

### **Australia: Selected Issues**

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AUSTRALIA

**Selected Issues**

Prepared by Ben Hunt and Dmitriy Rozhkov (APD)

Approved by the Asia and Pacific Department

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	Contents	Page
I.	Commodity Price Booms and Fiscal Policy Options in Australia.....	3
	A. Introduction.....	3
	B. The Global Integrated Monetary and Fiscal Model.....	3
	C. Permanent Increases in Commodity Prices and Fiscal Options.....	4
	References.....	17
II.	Australian Banks: Weathering the Global Storm.....	18
	A. Introduction.....	18
	B. The Global Turmoil: What Happened .....	18
	C. Rollover Risk .....	22
	D. Banks' Exposure to the Housing Market .....	27
	References.....	33
Tables		
I.1.	Macroeconomic Impact of Reducing Capital Taxes.....	9
I.2.	Macroeconomic Impact of Reducing Consumption and Lump-Sum Taxes.....	9
I.3.	Macroeconomic Impact of Alternative Spending Responses .....	10
II.1.	Selected Financial Soundness Indicators of the Banking Sector .....	19
II.2.	Four Large Banks: Selected Financial Soundness Indicators .....	20
II.3.	Australian Banks' Liabilities .....	23
II.4.	Maturity Structure of Banks' Liabilities, End-May 2008 .....	23
II.5.	Rollover Risk: Stress Test Results.....	25
II.6.	Estimation Results .....	29
II.7.	Housing Market Risk: Stress Tests Results .....	31
II.8.	Indebted Owner-Occupier Households, 2006.....	31
II.9.	Numeric Example .....	32

## Figures

I.1.	Permanent Increase in Commodity Prices and Adjustment of Labor Income Taxes ....	6
I.2.	Permanent Increase in Commodity Prices and Gradual Adjustment of Labor Income Taxes .....	8
I.3.	Permanent Increase in Commodity Prices and a Permanent Increase in Public Spending .....	11
I.4.	Permanent Increase in Commodity Prices and a Temporary Increase in Public Spending .....	12
II.1.	Australian Stock Market Indices .....	18
II.2.	Australian Banks' Credit and Deposits .....	21
II.3.	Bank Bill and Overnight Index Swap Rates .....	21
II.4.	Credit Default Swap Spreads .....	21
II.5.	Banks' Lending Structure .....	27
II.6.	House Price Inflation .....	28
II.7.	Household Indebtedness .....	28
II.8.	House Price Inflation: Actual and Predicted Values .....	29

## Appendix

I.1.	A Brief Overview of the Global Integrated Monetary and Fiscal Model .....	14
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## Appendix Table

I.1.	Key Steady State Calibration Values .....	16
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## I. COMMODITY PRICE BOOMS AND FISCAL POLICY OPTIONS IN AUSTRALIA<sup>1</sup>

### A. Introduction

1. **Over the last several years, rising commodities prices have contributed to an economic boom and buoyed tax revenue in Australia.** In this chapter, the IMF's new Global Integrated Monetary and Fiscal Model (GIMF) is used to examine the macroeconomic implications of alternative fiscal responses to higher revenue. GIMF is particularly useful for this application because its overlapping generations structure and rich array of fiscal instruments allow for a wide range of fiscal options to be analyzed while capturing their potential macroeconomic implications.
2. **The results suggest that lower labor and capital income taxes, along with higher public investment, will generate the largest economic gains in the long run.** The economic gains for Australia from other options such as lower consumption taxes or higher public consumption are not as large. The analysis assumes a permanent increase in demand for commodities, but it is difficult to judge whether the higher commodity prices seen in recent years reflect permanent or transitory shifts in demand.
3. **The model also shows that saving a portion of the additional revenue in the short run can help alleviate demand pressures and increase overall domestic savings.** Adjusting taxes slowly and allowing the fiscal balance to improve temporarily generally increases macroeconomic stabilization, although not in the case when labor income taxes are reduced. However, there are several reasons to think that increasing the fiscal balance would deliver greater macroeconomic stability in practice. These include the absence of liquidity-constrained households in this version of the model, the lack of frictions in labor supply, and the characterization of the labor-supply decision as continuous.
4. **Although the analysis presented here provides useful guidance for fiscal policy, extending the analysis would provide additional insights.** Useful extensions could include incorporating uncertainty about the permanence of the increase in commodity prices, including liquidity-constrained households, and adding frictions in the labor supply.

### B. The Global Integrated Monetary and Fiscal Model

5. **The Global Integrated Monetary and Fiscal Model (GIMF) is a multi-region, multiple-good model of the world economy that is derived completely from optimizing foundations.** The version of the model used here has been configured with two types of goods: a tradable manufactured good; and a tradable commodity good. For this application, a two-region version of the model has been calibrated to represent Australia and the rest of the

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<sup>1</sup> Prepared by Ben Hunt (ext. 36361).

world. In each region there are households, firms, and a government. Households maximize utility derived from the consumption of goods and leisure. Firms combine capital and labor with commodities to maximize the net income from goods production. Governments consume goods, maintain a public capital stock, and provide transfers all of which they finance through a range of taxes. Governments also adjust short-term nominal interest rates to provide nominal anchors, which here are assumed to be inflation targets. A brief description of key model features directly relevant to the application at hand is provided below. A slightly more detailed description of the model is presented in the appendix along with some of the key calibration choices.

**6. Commodities are assumed to be a fixed endowment, available each period.**

Commodities are used as an intermediate input into the production of the tradable manufactured good. The commodity market is subject to perfect worldwide price arbitrage. The revenues from the commodity sector accrue to domestic factors (labor and domestic owners of commodity firms), foreign owners of commodity firms, and the government through taxation.

**7. Fiscal policy is modeled with a wide range of expenditures and taxes.** On the expenditure side, the government consumes goods, maintains a public capital stock which complements private production, and provides transfers. These activities are funded with taxes that fall on labor income, capital income, consumption expenditure, as well as non-distorting lump-sum taxes. A fiscal policy reaction function adjusts taxes to achieve a target fiscal surplus that stabilizes public debt at a desired level given spending.

**8. The overlapping generations structure of GIMF increases the potential impact that fiscal policy can have on macroeconomic outcomes.** Each period, households face a constant probability of death. Because of this, households discount future tax liabilities as they may not be around to pay them. The implication is that fiscal choices regarding when to fund current spending or tax changes influence households' responses and thus the impact of these policy actions.

### **C. Permanent Increases in Commodity Prices and Fiscal Options**

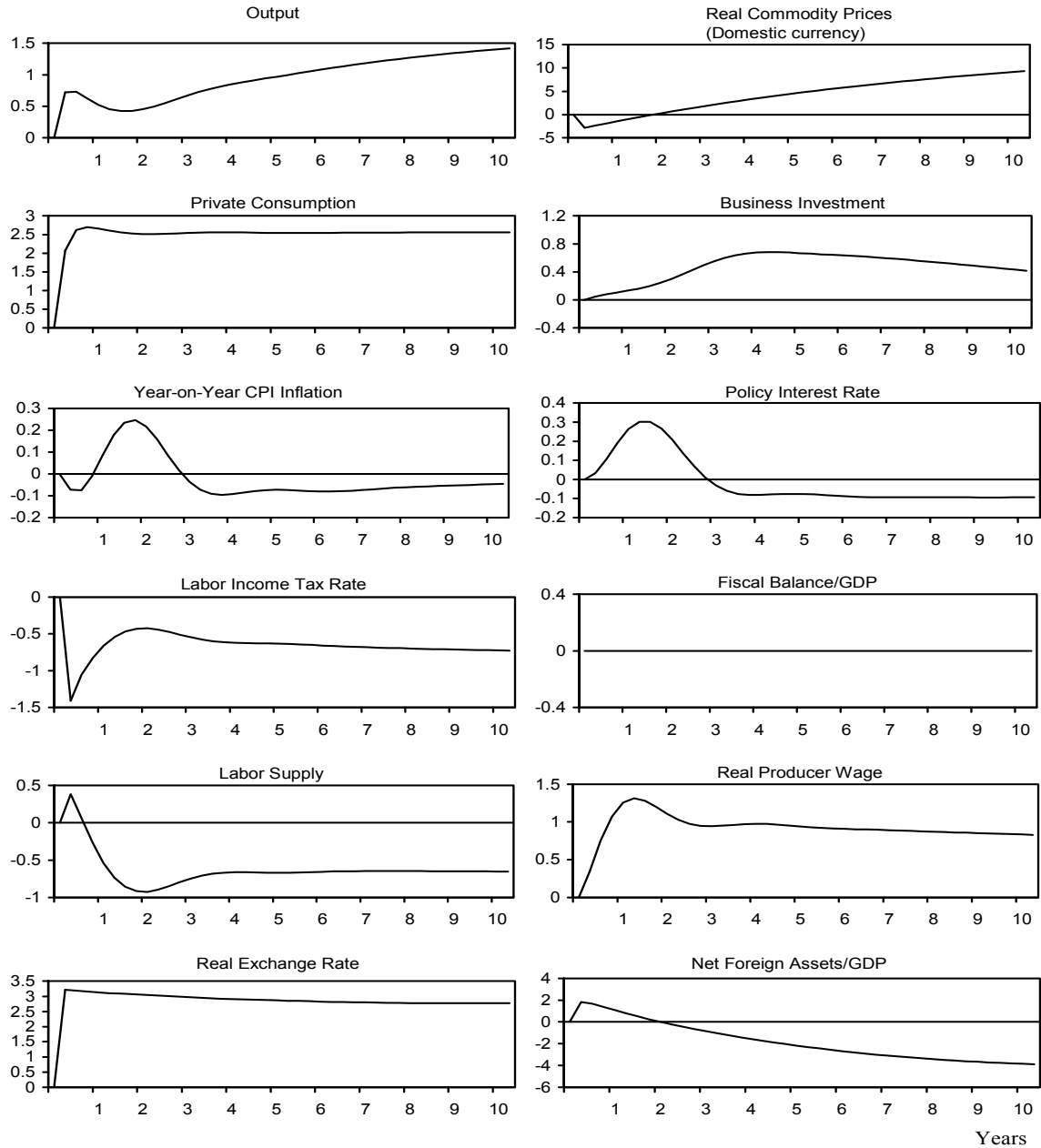
#### **The Base Case: Adjusting Labor Income Taxes**

**9. A permanent increase in demand for commodities in the rest of the world is used to generate a permanent rise in commodity prices.** The increase in demand raises commodity prices by roughly 10 percent after 10 years and 14 percent in the long run. The shock is implemented under perfect foresight. Households, firms, and the government understand the permanence and the full impact of the shock. The responses of several key macroeconomic variables from the Australian block of the model are traced out in Figure I.1. Here the fiscal policy rule adjusts the labor income tax rate to maintain the fiscal balance unchanged at baseline. Monetary policy is governed by an inflation-forecast-based policy rule.

10. **Rising commodity prices lead to an economic boom in Australia.** GDP increases on impact as private consumption and investment rise, and the gains are sustained with GDP higher by 1½ percent after 10 years. Consumption increases because households are wealthier given permanently higher returns from their equity in the commodity sector. Firms respond to higher demand by raising investment. On impact, the real exchange rate appreciates given the improvement in Australia's terms of trade. This appreciation initially improves the ratio of net foreign liabilities to GDP. However, higher permanent wealth encourages Australian households to increase their foreign borrowing to finance current consumption and net foreign liabilities as a share of GDP rise by almost 4 percentage points relative to baseline after 10 years.

11. **The surge in private demand puts pressure on inflation, prompting a tightening in monetary policy, while higher revenue allows fiscal policy to ease.** On impact, the initial decline in import price inflation, resulting from exchange-rate appreciation, temporarily reduces inflation. However, the forward-looking monetary authority recognizes that demand and wage pressures will dominate and monetary policy tightens to return inflation to target. Wage pressures arise because the income effect from higher commodity sector returns reduces households' labor supply, driving up the real wage. Holding public spending fixed at its baseline level, the increase in commodity sector revenue and the improvement in revenue from the booming domestic economy allow the government to reduce labor income taxes without deteriorating the fiscal balance.

Figure I.1. Australia: Permanent Increase in Commodity Prices and Adjustment of Labor  
Income Taxes  
(Percent or percentage point deviation from baseline)  
Base-Case Fiscal Policy Rule Adjusting Labor Income Taxes – Solid



Source: GIMF simulations.



## Slowing the Adjustment in Labor Income Tax Rates

12. **A delayed and gradual adjustment of labor income taxes mildly increases cyclical inflation pressures.**<sup>2</sup> In Figure I.2, the outcome when the labor income tax rate adjusts gradually (dashed) is compared to the outcome when the tax rate falls immediately (solid). With the tax rate assumed to remain unchanged for the first three years, the fiscal balance rises above baseline. Inflation rises more quickly in this simulation because the supply response is dampened. In the absence of the offsetting impact of declining labor income taxes, the initial effect on households' labor supply from rising commodity sector returns is larger than in the base case, thereby reducing productive capacity. The larger reduction in labor supply leads to higher real wages, which also fuel inflation.

13. **The rise in public savings from slowing the adjustment in taxes increases overall domestic savings.** With the fiscal balance allowed to improve, the public sector temporarily accumulates assets and because households discount the future tax reduction implied by those assets, overall domestic savings improve. The relative reduction in net foreign liabilities is roughly ½ percent of GDP after 10 years.<sup>3</sup>

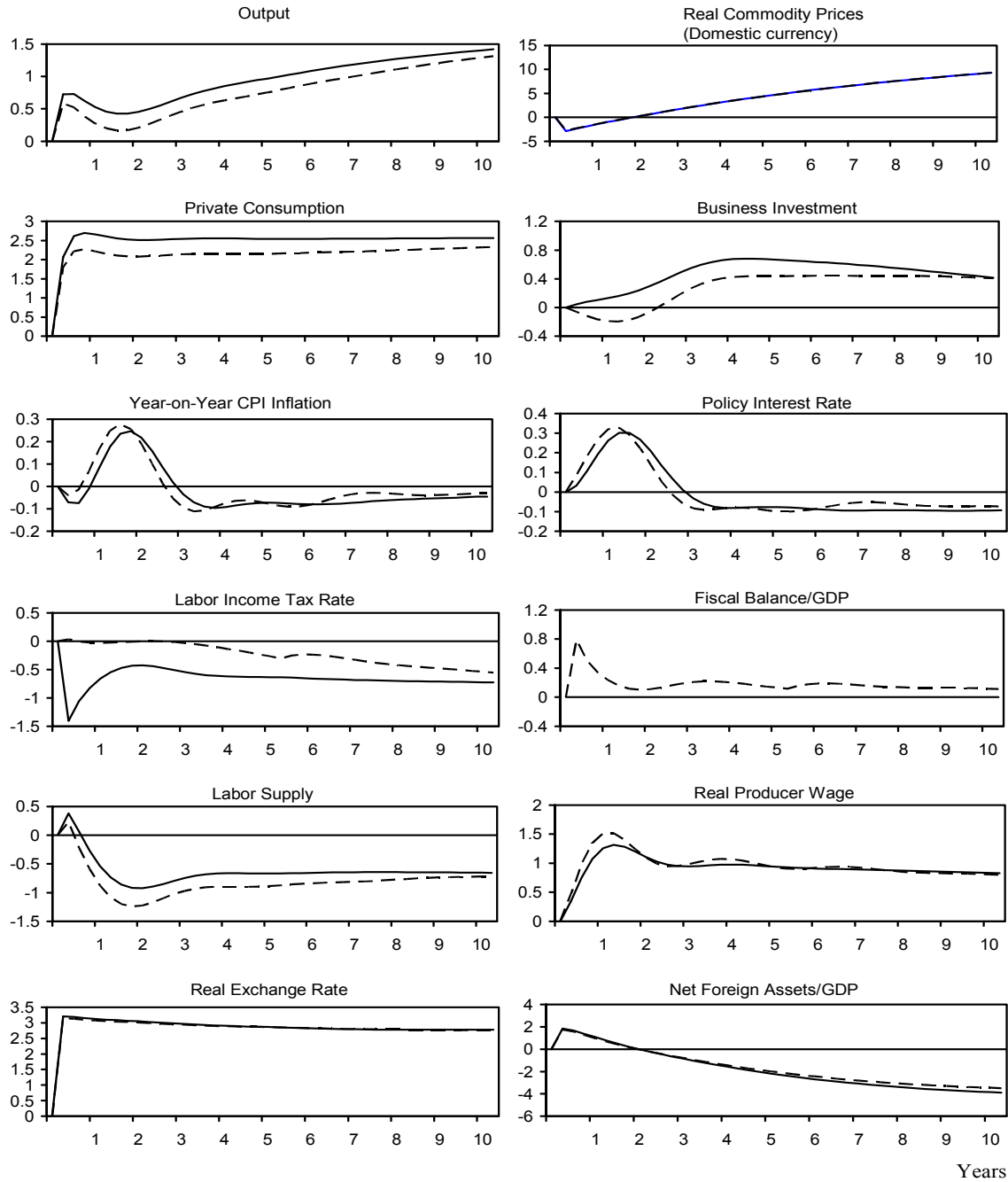
14. **These simulations suggest that temporarily running larger fiscal balances puts upward pressure on inflation, but the model may be overestimating the responsiveness of supply while underestimating the impact on demand in the base case.** The response of labor supply to the real take-home wage has a notable impact on the outcome. The model characterizes the labor supply decision as continuous and there are no frictions in either labor supply or use. Consequently, the simulated response of labor supply in the base case may be faster than what would occur in practice. Turning to demand, the version of the model used here contains no liquidity-constrained households. The short-run demand effects of cutting labor income taxes in the base case would likely be larger if a portion of households faced liquidity constraints and simply spent all their disposable income in each period. With the short-run decline in taxes being larger than the long-run decline, liquidity-constrained households would spend all the temporary increase in their disposable income. However, in the base-case simulations with all households unconstrained, most of the temporary increase in disposable income is saved. In the presence of liquidity constraints, delaying the tax cuts and temporarily increasing public savings would help contain demand pressures as it would reduce the disposable income of liquidity-constrained households. Further, with realistic frictions in labor supply and demand, the supply-side implications of delaying the tax cut are likely to be limited.

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<sup>2</sup> This result also occurs if the commodity price shock is temporary and of varying degrees of persistence.

<sup>3</sup> If permanent public savings of 1.1 percent of GDP are allowed to accrue, net foreign liabilities increase by just 0.6 percent of GDP in the long run versus over 1½ percent when the increase in public savings is temporary.

Figure I.2. Australia: Permanent Increase in Commodity Prices and Gradual Adjustment of Labor Income Taxes  
 (Percent or percentage point deviation from baseline)  
 Base-Case Fiscal Policy Rule – Solid, Slowing the Adjustment in Taxes – Dashed



## Adjusting Other Tax Rates

15. **Reducing the capital income tax rate results in the largest long-run economic gain, but adds to cyclical pressures.** The comparisons contained in Table I.1 illustrate that reducing capital income taxes leads to higher inflation and interest rates relative to cutting labor income taxes. Firms respond to the greater return to capital by increasing investment demand. The new investment takes time to become productive capacity and demand pressures increase. In addition, the interaction of declining labor supply (given increased returns from the commodity sector) and firms' increased labor demand (rising marginal product of labor given a larger capital stock) puts additional pressure on wages and thus inflation. In the long run, the higher capital stock and the associated rise in labor demand generate a larger increase in GDP than in the case where labor income taxes are reduced. Although a significant portion reflects the higher level for investment spending required maintaining a larger capital stock, the rise in private consumption is slightly above that achieved when labor income taxes are reduced. The benefits of a delayed and gradual decline in the capital tax rate are clearly illustrated by notably lower inflation and interest rates.

Table I.1. Australia: Macroeconomic Impact of Reducing Capital Taxes  
(In percent or percentage points)

Policy Response to Higher Revenues	Peak in CPI Inflation	Peak in Policy Interest Rate	Long-Run Increase in GDP	Long-Run Increase in Private Consumption
Labor income tax	0.25	0.31	1.49	2.51
Capital income tax	0.46	0.60	1.85	2.56
Delayed capital income tax	0.28	0.35		

16. **Cutting consumption and lump-sum taxes gives worse long-run outcomes than cutting labor and income taxes, and adds to cyclical pressures.** Reductions in consumption and lump-sum taxes add to demand pressures without any offsetting supply-side benefits (Table I.2). This is evidenced by higher inflation and interest rates and a smaller long-run increase in GDP.

Table I.2. Australia: Macroeconomic Impact of Reducing Consumption and Lump-Sum Taxes  
(In percent or percentage points)

Policy Response to Higher Revenues	Peak in CPI Inflation	Peak in Policy Interest Rate	Long-Run Increase in GDP	Long-Run Increase in Private Consumption
Labor income tax	0.25	0.31	1.49	2.51
Consumption tax	0.32	0.38	1.03	2.21
Delayed consumption tax	0.29	0.34		
Lump-sum tax	0.35	0.41	1.13	2.02
Delayed lump-sum tax	0.32	0.37		

## Permanently Increasing Public Spending

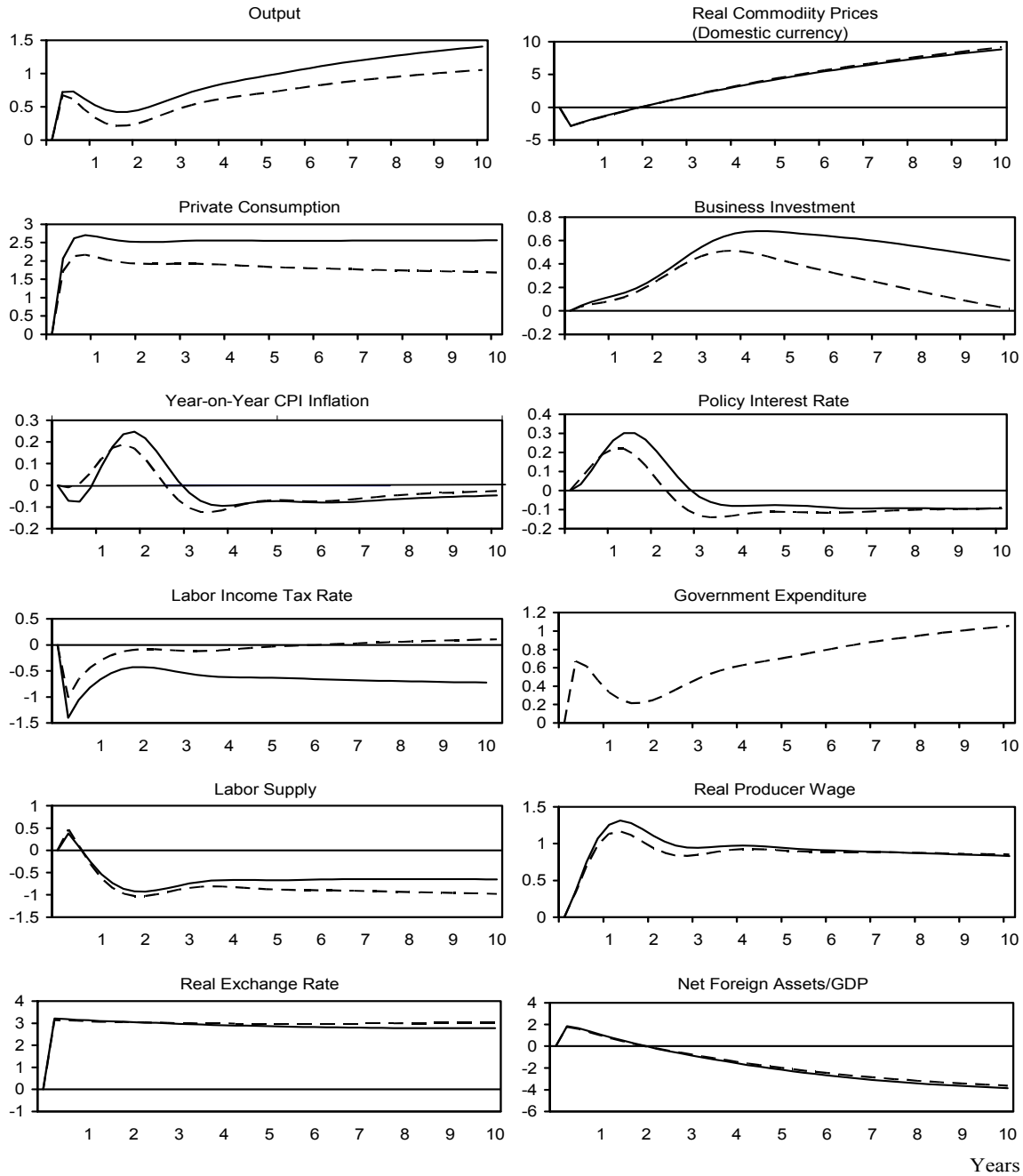
17. **Permanently increasing public spending in response to higher revenue dampens the boom, but leads to lower real output in the long run relative to most other policy responses.** In Figure I.3, the outcome when public spending permanently rises (dashed) is compared to the outcome when labor income taxes alone adjust to maintain an unchanged fiscal balance (solid). The initial increase in real activity is lower as higher public spending more than crowds out private spending. Households' permanent wealth does not increase as much because the initial reduction in labor income taxes is temporary and taxes must rise in the long run. As a result, consumption rises by less and lower demand curtails firms' investment spending. In the long run, the increase in GDP is smaller as the supply-side benefits of reducing labor income taxes are foregone to finance permanently higher public spending.

18. **Increasing public investment spending alone leads to more significant long-run gains than raising public consumption spending, but has similar cyclical results.** Maintaining the share in GDP of either public consumption or public investment leads to similar peaks in inflation and the policy interest rate (Table I.3). These are marginally higher than the outcome when both are increased because less private demand is squeezed out. The long-run rise in GDP, however, is higher when only public investment increases. This occurs because there is more scope for tax cuts with public investment a smaller share of GDP than public consumption and the complementarity between private and public capital encourages private investment.

Table I.3. Australia: Macroeconomic Impact of Alternative Spending Responses  
(In percent or percentage points)

Policy Response to Higher Revenues	Peak in CPI Inflation	Peak in Policy Interest Rate	Long-Run Increase—GDP	Long-Run Increase—Private Consumption
Labor income tax cut	0.25	0.31	1.49	2.51
Permanent increase in public consumption and investment	0.19	0.22	1.20	1.60
Permanent increase in public consumption	0.21	0.25	1.24	1.73
Permanent increase in public investment	0.21	0.26	1.43	2.33

Figure I.3. Australia: Permanent Increase in Commodity Prices and a Permanent Increase in Public Spending  
 (Percent or percentage point deviation from baseline)  
 Base-Case Fiscal Policy Rule – Solid, Permanent Increase in Public Spending – Dashed

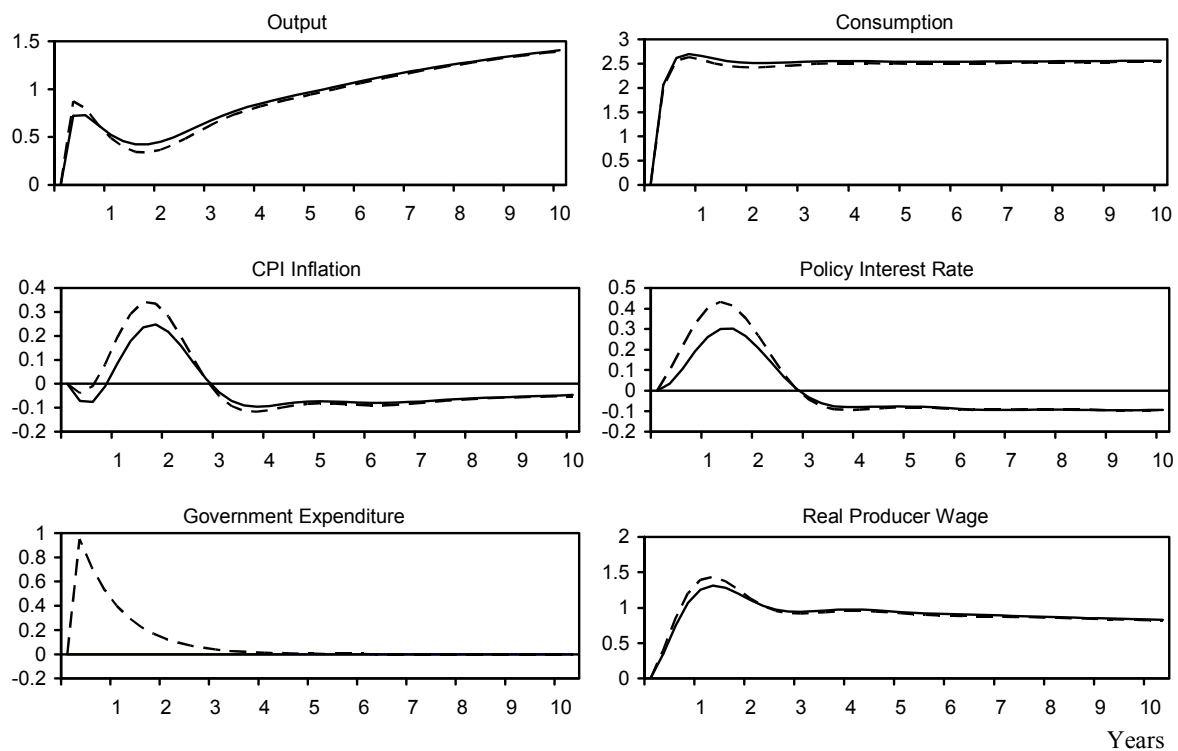


Source: GIMF simulations.

## Temporarily Increasing Public Spending

19. **If in addition to cutting labor income taxes, public consumption spending temporarily rises, cyclical demand pressures exceed those in the base case.** In Figure I.4, the outcomes for several key macro variables when government consumption expenditure is temporarily increased (dashed) are compared to the base case (solid). The increase in public consumption spending raises total government spending by 1 percent of GDP on impact, it then declines back close to baseline after two years. As in the base case, the labor income tax rate is the fiscal instrument that adjusts to maintain an unchanged fiscal balance. With households anticipating the future tax cuts, temporarily higher public spending in the short run does not crowd out private spending and aggregate demand initially rises by more, generating greater demand pressure. The smaller initial decline in labor income tax rates leads to a larger fall in labor supply and rise in the real wage, further stimulating inflation. Monetary policy must tighten by more and output is forced below the level achieved in the base case in the second year.

Figure I.4. Australia: Permanent Increase in Commodity Prices and a Temporary Increase in Public Spending  
(Percent or percentage point deviation from baseline)  
Base-Case Fiscal Policy Rule – Solid, Temporary Increase in Public Spending – Dashed



Source: GIMF simulations.

## Direction for Future Work

20. **While the analysis presented above offers useful insights, there are a number of ways that the framework and the analysis techniques can be improved.** The following are some extensions that would enhance the analysis of the macroeconomic implications of the fiscal response to a commodity-price-induced boom in Australia.

- ***Additional frictions and constraints.*** The addition of liquidity constrained households as well as costly adjustment in labor would enhance the analysis of the cyclical impact of changing labor income taxes.
- ***Incorporating uncertainty.*** When commodity prices change there is always considerable uncertainty about the source of the imbalance in the commodity market and thus the expected duration. This uncertainty will not only influence how private agents respond to higher commodity prices, but it will also influence the impact of the fiscal response. Analysis that incorporates alternative expectations about the duration of increases, thus allowing for expectational errors, would undoubtedly add useful insights.
- ***Enriching the modeling of the commodity sector.*** The model assumes that commodities are a fixed endowment. A richer framework that allows capital and labor to augment commodity production would better capture short-run demand effects and long-term benefits. Further, allowing the public capital stock to play a role in the commodity sector would enable a more thorough analysis of the impact of public investment spending, which could have large implications in Australia where public transportation infrastructure plays a key role in commodity supply.
- ***More regions and goods.*** This would enable analysis of how the source of the rise in commodity prices might matter for the macroeconomic outcomes. Other research work has illustrated that trade-related factors that are dependant on the source of rising commodity prices have important macroeconomic consequences for open economies.<sup>4</sup> These in turn could have an impact on the stabilization and long-run effect of fiscal actions.

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<sup>4</sup> For example see Bebee and Hunt (2008), Hunt (2008), and Elekdag and others (2008).

## Appendix I.1: A Brief Overview of the Global Integrated Monetary and Fiscal Model

1. **Global Integrated Monetary and Fiscal Model (GIMF) is a multi-region, multiple-good model of the world economy that is derived completely from optimizing foundations.** The version of the model used here has been configured with two types of goods: a tradable manufactured good, and a tradable commodity good. In each region there are three types of behavioral agents: households, firms, and a government. A brief overview of the behavioral characterization of these agents is provided below, but the interested reader should look to Kumhof and Laxton (2008) for a detailed description of the theoretical derivation of the model.

### Households

2. **Households have finite lives, consume goods, and via unions are the monopolistic suppliers of differentiated labor inputs to all domestic firms.** Households exhibit habit persistence in consumption contributing to real rigidities in economic adjustment. Monopoly power in labor supply implies that households' wages contain a markup over the marginal rate of substitution between consumption and leisure. This monopoly power is implemented via unions, which purchase labor from households and on sell it to firms. Unions are perfectly competitive in their input markets, but monopolistically competitive in their output market. The markup, or union dividend, is distributed lump sum to households in proportion to their share in aggregate labor supply. Because of adjustment costs in wage contracts, aggregate nominal rigidities arise through wage bargaining between unions and firms. Households own the domestic manufacturing firms, and a portion of the commodity sector. The market for capital is competitive. Capital accumulation is subject to adjustment costs that contribute to gradual economic adjustment.

### Firms

3. **Firms produce two types of goods: a tradable noncommodity good; and a tradable non-energy commodity good.** Goods are assumed to be differentiated, leading to market power that enables firms to charge a markup over the marginal cost of production. Goods prices are subject to adjustment costs that, along with slowly adjusting wages, give rise to the gradual adjustment of prices to economic disturbances. The characteristics of the final bundle of goods consumed in each region reflects the preferences of households and firms over all goods and, consequently, international trade is driven by the interaction of preferences and relative prices.

4. **Capital, labor, and commodities are combined to produce the tradable non-commodity good.** The production process is given by:

$$Y = f(A, K, L, Q_C, M_C), \quad (1)$$

where  $Y$  denotes the output of the noncommodity tradable good,  $A$  denotes the level of labor augmenting productivity,  $K$  is the capital input,  $L$  is the labor input,  $Q_C$  is the domestically



produced commodity input, and  $M_C$  is the imported commodity input. The production technology,  $f$ , embodies nested constant elasticity of substitution. There is a constant elasticity of substitution between commodities and a capital-labor composite and there is a constant elasticity of substitution between capital and labor deriving the composite.

5. **Commodities are specified to be an exogenous endowment.** The world commodity market is subject to perfect worldwide price arbitrage. Total commodity revenues are paid out to three recipients: domestic factors, the domestic government, and foreign owners. Revenue allocation is given by:

$$P_t^C \cdot X_t^C = G_t^C + D_t^C + F_t^C, \quad (2)$$

where  $P^C$  is the domestic currency price of commodities,  $X^C$  is domestically produced commodities,  $G^C$  is the commodity sector revenue accruing to the government,  $D^C$  is commodity sector revenue accruing to domestic factors, and  $F^C$  is commodity sector revenue accruing to foreigners.

6. **Distributors deliver goods to final users.** Domestic and foreign tradable manufactured goods are combined by distributors, which then use the stock of public infrastructure to deliver them to final purchasers (households, firms, and the government).

### Government

7. **Governments finance expenditure through a range of taxes and maintain nominal anchors.** Governments purchase final goods for public consumption and to maintain public infrastructure. Governments also provide transfers. These activities are financed through labor income taxes, capital income taxes, consumption taxes, and lump-sum taxes on households. Governments also adjust short-term nominal interest rates to maintain nominal anchors. Here these are assumed to be inflation targets achieved by following inflation-forecast-based monetary policy rules.

Appendix Table I.1. Australia: Key Steady State Calibration Values

Variable	Australia	Rest of World
Size (sums to unity)	0.013	0.987
Shares of GDP		
Private consumption	55.7	63.0
Private investment	20.0	19.0
Government consumption	19.0	15.0
Government investment	4.0	3.0
Exports	18.7	0.2
Of which: Commodities	8.3	0.0
Imports	17.4	0.1
Government debt	0.0	50.0
Government balance	0.0	-2.5
Transfers	6.0	10.0
Taxes (excluding commodities sector revenue)	27.7	27.2
Shares in total taxes (Excluding commodities sector revenue)		
Labor income tax	0.48	0.30
Capital income tax	0.14	0.10
Consumption tax	0.25	0.30
Lump-sum tax	0.12	0.30
Allocation of commodity sector revenue (share)		
Domestic factors	0.77	0.60
Labor	0.65	0.60
Owners	0.12	0.00
Foreign owners	0.12	0.00
Government	0.11	0.40

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## II. AUSTRALIAN BANKS: WEATHERING THE GLOBAL STORM<sup>1</sup>

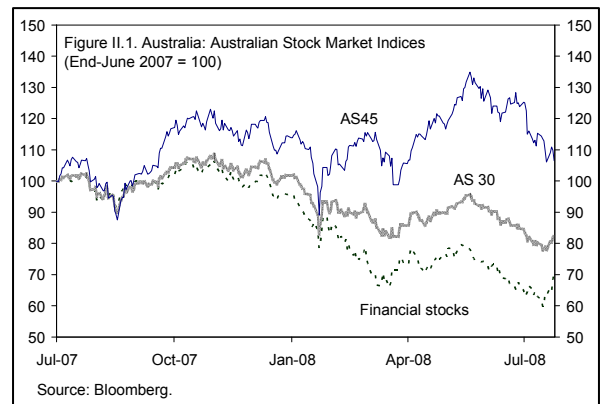
### A. Introduction

1. **The global financial turmoil had a limited direct impact on the Australian banks, but highlighted some potential vulnerabilities.** Banks' soundness indicators remain strong, and banks are well provisioned against potential losses on their small exposures to structured debt instruments. The main impact of the global turmoil was the sharp increase in the banks' cost of funding, which highlighted two potential vulnerabilities. The first is the rollover risk, related to banks' reliance on wholesale funding, a large fraction of which is short term. The second is banks' exposure to the housing market and highly indebted households. This chapter looks at these two areas of vulnerability.

2. **Staff analysis shows that, while profits may be affected, bank's capital is sufficient to withstand even relatively large shocks.** The stress test scenarios used are extreme, and include shocks such as loss of access to offshore markets for funding for 90 days, and a default on up to 10 percent of all mortgage loans.<sup>2</sup> The results indicate that, while banks' profitability may suffer, their capital is sufficiently strong to allow them to handle these shocks. The analysis shows the importance of conducting regular stress tests, including with extreme scenarios—something that is already being done by Australian regulators in the context of Basel II. The analysis also indicates some data deficiencies. In particular, publication of more detail on the maturity structure of banks' funding, especially from offshore markets, would improve the precision of stress tests' results and impose additional discipline on banks.

### B. The Global Turmoil: What Happened

3. **The Australian banks have weathered the global financial turmoil reasonably well to date.** Although the share price of Australian financial companies declined sharply in late 2007 and early 2008 in line with other developed economies, reflecting the global re-appraisal of underlying risks (Figure II.1), the direct impact of the crisis on Australian banks has



<sup>1</sup> Prepared by Dmitry Rozhkov (ext. 39745).

<sup>2</sup> Jing Li (MCM consultant) and Rodolfo Maino (MCM) contributed to the stress test analysis of rollover risks (Section C).

been limited.<sup>3</sup> Banks had minimal exposure to U.S. subprime related assets, and the securitization of mortgages in Australia was not widespread before the crisis, with only about 18 percent of housing loans securitized. These mitigating factors implied that Australian banks suffered only limited direct losses, compared to their counterparts in North America and Europe, and their credit ratings remained high throughout the period.

4. **The aggregate financial soundness indicators for the banking system remained strong through early 2008.** The turmoil did not affect banks' strong capitalization and profitability, and impaired assets remain very low by international standards, at 0.3 percent of total assets (Table II.1). The published interim financial reports confirm that none of the four large banks suffered any noticeable deterioration in soundness indicators compared to the precrisis period (Table II.2).

Table II.1. Australia: Selected Financial Soundness Indicators of the Banking Sector  
(In percent)

	2004 Dec.	2005 Dec.	2006 Dec.	2007 Dec.	2008 Mar.
<b>Profitability</b>					
Return on assets (after tax)	1.1	1.1	1.0	1.0	...
Return on equity (after tax)	16.0	15.9	16.8	18.1	...
<b>Capital adequacy</b>					
Regulatory capital to risk-weighted assets	10.5	10.4	10.4	10.2	10.5
Tier I capital to risk-weighted assets <sup>1/</sup>	7.6	7.6	7.4	7.2	7.3
<b>Asset quality</b>					
Gross impaired assets to total assets	0.3	0.2	0.2	0.2	0.3
Net impaired assets to equity	2.1	1.8	1.9	1.9	...
Specific provisions to impaired assets	41.4	37.0	39.5	39.5	36.8
Risk weighted assets to total assets	58.0	59.3	57.1	54.5	...

Sources: Reserve Bank of Australia; Australian Prudential Regulation Authority.

1/ Tier I capital includes issued and fully paid common equity and perpetual noncumulative preference shares, and disclosed reserves.

<sup>3</sup> Banks account for slightly over one-half of total assets of the Australian financial system. The four large banks account for about two-thirds of the total banking system assets.

Table II.2. Australia: Four Large Banks: Selected Financial Soundness Indicators

	NAB		ANZ		CBA		Westpac	
	Mar-08	Sep-07	Mar-08	Sep-07	Dec-07	Jun-07	Mar-08	Sep-07
<b>Profitability</b>								
ROA (cash basis)	0.9	1.0	0.8	1.1	1.2	1.2	1.1	1.2
ROE (cash basis)	16.8	17.7	15.1	19.6	20.8	21.0	22.7	24.2
Net interest margin	2.2	2.3	2.0	2.2	2.2	2.2	2.1	2.1
<b>Capital adequacy</b>								
Tier 1 capital ratio	6.5	6.7	6.8	6.7	7.3	7.1	7.4	8.0
Total capital ratio	9.7	10.0	10.1	10.1	9.7	9.8	10.1	11.3
<b>Assets quality and provisioning</b>								
Gross impaired to total assets	0.2	0.2	0.3	0.2	0.1	0.1	0.2	0.1
Net impaired assets to equity	3.1	2.6	3.6	2.2	1.1	0.9	3.3	2.2
Specific provision to gross impaired assets	35.8	28.1	38.8	38.1	47.7	47.3	33.2	27.4
Total provision to gross impaired assets	203.9	211.1	210.4	294.2	245.6	298.3	173.6	253.5
Risk weighted to total assets	63.6	62.9	61.0	70.0	60.0	57.7	46.5	44.9
<b>Liquidity</b>								
Cash to total assets	2.0	2.3	4.1	4.3	1.5	2.4	1.0	0.6
Cash and due from banks to total assets	8.5	6.7	6.8	6.4	3.2	3.7	8.5	8.2

Source: Banks' interim financial reports.

5. **The asset quality of small banks is not as strong as that of the four large banks, but they are still financially sound as a group.**<sup>4</sup> Capitalization and profitability of the small banks are in line with the four large banks, but their impaired assets are higher. This reflects the fact that most of the low-doc and nonconforming lending in recent years was concentrated in the smaller banks and the nonbank sector. As a result, the aggregate ratio of impaired to total assets is about ½ percent for small banks, double that of the banking system as a whole. However, this ratio is still very low by international standards. Although impaired assets are likely to increase further in the future, and some of the smaller banks may turn out to be more vulnerable than the aggregate numbers suggest, this is unlikely to cause systemic problems, given the overall low incidence of subprime mortgages in Australia.<sup>5</sup>

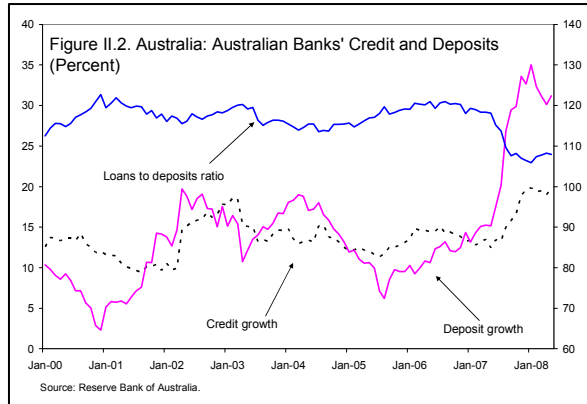
6. **Despite the high asset quality, several large banks have recently increased their provisioning for bad debts.** This partly reflects the renewed concerns about the banks' exposures to companies that have been impacted by the credit crisis, and about the banks' CDO portfolios. However, these portfolios are reported to be relatively small in size (less than ½ percent of assets for large banks), and are now substantially covered by provisions (after the increase, specific provisions are reported to cover nearly 90 percent of total CDO exposure for some of the large banks). While concerns about a possible

<sup>4</sup> In this chapter, "small banks" refers to all banks apart from the large four. There are 57 such small banks in Australia, and the largest of them accounts for about 5 percent of total banking system assets.

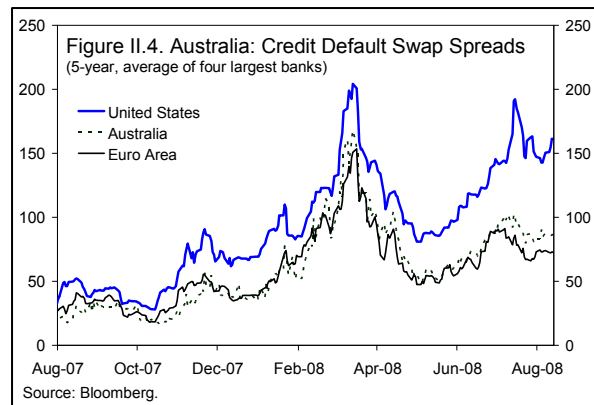
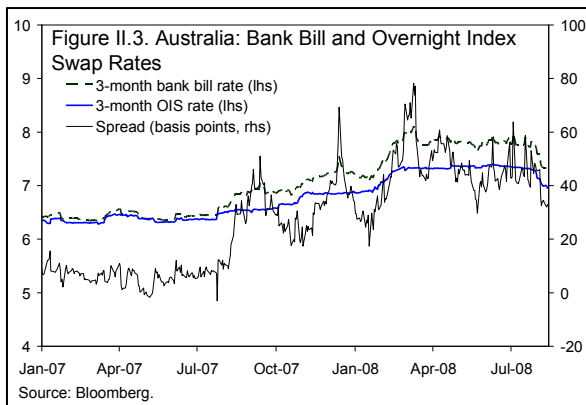
<sup>5</sup> Low-doc mortgages comprise 7 percent of total mortgages, and nonconforming loans (the closest equivalent of subprime that exists in Australia) an additional 1 percent.

deterioration of asset quality remain, market analysts expect banks to remain profitable in 2008, and see the large additional provision as a one-off event.

7. **During the turmoil, banks took steps to improve liquidity.** Faced with the global liquidity squeeze, the Reserve Bank of Australia (RBA) provided banks with liquidity support through exchange settlement accounts and by increasing the range of securities accepted for repo lending. In response, banks have started issuing short-term securities to one another and increased securitization of full-doc mortgages, thereby increasing the supply of eligible securities that can be used for repos with the RBA.<sup>1</sup> Banks have also been able to attract more deposits, bringing the aggregate loan-to-deposit ratio down from 120 to a still high 110 percent (Figure II.2).<sup>2</sup>



8. **The main impact of the global turmoil was the sharp increase in the cost of funding for banks, in both domestic and offshore debt markets.** The spread between the 3-month bank bill rate and the overnight index swap (OIS) rate was around 50 basis points on average in March–July 2008, compared to the average of 10 basis points in recent years (Figure II.3). Furthermore, credit default swap (CDS) spreads for the major Australian banks widened sharply during the same period (although not by as much as for their U.S. counterparts), also indicating a higher cost of funding (Figure II.4). Although spreads



<sup>1</sup> The increased issuance of short-term securities between banks is reflected in the amounts of “due from other banks,” which have increased by more than 50 percent in six months for some large banks.

<sup>2</sup> Most of the growth in deposits was due to CDs, which increased at an annual rate of over 60 percent since September 2007.

narrowed following their peak in March, the funding costs remain high compared to historical averages.

9. **Increased cost and reduced availability of funding had a significant impact on some segments of the financial system.** In particular, as the market for securities backed by housing loans has been disrupted, lenders (mostly nonbank) that relied on this market for their funding found conditions much more difficult than banks that relied more on deposits and other markets.<sup>3</sup>

10. **Despite the increase in funding costs, banks were able to refinance themselves during the turmoil, and pass part of the cost increase on to their customers.** Banks have generally maintained access to wholesale markets during the period, albeit at higher spreads, and were able to finance significant growth in their assets, driven to a large extent by re-intermediation of business credit, as corporates have found it more difficult to access non-intermediated debt markets.<sup>4</sup> Furthermore, large banks are generally ahead of schedule with their funding plans, as they have been issuing more debt securities than needed, in case the dislocation in credit markets was to worsen (DeBelle, 2008). Banks have also been able to pass on a significant part of the increase in funding costs to their customers, with lending rates on both housing and business loans being pushed up by 60–80 basis points more than the rise in the policy rate over the period August 2007–July 2008.<sup>5</sup>

11. **Nevertheless, the global turmoil has highlighted potential banking-system vulnerabilities.** The tightening of credit conditions and a sharp increase in funding costs underlined the vulnerability of banks to rollover risk associated with short-term wholesale funding. In addition, the increase in lending rates for the already highly indebted households highlighted the risks related to the high exposure of banks to the housing market. These risks are analyzed in the next two sections.

### C. Rollover Risk

**Australian banks rely heavily on wholesale funding.** Wholesale funds (domestic and offshore) account for about 60 percent of total funding of the banking system, and more than 40 percent of wholesale funds come from offshore (Table II.3). A significant increase in banks' reliance on wholesale funding occurred in the 1990s, driven by the combination of strong credit growth and an erosion of banks' traditional retail deposit base, which was due in large part to the shift in household financial assets to superannuation funds.<sup>6</sup> This funding

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<sup>3</sup> Reserve Bank of Australia, *Financial Stability Review*, March 2008.

<sup>4</sup> Ibid.

<sup>5</sup> Reserve Bank of Australia, *Statement on Monetary Policy*, August 2008 (Table 14).

<sup>6</sup> *Australia: Financial System Stability Assessment*, IMF Country Report No. 06/372.



structure is predicated on banks maintaining high credit ratings and carries foreign exchange, interest rate, and liquidity risk (although the foreign exchange and interest rate risks have mostly been hedged).

Table II.3. Australia: Australian Banks' Liabilities  
(Percent of total)

	Dec 04	Dec 05	Dec 06	Jun 07	Dec 07	May 08
Deposits (ex CDs)	44.1	44.2	42.4	42.6	40.0	40.6
Of which: Household	20.4	20.0	18.5	17.2	16.3	16.6
Business	13.9	13.8	13.8	14.0	13.3	12.6
Intra-group	3.4	3.7	3.0	3.1	4.1	4.8
Domestic wholesale	28.7	28.7	29.8	30.7	34.6	34.0
Offshore	27.2	27.1	27.8	26.7	25.4	25.4
Total liabilities	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Australian Prudential Regulation Authority; Reserve Bank of Australia.

12. **Furthermore, a significant share of wholesale funds are short-term.** About 30 percent of total offshore funds of Australian banks have residual maturity of less than one year (Table II.4). This ratio is close to 45 percent for small banks. Domestic wholesale funding is predominantly short-term, with about 75 percent of funds having residual maturity of less than one year. This funding structure makes the banks dependent on a stable international and domestic funding environment, and leaves them vulnerable to increases in the cost of funds and to the protracted loss of access to international short-term debt markets.

Table II.4. Australia: Maturity Structure of Banks' Liabilities, End-May 2008  
(In percent)

	Major Banks	Other Banks	All Banks
Domestic wholesale			
Short term (< 1 year)	79.0	63.1	74.4
Long term (> 1 year)	21.0	36.9	25.6
Securitization			
Short term (< 1 year)	25.0	3.8	12.5
Long term (> 1 year)	75.0	96.2	87.5
Offshore			
Short term (< 1 year)	25.5	43.5	28.8
Long term (> 1 year)	74.5	56.5	71.2

Source: Australian Prudential Regulation Authority.

13. **The analysis of rollover risks related to banks' reliance on short-term wholesale funding is complicated by the lack of sufficiently detailed data on the maturity structure of liabilities.** Available data provide the breakdown of offshore funding by short-term and long-term (defined as funds with residual maturity of less and more than one year, respectively), but do not allow for the identification of funds with residual maturity of less than 90 days, which are most likely to be affected in a liquidity crisis. In the analysis that follows, a conservative assumption was made that most short-term wholesale funds are due in less than 90 days.<sup>7</sup>

14. **The stress test scenario assumes that access to funding from offshore markets is lost completely for 90 days.** This scenario is more severe than anything that Australian banks have had to face to date. As a result of the loss of access to offshore markets, banks have to refinance their offshore liabilities due in less than 90 days domestically. This leads to an increase in interest rates and, consequently, all wholesale domestic liabilities with less than 90 days maturity have to be refinanced at a higher interest rate as well. A conservative assumption is made that the interest rates on banks' assets do not increase, so that the banks suffer a pure interest rate shock on their liabilities. It is also assumed that banks can use part of their liquid assets to cover the shortfall in financing, but they have to maintain the minimum ratio of 1 percent for cash to liquid assets. This scenario is applied to the four largest banks individually, and to the banking system as a whole.

15. **The Australian banks pass this stress test reasonably well.** In the most severe case where all wholesale funds (domestic and offshore) due in less than 90 days have to be refinanced at an interest rate that is 500 basis points higher than before the shock, the aggregate capital ratio for the system only falls to 8½ percent (Table II.5). The worst affected among the four large banks has the capital ratio drop to 7½ percent. Banks' profitability suffers a more serious hit, which is not surprising, given their heavy reliance on short-term wholesale funding. Nevertheless, it takes a 500 basis points increase in interest rates on liabilities to generate losses for banks.

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<sup>7</sup> Available data on Australian external debt indicates that debt with residual maturity of less than 90 days accounts for about 36 percent of total debt, and 73 percent of debt with residual maturity of less than one year. Since financial corporations account for about 75 percent of total external debt, the stress test scenario assumed a similar structure for external debt of the banking system.

Table II.5. Australia: Rollover Risk: Stress Tests Results

	Four Large Banks Mar-08	All Banks Dec-07
Total capital ratio (actual)	9.9	10.2
Return on assets (actual, cash basis)	1.0	0.9
Offshore debt due in < 90 days (billions of Australia dollars, est.)	162.0	221.8
As percent of total liabilities	9.0	9.0
Stress test scenarios		
Offshore debt is refinanced domestically at a premium of:		
100 basis points		
New total capital ratio	9.5	9.9
Lowest capital ratio among four large banks	9.3	...
New return on assets	0.7	0.7
300 basis points		
New total capital ratio	8.7	9.2
Lowest capital ratio among four large banks	8.5	...
New return on assets	0.2	0.3
500 basis points		
New total capital ratio	7.9	8.5
Lowest capital ratio among four large banks	7.4	...
New return on assets	-0.3	-0.1

Source: IMF staff calculations.

16. **Given the extreme nature of the shocks analyzed, the banking system appears resilient.** Even in a more extreme case (not shown in Table II.5) where the interest rates on all deposits (including checking) also rise by 500 basis points, the aggregate capital ratio drops to 5¾ percent for the system, and to 5 percent for large banks. While this is a significant reduction in capital, the fact that the banks are able to maintain their capitalization ratios above 5 percent under a shock of that magnitude (and under a number of conservative assumptions that were made) underlines the resilience of the system.

17. **Some smaller banks could be more vulnerable than the aggregate analysis suggests.** All four large banks were analyzed individually, and were shown to be sufficiently sound to handle a large interest rate shock. Small banks, however, were only looked at as a group. Some of these banks have smaller deposit bases, rely more heavily on securitization, and could be more vulnerable to certain shocks.<sup>8</sup> Nevertheless, given their small size and the strong aggregate results, they are also not likely to present a threat to systemic stability.

<sup>8</sup> According to the Australian Prudential Regulation Authority, 11 percent of small banks' liabilities are securitized, compared to 2 percent for large banks. However, most of these securitized liabilities are long-term, with maturity over one year.

18. **The stress tests did not consider the wider impact that a financial crisis would have on the economy.** However, during the 2006 Financial Sector Assessment Program (FSAP), a comprehensive macroeconomic stress test was conducted, envisaging a recession with a large drop in house prices (30 percent in the first year), an increase in the unemployment rate to 9 percent, a 40 percent depreciation of the Australian dollar, and increased funding costs for the banks.<sup>9</sup> The results did not reveal any near-term stability issues, as the large Australian banks withstood the adverse macroeconomic scenario relatively well. Furthermore, Australia has the advantage of the flexible exchange rate system, which would serve as a buffer in case of macroeconomic shock, helping the economy to adjust.

19. **A number of mitigating factors that may soften the impact of a shock were not realistically modeled in the stress tests.** The scenario above assumed that the interest rates on banks' assets do not increase in response to increased funding costs. In reality, however, over the past year banks have been able to raise interest rates on lending, thereby softening the impact on bank profits of higher cost of funds. Moreover, in the scenario above it was assumed that the RBA does not react, and the banks have to attract additional financing by raising interest rates. The RBA has the ability to provide substantial liquidity support to banks, for example, by using highly rated mortgages or other acceptable securities in the RBA's discount window. Banks could also securitize some of their assets, to get additional access to RBA liquidity in case of need. In principle, the RBA has the ability to provide significant liquidity to the banking system in this manner, although the amounts that would be needed in case of complete loss of access to offshore markets are certainly larger than anything that occurred in the past. Finally, the RBA could also cut its policy rate, if the tightening of monetary conditions was not consistent with inflation outlook.

20. **The discussion above underlines that Australian banks need to constantly roll over large amounts of foreign debt.** For the purpose of stress tests, it was estimated that foreign debt of all banks with residual maturity of less than 90 days is around \$A 220 billion (\$A 160 billion for the four large banks). While this likely overestimates the true amount, given the conservative assumptions, it implies that the amounts that need to be rolled over every three months are large, equivalent to around 20 percent of GDP. This highlights the dependence of Australian banks on a stable international funding environment, which in current circumstances cannot be taken as a given.

21. **The analysis shows the importance of conducting regular stress tests, including extreme scenarios.** While the stress tests using the most recent available data showed the resilience of the banking system, the vulnerability to the rollover risk remains, and needs to be closely monitored. Australian Prudential Regulation Authority (APRA) is now conducting regular stress tests for large banks in the context of Basel II, implemented in January 2008. It

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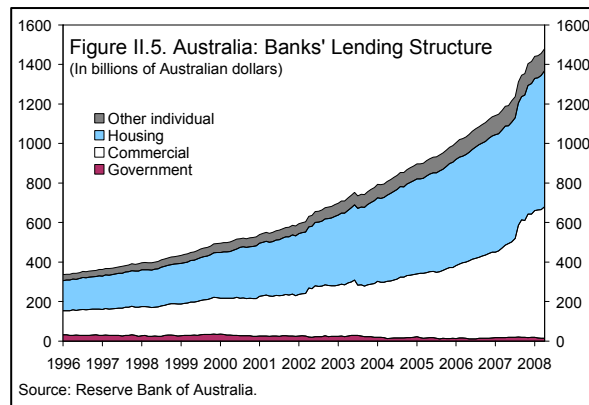
<sup>9</sup> *Australia: Financial System Stability Assessment*, IMF Country Report No. 06/372.

is important that these stress tests include extreme scenarios, such as the loss of access to funding.

22. **Banks are now attempting to diversify their funding by issuing longer-term securities, but the impact on their funding structure has been limited.** In particular, diversification in the offshore markets has taken place through private placements of one-year extendible bonds in the U.S. and through issuance of yen-denominated “samurai” bonds for the first time. This allowed banks to issue bonds with relatively longer maturity (typically five years). However, changing the maturity profile has been costly, as investors globally are demanding high premia for term funding.<sup>10</sup> The share of offshore wholesale funding has fallen by only 1¼ percentage point over the period June 2007–May 2008, to 25½ percent of total liabilities, and the debt structure of Australian banks remains predominantly short-term.

#### D. Banks’ Exposure to the Housing Market

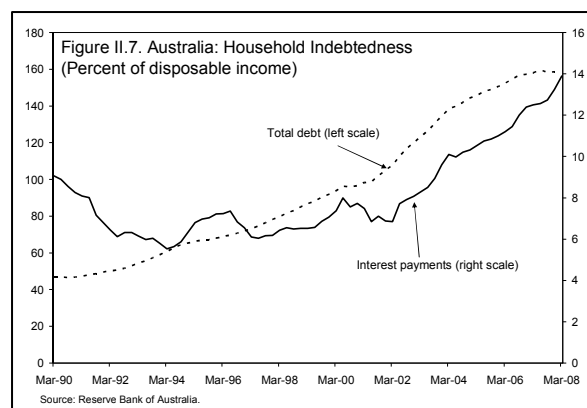
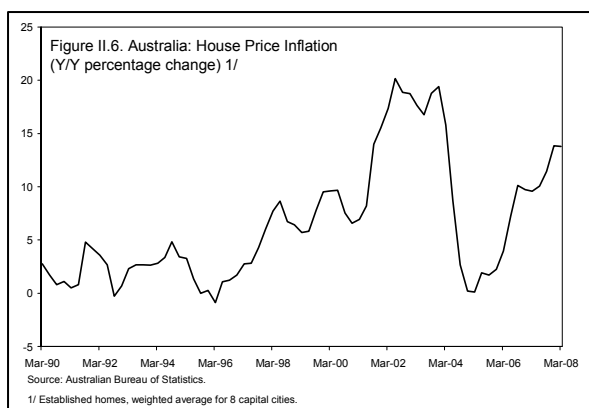
23. **Australian banks remain exposed to the housing market.** Over 50 percent of the banking system’s loans are mortgages, and this ratio is over 60 percent for one of the four large banks. The dependence of banks on the housing market has grown significantly since 2000, driven by the boom in house prices (Figure II.5). Investor activity in the residential property market has been a key driver of the recent property boom (Parlett and Rossiter, 2004), with many investors pursuing the negative gearing strategy that is allowed by Australian tax rules.<sup>11</sup> As a result, about one-third of all mortgage loans are for investor housing.



<sup>10</sup> This was especially the case in the first quarter of 2008, when the average maturity of newly issued bank bonds in fact dropped to around two years, compared to 4½ years prior to the market turmoil. The average maturity of new issuance has since rebounded to normal levels. For details, see Debelle (2008).

<sup>11</sup> See Ellis (2006) for a description of the features of taxation systems relevant to housing markets in a number of developed countries. Rozhkov (2007) discusses the impact of taxation system on the housing market in the context of New Zealand.

24. **This section looks at whether banks' high exposure to housing is a cause for concern.** Following the boom in 2001–04, house prices stabilized for a short period of time, but then house price inflation picked up again in 2006–07 (Figure II.6), creating concerns that Australian house prices may be overvalued. At the same time, driven by increasing house prices, debt levels of Australian households increased to historically high levels. In March 2008, total households' debt was close to 160 percent of their disposable income, and their debt-service ratio was approaching 14 percent (Figure II.7). So far, this increase in debt burden has not led to an increase in defaults. As of June 2008, nonperforming loans accounted for only 0.4 percent of the value of housing loans on banks' books. Nevertheless, households are vulnerable to falls in house prices and increases in interest rates.<sup>12</sup> This section first asks whether there is sufficient evidence that Australian house prices are overvalued, and then analyses the banks' resilience to an increase in mortgage defaults.



### Are House Prices Overvalued?

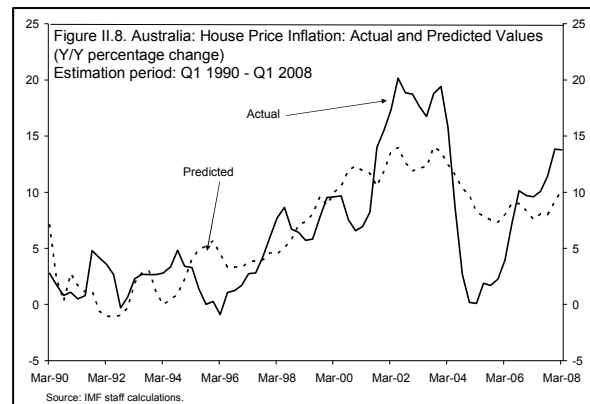
25. **The first step is the estimation of equilibrium level of house prices.** An earlier IMF study (Terrones, 2004) modeled house price inflation for a group of countries as a function of the affordability ratio, growth in disposable per capita income, short-term interest rates, credit growth, growth in the equity market index, and growth in the working-age population. To estimate the equilibrium price level for Australia, however, it is more appropriate to use an Australia-specific equation, and replace some of the variables by others that better reflect the Australian context.<sup>13</sup> In particular, mortgage interest rates are used instead of short-term interest rates, and long-term migration is used instead of growth in working-age population.

<sup>12</sup> Ryan and Thompson (2007) note that the riskiness of banks' mortgage portfolios has increased, but conclude that the banking system as a whole is sound and well placed to weather unexpected adverse events.

<sup>13</sup> Benito (2007) extended Terrones' study by using an updated data set and country-specific equations. However, the same variables were used for all countries.

26. **The regression results are fairly intuitive, and house price inflation is predicted reasonably well.** A number of equation specifications and estimation periods were

tried, and the results of the preferred specification are presented in Table II.6. All coefficients are significant and have the expected sign. The results also confirm the conjecture that migration is a better explanatory variable in the Australian context than population growth, although its explanatory power is not as high as in the case of New Zealand.<sup>14</sup> Given the large



estimated coefficient of lagged house price inflation, its predicted values are used instead of actual values in the fitted regression line in the chart (Figure II.8). Nevertheless, the equation predicts the house price inflation reasonably well, although the highest points of recent peaks and troughs are typically missed.

Table II.6. Australia: Estimation Results

Dependent variable: House price inflation  
Frequency: Quarterly  
Estimation Period: 1990:Q1 to 2008:Q1

Explanatory Variable	Regression Coefficient <sup>1/</sup> (Standard errors in parentheses)	
Constant	-0.026	(0.028)
House price inflation (t-1)	0.380***	(0.111)
Growth of real personal incomes (t-1)	0.258**	(0.121)
Mortgage interest rate	-0.002***	(0.001)
Stock market returns	-0.031**	(0.015)
Net long-term migration to population (t-3)	0.005**	(0.003)
Number of observations	72	
R-squared	0.46	
Breusch-Godfrey LM test <sup>2/</sup>	0.08	

1/ \*\* denotes significance at 5 percent level, \*\*\* at 1 percent level.

2/ A  $\chi^2$  test for the null hypothesis of no autocorrelation.

<sup>14</sup> *New Zealand: 2008 Article IV Consultation—Staff Report; and Public Information Notice on the Executive Board Discussion* (IMF Country Report No. 08/163), and Coleman and Landon-Lane (2007).

27. **The results indicate that the overvaluation of house prices in Australia is, if anything, moderate.** The preferred regression specification produces an estimate of overvaluation of about 15 percent for early 2004, which drops to about 5 percent by March 2008.<sup>15</sup> Other specifications and estimation periods result in a range of estimates between 2 and 15 percent for March 2008.<sup>16</sup> Moreover, extrapolating the results in the future indicates that, if house prices increase in line with inflation, and real personal incomes and migration increase as expected, house prices will be in line with their equilibrium value by mid-2009. To summarize, the results do not produce evidence of a significant overvaluation of house prices.

### **Can Banks Handle an Increase in Mortgage Defaults?**

28. **Although the results above indicate that a sharp fall in house prices is unlikely, it is still useful to test the resilience of banks to an increase in mortgage defaults.** Given the high indebtedness of households, the defaults may be triggered not only by house price declines, but also by increases in interest rates and unemployment.

29. **Stress test results confirm the resilience of the banking system to this type of shock as well.** The tests that were conducted involved scenarios of default on 5 or 10 percent of all housing loans (Table II.7). The average loss given default was assumed to be 40 percent, in line with the findings of various studies of the Australian and New Zealand housing markets (Harrison and Mathew, 2008). Despite the extreme nature of these scenarios, banks fare reasonably well. The aggregate capital ratio stays above 8 percent, and the most affected large bank has the capital ratio dropping to 7 percent.

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<sup>15</sup> The estimate is based on comparing the cumulative house price inflation over the period 2001–07 (112 percent) with predicted value for the same period from the regression (102 percent). This implies that house prices are 5 percent higher than their equilibrium value.

<sup>16</sup> Simpler methods based on housing affordability measures result in slightly larger estimates of overvaluation. For example, average house prices to incomes ratio was 24 percent above its long-run average in March 2008, indicating that the house prices would need to fall by 18 percent to restore the long-run equilibrium. However, this measure would also be reduced sharply if real incomes grow as expected in the period ahead. Real personal disposable income is expected to grow strongly in 2008–09, driven by a 20 percent increase in the terms of trade and cuts in personal income taxes.



Table II.7. Australia: Housing Market Risk: Stress Tests Results

	Four Large Banks Mar-08	All Banks Dec-07
Total capital ratio (actual)	9.9	10.2
Housing loans to total loans (actual)	54.8	51.5
Stress test scenarios		
Default on 5 percent of all housing loans		
New total capital ratio	8.7	9.2
Lowest capital ratio among four large banks	8.3	...
Default on 10 percent of all housing loans		
New total capital ratio	7.5	8.1
Lowest capital ratio among four large banks	7.0	...

Source: IMF staff calculations.

30. **The stress test scenarios above are extreme, and large-scale default on housing loans is unlikely.** As of 2006 (the latest year for which data are available), only about 7½ percent of owner-occupier households belonged to the higher risk group with a debt-service ratio of over 30 percent of disposable income and a gearing ratio of over 80 percent (Table II.8). This is in line with Girouard, Kennedy, and André (2007) who found that most household debt in OECD countries is held by households better able to manage it. Based on the estimated probabilities of default for various debt-service and gearing buckets from Harrison and Mathew (2008), the average probability of default for Australia households can be estimated to be around 1 percent. A 15 percent fall in house prices would increase that probability to around 2 percent, still significantly lower than the assumptions used in stress tests.

Table II.8. Australia: Indebted Owner-Occupier Households, 2006  
(Percent of all owner-occupier households)

Debt-Service Ratio	Gearing Ratio		
	< 40	40–80	> 80
0–20	33.2	9.7	1.7
20–30	11.1	13.0	3.1
30–40	4.4	6.9	3.4
40–50	2.0	3.2	1.7
50+	1.4	2.9	2.3

Source: Reserve Bank of Australia; HILDA Release 6.0.

31. **Another way of assessing the likelihood of the stress test scenarios materializing is to see what the scenarios imply for default probabilities for various debt-service and gearing buckets.** Table II.9 provides an example of a numeric calculation that shows that to get the overall probability of default of 10 percent, one would need to assume rather high default probabilities (in the range of 50–70 percent) for the high risk groups of households. In addition, substantial probabilities of default (10–16 percent) need to be assumed for households with gearing ratios of 40–80 percent.

Table II.9. Australia: Numeric Example  
Probabilities of default (in percent) required for the overall probability of default to be equal to 10 percent.

Debt-Service Ratio	Gearing Ratio		
	< 40	40–80	> 80
0–20	0.0	10.0	28.0
20–30	0.1	11.0	35.0
30–40	0.1	12.0	50.0
40–50	0.1	14.0	60.0
50+	0.2	16.0	70.0
Overall probability		10.0	

Source: IMF staff calculations.

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