lowered the cash rate by a further 50 basis points, bringing the cumulative decline since November to a full percentage point. Over this period, most lending rates in the economy have fallen by around three-quarters of a percentage point and are now at slightly below-average levels.

The Bank's latest inflation forecast is for underlying inflation, abstracting from the effects of the carbon price, to stay close to its recent rate over the next one to two years. Given that the disinflationary impact of the appreciation of the exchange rate on prices of imported goods is likely to lessen over time, this forecast incorporates some moderation in domestically generated inflation pressures. In particular, it is based on an expectation that productivity growth will pick up somewhat as firms respond to the difficult trading environment that many currently face. It is also based on an expectation that the current pressures on margins being experienced by many firms in the non-mining-related parts of the economy will work their way up the production chain, leading to some moderation in growth in input costs, including in the cost of labour.

In terms of output, overall GDP growth is expected to return to around trend over the forecast horizon, with the recent reductions in the cash rate providing some boost to demand in the non-mining-related parts of the economy. However, it does seem likely that growth in some sectors will remain below the average experienced over the past couple of decades. How things develop will depend importantly on the ability of firms to improve their productivity and on the ability of the labour market to match workers with the new jobs being created.

Finally, as we work our way through these myriad issues, it is important that we do not lose sight of the considerable benefits to Australia from the lift in the prices of our key exports and the unprecedented level of investment that is taking place. This morning I have talked about how these developments are changing the structure of the economy. I have also talked about the challenge that they pose for assessing the balance between supply and demand. Yet for all this, the high commodity prices and high investment provide Australia with tremendous opportunities – opportunities that many other countries wish they had. As our society works out how best to take advantage of these opportunities, the job of the Reserve Bank is to ensure that inflation remains low and stable and that the overall economy remains on an even keel. The medium-term inflation-targeting arrangements that have been in place for nearly two decades now provide a strong framework in which to do this.

Thank you for listening and I look forward to your questions.

Reserve Bank Publications

Most of the publications listed below are available free of charge on the Bank's website (www.rba.gov.au). Printed copies of these publications, as well as a wide range of earlier publications, are also available on request; for details refer to the enquiries information at the front of the *Bulletin*.

Statement on Monetary Policy

These statements, issued in February, May, August and November, assess current economic conditions and the prospects for inflation and output.

Financial Stability Review

These reviews, issued in March and September, assess the current condition of the financial system and potential risks to financial stability, and survey policy developments designed to improve financial stability.

Annual Reports

- *Reserve Bank of Australia Annual Report*
- *Payments System Board Annual Report*
- *Equity & Diversity Annual Report*

Research Discussion Papers (RDPs)

This series of papers is intended to make the results of current economic research within the Bank available for discussion and comment. The views expressed in these papers are those of the authors and not necessarily those of the Bank.

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Conference Volumes

Conference volumes have been published on the Bank's website since 1993. The most recent titles are:

- *The Australian Economy in the 2000s*, December 2011
- *Reserve Bank of Australia 50th Anniversary Symposium*, July 2010
- *Inflation in an Era of Relative Price Shocks*, May 2010
- *Lessons from the Financial Turmoil of 2007 and 2008*, October 2008
- *The Structure and Resilience of the Financial System*, November 2007
- *Demography and Financial Markets*, October 2006
- *The Changing Nature of the Business Cycle*, October 2005
- *The Future of Inflation Targeting*, November 2004

Other Publications

The Bank periodically produces other publications that may take the form of submissions to inquiries, surveys or consultation documents. Some recent examples include:

- *Strategic Review of Innovation in the Payments System: Conclusions*, June 2012
- *A Variation to the Surcharging Standards: Final Reforms and Regulation Impact Statement*, June 2012
- *Review of the Regulatory Framework for the EFTPOS System: Consultation on Options for Reform*, June 2012
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