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AUSTRALIA

Selected Issues

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Approved by the Asia and Pacific Department

September 30, 2003

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I. The Determinants of Property Prices in Australia[1]

1. **Property price inflation has accelerated during the last few years, propelled by low mortgage rates, poor returns from alternative investments, strong employment and immigration, and tax incentives** (Table 1)[2]. Low interest rates and the First Home Owners Scheme reduced the cost of housing for owners. Investor demand has also driven housing prices, particularly in the central business districts of the major cities, as increased expected returns on housing far outstripped returns on other assets. Consequently, investor housing accounted for 30 percent of the stock of housing loans by the end of 2002, compared to 18 percent a decade ago.

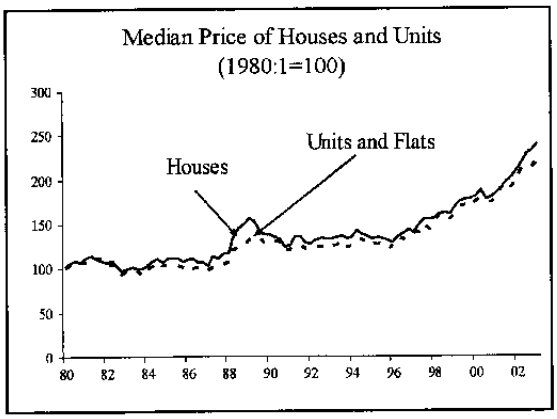

Table 1. Australia: New and Established House Price Index during 1998:4-2002:4
(in percentage change)

	1Y		2Y		3Y		5Y	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
Brisbane	16.1	13.7	37.1	30.4	45.1	30.2	48.8	28.3
Melbourne	11.6	9.3	32.0	25.6	46.6	31.6	84.8	59.3
Sydney	17.0	14.6	40.5	33.6	47.1	32.0	75.9	51.7
Average of 8 Capital Cities	14.1	11.7	33.9	27.4	43.2	28.5	65.9	43.1

Source: Australian Bureau of Statistics.

2. **The recent run-up in housing prices is largely explained by economic fundamentals; however, further changes in fundamentals would not appear to support additional sharp increases in prices.** The estimation results of an econometric model show that real Australian housing prices over the last two decades are well explained by movements in real mortgage interest rates, real disposable income, real returns on equities, and population growth. In particular, the real mortgage rate decline of 4½ percentage points during the last five years alone accounted for about 30 percent of the increase in real property prices during the period. Mortgage rates are not expected to decline significantly in the period ahead, nor should expected changes in other fundamental determinants contribute to a further sharp rise in housing prices.

A. Factors Influencing Housing Demand

3. **Financial innovation and increased competition in the mortgage industry have lowered the cost of borrowing and enhanced household access to credit.** In the

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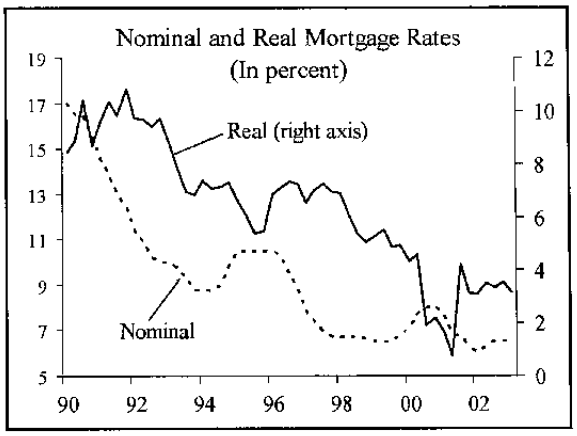
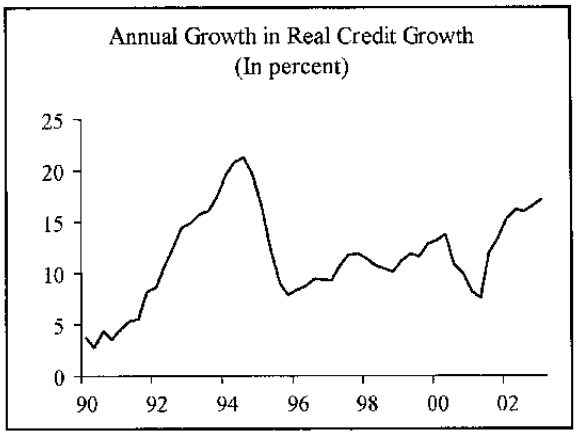
[1] Prepared by Abdelhak Senhadji (Ext. 38380).

[2] Since the housing price indices do not fully adjust for quality, Table 1 may overstate the extent of housing price inflation.

early 1990s, financial institutions were keen to expand their portfolios of relatively high-return, low-risk housing loans, especially considering the losses that they had incurred on their corporate loan portfolios. This interest in housing finance, as well as strong competition from new entrants, reduced borrowing costs and spurred innovation. The development of the mortgage brokering industry over the past couple of years has added further to the competitive environment for housing loans. The brokers have also substantially lowered entry costs for new lenders, by reducing the need for extensive branch networks and advertising.

4. **Nominal and real interest rates have declined significantly since 1990**. The standard variable mortgage rate has averaged 6.8 percent over the past five years, compared to 10.8 percent in the period 1990–97. From a peak of 17 percent in early 1990, the mortgage rate has fallen to 6.6 percent in March 2003. This decline largely reflects the decline in inflation over the period. The mortgage rate has declined in real terms from an average of 8.4 percent in 1990–97 to an average of around 4 percent during the last five years.[3] The substantial decline in interest rates has significantly increased households' borrowing capacity.

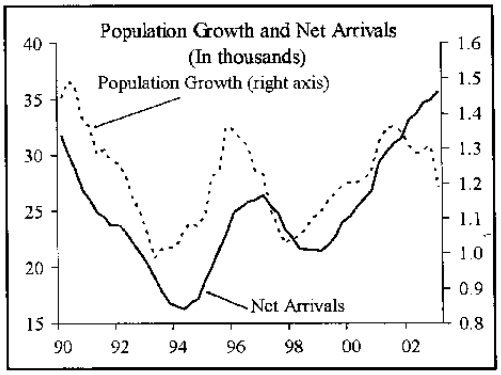




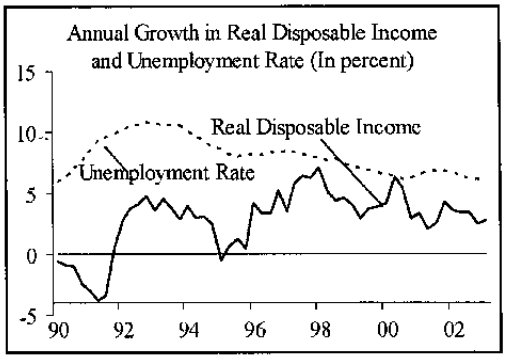
5. **Household mortgage credit has grown at a rapid pace during the last five years**. Real credit grew at an average of 12½ percent per year during the last five years compared to 11 percent in 1990–97. However, the pace of growth has accelerated to reach more than 17 percent by the first quarter of 2003. Considering the relatively slow adjustment in the supply of housing, the rapid growth in

[3] The sharp decline in real interest rates during 2000-01 reflects the introduction of the goods and services tax and the consequent large transitory increase in CPI inflation.

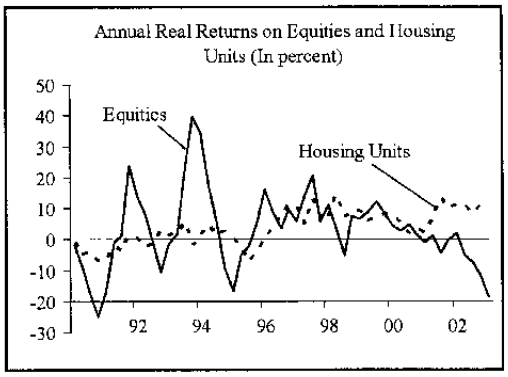
credit (reflecting housing demand), has translated into higher housing prices. Some of the increase in housing prices reflects quality improvements, but a large part of the increase in housing prices probably reflects pure inflation.



6. **Strong immigration and falling household size have boosted housing demand**. Permanent and long term net immigration flows have averaged close to 125,000 persons a year during the last five years, more than 40 percent higher than the average over the 1990–97 period. Strong immigration flows, in conjunction with falling household size, boosted demand for housing.[4] This has been particularly true for capital cities such as Sydney, Melbourne, and Brisbane where housing prices have increased the most.



7. **Strong growth in disposable income and a declining unemployment rate have also contributed to sustaining the boom in the housing market**. Real disposable income grew by 3.3 percent a year during the last five years compared to 2.1 percent in 1990–97.[5] The unemployment rate has declined from almost 11 percent in the early 1990s to about 6 percent by the end of 2002.



8. **Poor returns on alternative investments have also contributed to the rapid rise in housing prices, especially in the investor segment of the housing market**. Average yearly returns on equities was less than one percent during the last five years compared to 7½ percent for housing investments.[6] In addition, housing investments benefited from the halving of the capital gains tax rate in 2000.

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[4] According to the 2001 Census of Population and Housing, the average household size decreased from 2.8 persons in 1991 to 2.6 in 2001. The number of households increased from 15.4 million in 1991 to 17.2 million in 2001.

[5] The CPI series used to deflate nominal disposable income has been adjusted for the introduction of the GST in 2000.

[6] The returns for both housing and equities only include capital gains. Including dividends for equities and rents for housing is likely to show even higher returns for housing relative to equities.

B. An Econometric Model for the Relative Price of Housing

9. Inherent features of the real estate market—in particular, *supply rigidities and imperfect information*—combined with the procyclical nature of bank lending contribute to making the housing market vulnerable to periods in which actual prices may deviate from their fundamental value.[7] Since the price of housing depends on the future value of fundamentals, investors may either underestimate or overestimate the fundamental price in an environment with imperfect information. In particular, housing purchasers may become overly optimistic about expected capital gains, driving the price above its replacement cost. In efficient financial markets, these deviations would rapidly be eliminated by a relatively quick adjustment of supply and demand conditions. However, in the housing market, optimistic housing purchasers will remain in the market as long as prices are rising and financing is available, owing to the slow supply response, and the lack of futures and options markets for housing prevent a quick adjustment to equilibrium. Finally, as prices move farther and farther away from their fundamental value, more and more investors would eventually move to the sell side, dampening price inflation. As this process gathers momentum, prices could drop abruptly.

10. For owner-occupied housing, the demand for housing can be specified as a function of real disposable income, the cost of borrowing, and demographic changes. In the case of investors, the demand for housing can be specified as depending on the cost of borrowing, real disposable income, expected capital gains in the housing market, and expected yields on alternative investments. The effect of the latter variable is uncertain given the presence of substitution and income effects.[8] Another potential explanatory variable is housing credit growth, but it is not possible to distinguish between an increase in the demand for credit driven by a decline in mortgage rates and an increase reflecting greater availability of credit for housing.

11. Table 2 provides the Augmented Dickey-Fuller unit root test for all the variables included in the two housing demand equations that are estimated. Generally, variables fail to reject the unit-root hypothesis at conventional significance levels. Table 3 reports the

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[7] Kiyotaki and Moore (1997) show how the effect of shocks to the housing market can be amplified by collateralized lending. In particular, they find that the dynamic interaction between credit limits and asset prices are a powerful transmission mechanism by which the effect of shocks persist, amplify, and spread out. See also Herring and Wachter (1999).

[8] A decline in the relative yield of alternative investments would decrease investors' wealth, which should reduce demand for housing. The substitution effects implies investors would move out from alternative investments and into housing as the relative yield of alternative investments decreases. The substitution effect is likely to dominate.

estimation results for the housing demand equations.[9] For the owner-occupied segment of the housing market, the log of the relative price of houses (*P_h*)—where the latter is the median price for new and established houses divided by the consumer price index (CPI)—is expressed as a function of the expected real mortgage rate (*r*), the log of real disposable income (*Yd*), population growth (*POP*), and the lag of the dependent variable in order to capture persistence in the relative price of houses.[10] Similarly, for the investor segment of the housing market, the log of the relative price of units and flats (*P_u*)—where the latter is the median price for new and established units and flats divided by the CPI—is expressed as a function of the expected real return on units and flats, expected real return on equities, the expected real mortgage rate, real disposable income, and the lag of the dependent variable in order to capture persistence in the relative price of units and flats. As is customary in the literature, the expected future value of a variable is computed as its moving average.

12. In the equation for owner-occupied housing, all variables have the expected sign and are highly statistically significant, and the estimated equation fits the data quite well (Figure 1). The relationship between the real mortgage interest rate and the relative price of housing is nonlinear. This relationship strengthened significantly after 1995 with the short-term semi-elasticity between these two variables increasing from 0.4 to 1.1 after 1995.[11] The corresponding long-run semi-elasticity after 1995 is 2.8. This implies that the decline in real mortgage interest rates of 4½ percentage points during the last five years accounted for about 12¾ percentage points increase or 30 percent of the total increase in the relative price of housing during the period. As expected, demand for housing is strongly procyclical. An increase in real disposable income of 1 percent would increase the relative price of housing by 0.6 percent on impact and by 1⅔ percent in the long run. Population growth also has a powerful effect on the relative price of housing. A one percentage point increase in population growth is associated with an increase in the relative price of housing of more than 9 percent on impact and by 27 percent in the long run.

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[9] To take into account nonstationarity in the data, the cointegration framework of Phillips and Hansen (1991) was used. In addition, the Phillips-Hansen Fully Modified estimation method has the attractive feature of correcting for bias that may arise from potential endogeneity of the explanatory variables and/or serial correlation of the error term.

[10] The precise definition of each variable is given in the annex.

[11] The strengthening of the relationship between the relative price of housing and the real mortgage interest rate starting in the mid-1990s may reflect a more stable interest rate environment. Indeed, both the level and variability of interest rates declined significantly during the first half of the 1990s. Reduced variability in interest rates is particularly important when mortgage interest rates are adjustable, which is the case in Australia where variable interest rate loans account for about 85 percent of housing loans outstanding. A given decline in mortgage interest rates would likely generate a higher demand for housing (and thus lead to a larger increase in the relative price of housing) in an environment with low variability, and thus less uncertainty about the future path, of mortgage interest rates.

13. In the equation for the relative price of housing in the investor segment of the market, all variables have the expected sign and are highly statistically significant, and the estimated equation fits the data quite well (Figure 2). Higher expected real returns in the housing market tend to increase demand (for a given supply of housing), which leads to an increase in the relative price of housing. An increase of 10 percentage points in real returns on housing investments will increase the relative price of housing by about 3¼ percent in the long run. The long-run effect of mortgage interest rates on housing investments is very similar to that on the owner-occupied housing. The long-run semi-elasticity for investment housing is 2.7 versus 2.8 for owner-occupied housing. An increase in expected real returns on equities (holding real returns on housing constant) exerts a negative effect on the relative price of housing which implies that the substitution effect largely dominates the income effect. A decline in real returns on equities would lead investors to move out of equities (or at least redirect new cash out of equities) and into housing, bidding up the relative price of housing. A decline of 10 percentage points in real returns on equities would induce an increase in the relative price of housing of 1.7 percent on impact and 2.5 percent after prices have adjusted fully. Interestingly, the adjustment of relative prices of housing to a shock is faster in the investor than in the owner-occupied segments of the housing markets.

14. These estimated equations can be used to assess the degree of divergence between the *actual* relative price of housing and the relative price of housing that is *implied* by fundamental factors. The relative price of housing for both the owner-occupied and investor segments of the market are broadly in line with their estimated values, deviating by only 2½ percent in the first quarter of 2003.

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Table 2. Australia: The Dickey Fuller-GLS Unit Root Test

Variables	DF-GLS Statistic
P_h	-2.22[a]
P_u	-1.00[a]
H_r	-1.93[a]
M_r	-1.75[a]
Yd	-2.35[a]
E_r	-2.58[a]
POP	-1.73[a]
N	82

Notes: The variables are: the log of the median price for new and established houses deflated by the CPI (*P_h*), the unit price index deflated by the CPI (*P_u*), the 8-quarter moving average of the year-on-year percentage change in the housing price (H_*r*), the 8-quarter moving average of the mortgage real interest rate (M_r), the log of real disposable income (*Yd*), the 4-quarter moving average of the year-on-year percentage change in the equity price index (*E_r*), and the 8-quarter moving average of year-on-year percentage change in population (POP). The asymptotic critical values for the DF-GLS test are –3.71, -3.14, and –2.84 for the 1 percent, 5 percent, and 10 percent significance level, respectively. The superscript "*a*", "*b*", and "*c*" indicate rejection of the unit root hypothesis at the 10, 5, and 1 percent significance levels, respectively.

Sources: Real Estate Institute of Australia, Australian Bureau of Statistics, and Fund staff calculations.

Table 3. Australia: Determinants of Median Price for New and Established Houses and Units Deflated by CPI

Independent Variables	Dependent Variable	
	P_h	*P_u*
Constant	-2.502 (-4.69)[a]	-3.364 (-8.15)[a]
Lagged Dependent Variable	0.666 (8.72)[a]	0.324 (4.29)[a]
H_r		0.218 (2.95)[a]
Mr	-0.376 (-2.33)[b]	-0.678 (-4.09)[a]
*D95*M_r*	-0.569 (-3.32)[a]	-1.157 (-6.85)[a]
Yd	0.554 (4.75)[a]	0.981 (9.51)[a]
E_r		-0.166 (-4.57)[a]
POP	9.128 (2.82)[a]	
Long-Elasticity for M_r (after 1995)	2.83	2.71
Adjusted R^2	0.977	0.985
Shin's Cointegration Statistic	0.025	0.019
N	77	77

Note: The equations are estimated using quarterly data for the period 1984:1– 2003:1. The dependent variables are the log of the median price for new and established houses deflated by the CPI (*P_h*) and the log of the median price for new and established units deflated by the CPI (*P_u*). The independent variables include: the 8-quarter moving average of the year-on-year percentage change in the housing price (H_r), the 8-quarter moving average of the mortgage real interest rate (M_r), the log of real disposable income (*Yd*), the 4-quarter moving average of the year-on-year percentage change in the equity price index (*E_r*), and the 8-quarter moving average of year-on-year percentage change in population (POP). The superscript "*a*", "*b*", and "*c*" indicate statistical significance at the 1, 5, and 10 percent level. The critical values for Shin's cointegration test are 0.184, 0.121, and 0.097. Shin's test fails to reject the null hypothesis of cointegration at 1 percent significance level for both equations.

Sources: Real Estate Institute of Australia, Australian Bureau of Statistics, and Fund staff calculations.

Figure 1. Australia: Median Price for New and Established Houses
Deflated by the CPI (in log)

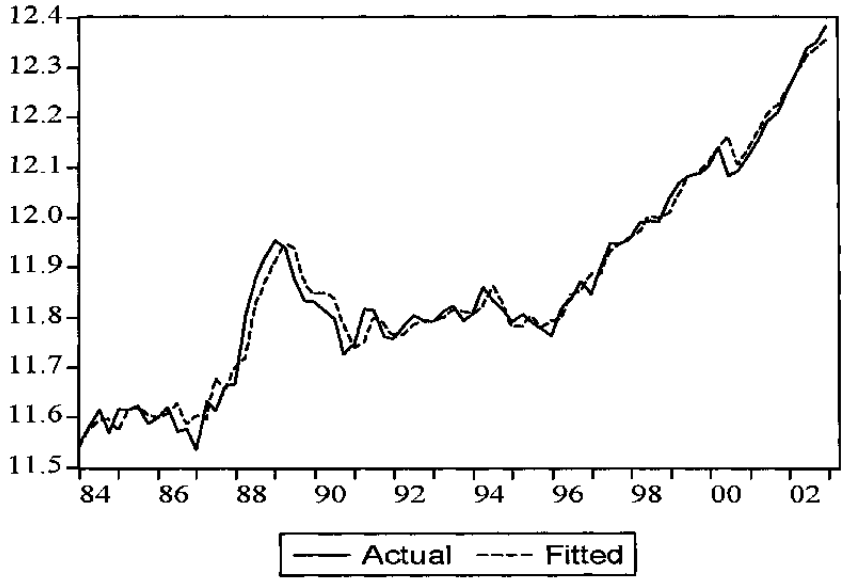
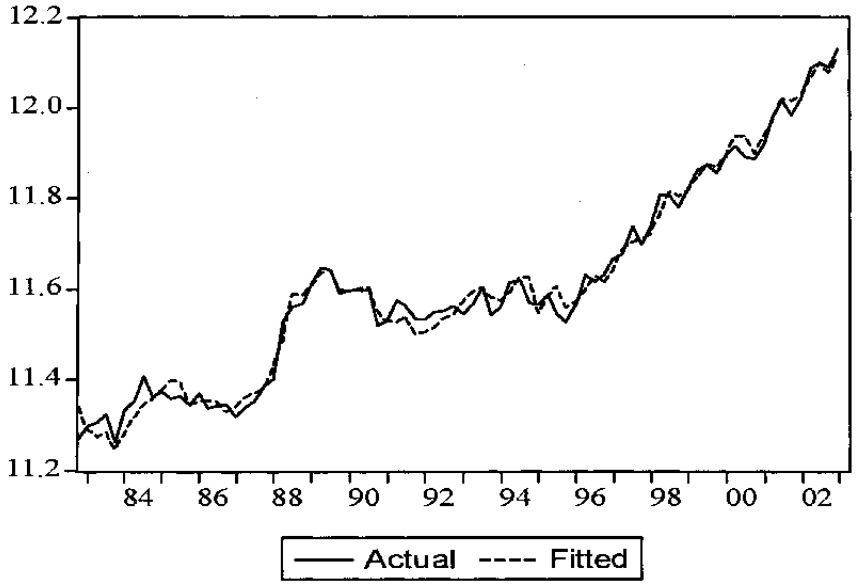


Figure 2. Australia: Median Price for New and Established Units
Deflated by the CPI (in log)



Data Sources and Definitions

The data are quarterly for the period 1980:1 to 2003:1. The definition and sources for each variable are as follows:

Median price for new and established houses, weighted average for the eight capital cities. Source: Real Estate Institute of Australia.

Price index for new and established houses, weighted average for the eight capital cities. Source: Australian Bureau of Statistics.

Median price for new and established units and flats, weighted average for the eight capital cities. Source: Real Estate Institute of Australia.

The consumer price index (CPI). Official CPI series of the Reserve Bank of Australia, except for the computation of the real disposable income where the nonpublished CPI series adjusted for the introduction of GST in 2000 was used.
Source: Reserve Bank of Australia.

Real mortgage interest rate. Nominal mortgage interest rate minus CPI inflation.
Source: Reserve Bank of Australia.

Real returns on property prices. Year-on-year percentage change in the median price of new and established units and flats deflated by the CPI.
Sources: Real Estate Institute of Australia and Reserve Bank of Australia.

Real returns on equities. Year-on-year growth rate of the ASX200 index deflated by the CPI.
Source: Reserve Bank of Australia.

Real disposable income. Nominal deposable income deflated by the CPI.
Source: The Australian Bureau of Statistics.

Population growth. Year-on-on year growth rate of total population.
Source: The Australian Bureau of Statistics

II. Housing, Consumption, and Output[1]

1. **Housing activity in Australia has had a substantial macroeconomic impact in recent years**. Strong housing investment in advance of the introduction of the goods and services tax (GST) contributed substantially to GDP growth in 1999 (Figure 1), but GDP growth dropped in 2000 as housing investment slumped after the GST was imposed in July 2000. Since the government established the First Home Owners Scheme (FHOS) to offset the impact of the GST, housing investment has increased substantially and made significant contributions to Australia's GDP growth. In turn, the strength in housing activity has directly impacted consumption of housing-related durable goods and services, has contributed to a sharp rise in housing prices, and has influenced private consumption indirectly through increasing household net wealth (the traditional wealth effect). In addition, innovations in the credit market, which have allowed homeowners to more easily and less expensively borrow against their housing equity, have played an important role in stimulating consumption.

2. **The rapid increase in housing prices in recent years has raised concerns about the potential economic consequences of a sharp decline in prices**. From understanding the channels through which the housing boom has affected real GDP, it is possible to gain some insight into how economic activity might be affected by a sharp decline in housing prices. The impact of such a decline would lead to a fall in housing investment and consumption of housing-related durables. The wealth effect would also operate in a symmetric fashion to reduce consumption. In contrast, although net equity withdrawals and the consumption they financed would decline when housing prices fall, households would not be expected to make substantial repayments of previous housing equity withdrawn. Accordingly, there would not be an additional negative effect on consumption. Hence, the impact on consumption of a sharp fall in housing prices could be significantly less than the rise in consumption that was associated with a similar rise in prices. However, a decline in housing prices could also affect output and consumption through its impact on the soundness of the banking system, which could potentially have a large and lasting impact on economic activity. Household financial distress could lead to rising loan defaults affecting both the ability and willingness of banks to lend, not just to the housing sector, but across the whole economy. At present, this is not expected to have a substantial negative effect because the stress tests done on the Australian banks suggest that a large decline in housing prices is not likely to lead to systemic problems.

A. Recent Developments in Housing Prices and Household Wealth

3. **Strong housing demand has led to a substantial rise in housing prices in recent years**. The weighted average of housing prices across the eight capital cities has risen at an average annual rate of 13 percent since 1999, with a price increase of 18 percent in the last year alone (Figure 2). In addition to the stimulus provided by the government's FHOS, solid

[1] Prepared by Uma Ramakrishnan (Ext. 35413).

growth in long-term immigration and a rising number of households have increased housing demand. The rise in housing prices also has occurred during a time when returns from alternative investments, such as equities, have weakened significantly.[2] As a result, strong investor demand for housing has developed. This demand primarily reflects purchases of single housing units by individuals seeking to capture capital gains in the housing market. The housing price increase also reflects a long-term adjustment by households to a new low inflation and low interest rate environment, which has allowed households to borrow two times more relative to their disposable income than they could in the 1980s, while maintaining their debt-servicing costs largely unchanged.[3]

4. **The housing price increase also has been a major contributor to a rise in household net wealth** (Figure 3). Household net wealth rose from 430 percent of disposable income in June 1992 to 490 percent in June 2002. While the initial rise in wealth during this period was driven by increases in the prices of financial assets (mainly equity prices), household net worth in more recent years has been largely propelled by higher nonfinancial wealth (mainly housing). This rise in net housing wealth has taken place despite a sharp rise in gross indebtedness. Household debt has more than doubled over the 1990s, from just over 50 percent of disposable income in 1990 to some 125 percent by the end of 2002—a debt level that is now broadly comparable to that in the United States and the United Kingdom—with most of this debt being housing-related.[4]

5. **Historically, there are similarities and distinct differences in the behavior of housing price in Australia compared to other industrial countries**. Since the late 1990s, Australia has experienced a rate of increase in housing prices very similar to that which has taken place in the United Kingdom (Figure 4). In both the United States and Canada, housing prices have risen at significantly slower rates over this period. Moreover, in 2002, the deviations in housing prices from their long-term trend were broadly similar in the United Kingdom and in Australia (around 3 to 4 percent; Figure 5). However, the behavior of housing prices in Australia following the end of previous booms differs sharply from that in the United Kingdom. Housing price booms in Australia have been followed by periods of relatively stable prices; in the United Kingdom, they have been followed by significant declines in prices. In this, housing price behavior in Australia has been closer to that in the United States.

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[2] Equity prices in Australia have risen at an annual average of 2¼ percent for the three years ending 2002, compared to the 13 percent increase in housing prices.

[3] Reserve Bank of Australia *Statement on Monetary Policy* (August 2003).

[4] For a more detailed discussion of Australian household debt data, see Reserve Bank of Australia (2003a).

B. Effects of Housing on Consumption

6. **Housing influences consumption directly or indirectly through at least three different channels.** First, the rise in housing investment directly affects consumption of housing-related durable goods and services. Second, housing influences consumption indirectly through the effect of rising housing prices on the net worth of households. Third, housing also could have an indirect influence through innovations in credit markets that allow households to tap equity in their homes to finance consumption relatively easily and at lower interest cost than alternative means of borrowing.

7. **In Australia, housing activity has had a strong direct effect on consumption** (Figure 6). Housing investment has been highly correlated with the consumption of housing-related durable goods and services (correlation coefficient of 0.88 since March 1990).[5] The consumption of these goods have made a fairly significant contribution to the growth in private consumption in recent years.

8. **Econometric estimates of a consumption function suggest that the net housing wealth effect has significantly impacted Australian household consumption.** According to the traditional wealth effect, an increase in "permanent" household wealth would induce households to spend more out of current income (i.e., save less). An equation derived from a long-run consumption function consistent with permanent income and life-cycle models was estimated based on cointegration theory using quarterly data from 1981:4 to 2002:3.[6] The equation specifies consumption as being determined by a set of variables including personal disposable income, net housing wealth, and households' access to credit to capture the effects of financial deregulation and innovation.[7] The results suggest that housing wealth has had a significant impact on private consumption in Australia with annual private consumption rising by some 5 cents for a dollar increase in net housing wealth (Table 1 and Figure 7).[8]

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[5] Housing-related durable goods and services are derived from data on household expenditure as the sum of furnishings and household equipment and other dwelling services. Quarterly data for other dwelling services were computed by applying the ratio in annual data of other dwelling services to the sum of rent and other dwelling services.

[6] The equations were estimated using the Phillips-Hansen fully modified OLS (FMOLS) procedure. This method estimates the long-run parameters by correcting for serial correlation in the residuals without having to explicitly specify the dynamics of the model. It is a valid procedure when there exists a single cointegration equation and when the explanatory variables are not themselves cointegrated. For details, see Phillips and Hansen (1990).

[7] Explanations for the derivation of the variables used and sources for the data are provided in the Annex.

These results are broadly consistent with those presented in other studies. For example, Dvornak and Kohler (2003) found that a dollar increase in housing wealth in Australia raises consumption by some 3 cents. In a cross-country panel study that included Australia, IMF (2002) found that in market-based economies, consumption increased by 7 cents for every dollar increase in housing wealth.

9. **Housing also appears to have played a role in stimulating consumption through a credit market channel**. Financial deregulation and greater competition among banks have led to the development of new products, such as home equity loans and mortgages with a redraw facility, that have reduced credit constraints on household borrowing.[9] During the period from end-2001 to March 2003, the cumulative mortgage equity withdrawal by households was around $A 165 billion (Figure 8).[10] Housing wealth increased by around $A 650 billion during this period, which, based on the estimated wealth effect, suggests that consumption could have been increased by as much as $A 33 billion, if households considered this increase in wealth to be permanent. Thus, the resources released from mortgage equity withdrawal were around five times more than the funds available from the estimated housing wealth effect. The positive cash flow generated from equity withdrawal represents money available to finance other spending and consumption activities. According to an ABS survey (ABS, 2001), some 20 percent of borrowers used their home refinancing during 1997-99 to finance purchases such as cars and holidays (Table 2). While more recent surveys are not available, it is likely that a more substantial part of the housing equity withdrawal was used for consumption spending in recent years, due to the large interest rate differential between home equity loans and other personal loans, which would make it cheaper for households to finance purchases, such as cars, using home equity loans (Figure 8).

10. **Rising housing prices might also affect housing investment and consumption by influencing the willingness of banks to lend and households to borrow**. It is particularly difficult to try to model this effect because of the difficulty in quantifying this "willingness" factor and to identify "overlending" or "overborrowing" that might result from it. While this may have relatively minor effects when housing prices are rising, more significant problems could emerge in the event of a pronounced price decline. In such circumstances, substantial

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[8] Net financial wealth was dropped from the estimation due to insufficient data spanning the whole sample period. Further, Australian net worth has been increasingly held in housing, with the ratio rising from 53 percent of total wealth in 1993 to the current level of more than 70 percent, making it the dominant determinant of the wealth effect.

[9] The redraw facility entitles the customer to automatically redraw any payments made to the loan account in excess of the repayment commitment under the loan.

[10] For a detailed discussion on mortgage equity withdrawal in Australia, see Reserve Bank of Australia (2003b).

financial stress could develop in the household sector with rising default rates and repercussions for the soundness of financial institutions. In turn, there could be wider ramifications for the economy, if problems in home loan portfolios were to induce a more broad-based retrenchment of bank lending. In Australia's case, housing mortgages comprise roughly half of total bank loans of the major banks. Default rates on mortgages are low, but this could reflect the fact that, historically, Australian housing prices have not fallen significantly, and the vast majority of loans have been to owner-occupiers. In the event of a sharp fall in housing prices and with a larger number of investors in the housing market (whose behavior in this circumstance is not clearly known), default rates could rise and financial system problems emerge. To assess this possibility, the Australian Prudential Regulation Authority conducted special stress tests to see how individual banks might fare if housing prices were to decline sharply. The preliminary results of these tests suggest that, while the net income of individual banks could be significantly affected by a housing price fall, bank capital appeared to be sufficient to avert the risk of failure of any major institution and systemic difficulties.

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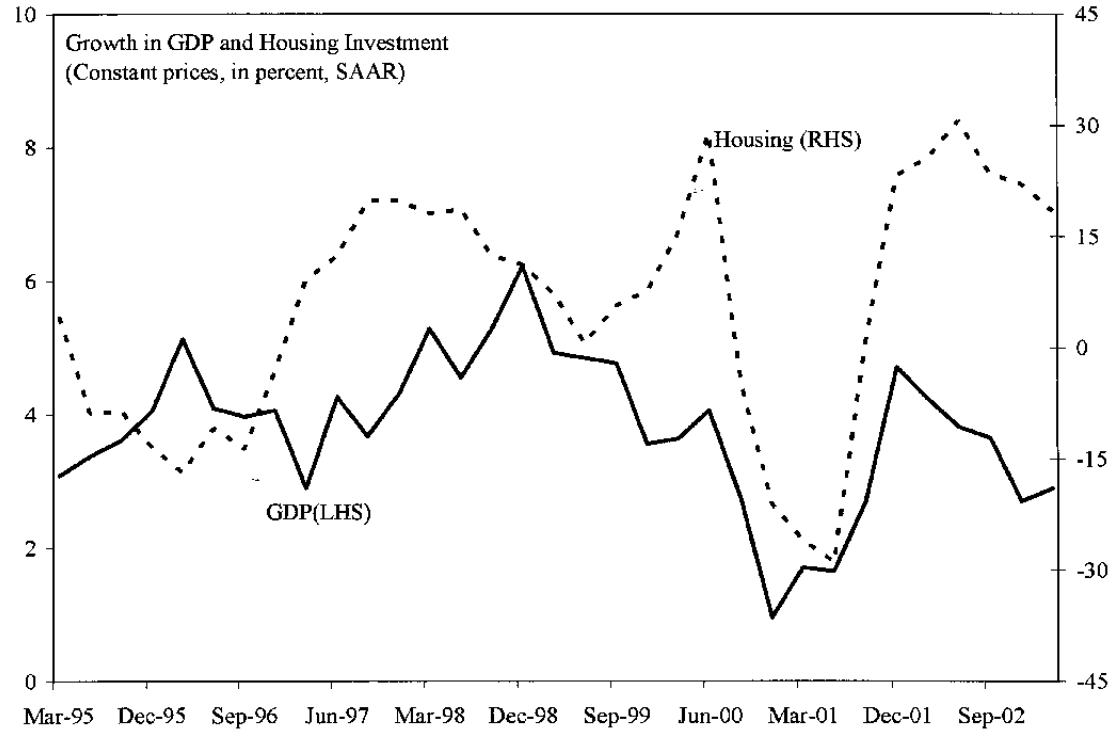
Figure 1: Australia: Housing-Related Activity



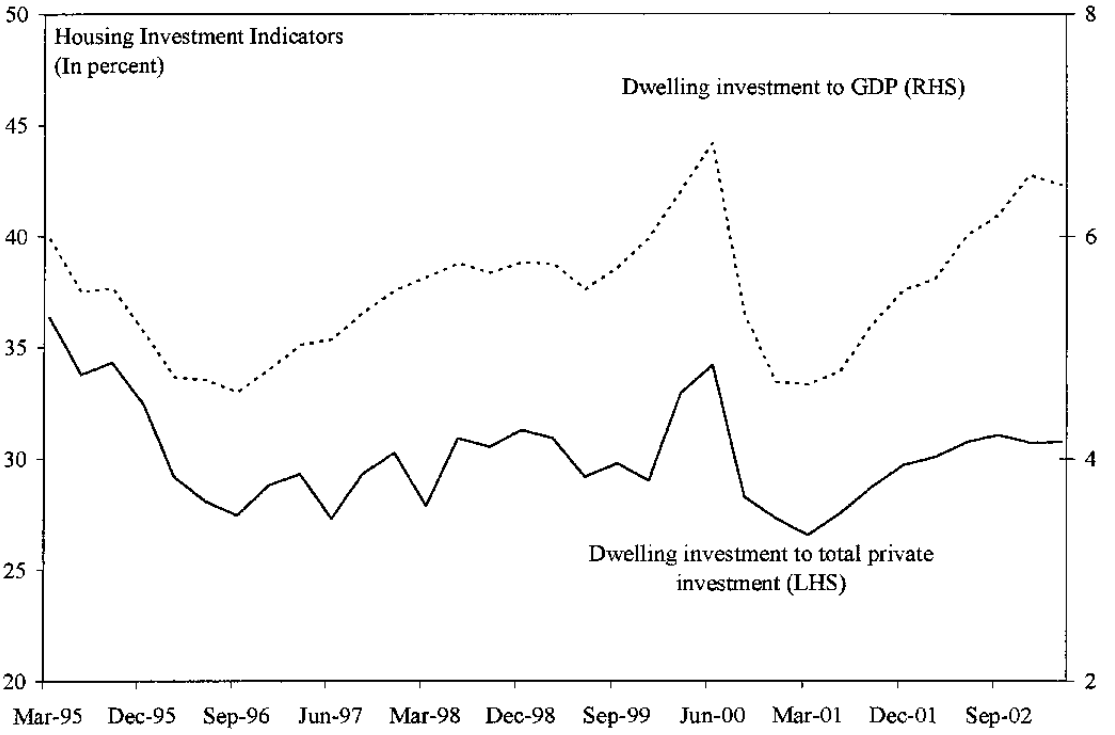


Figure 2: Australia: Housing Price Developments

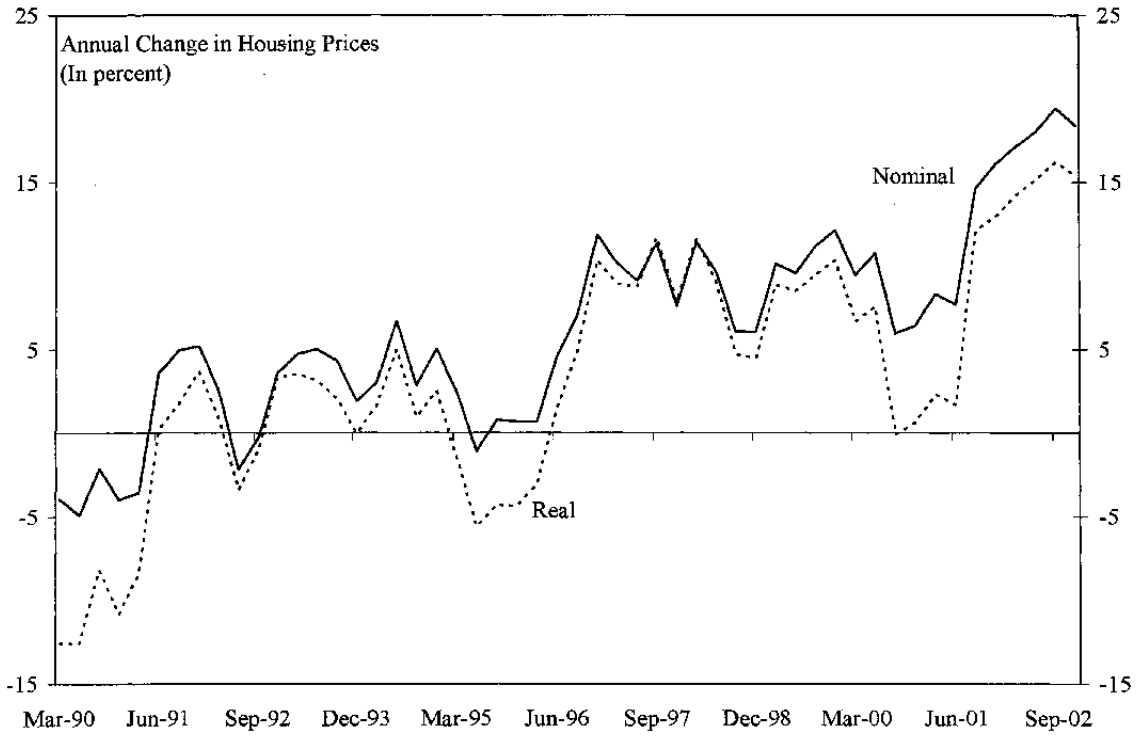
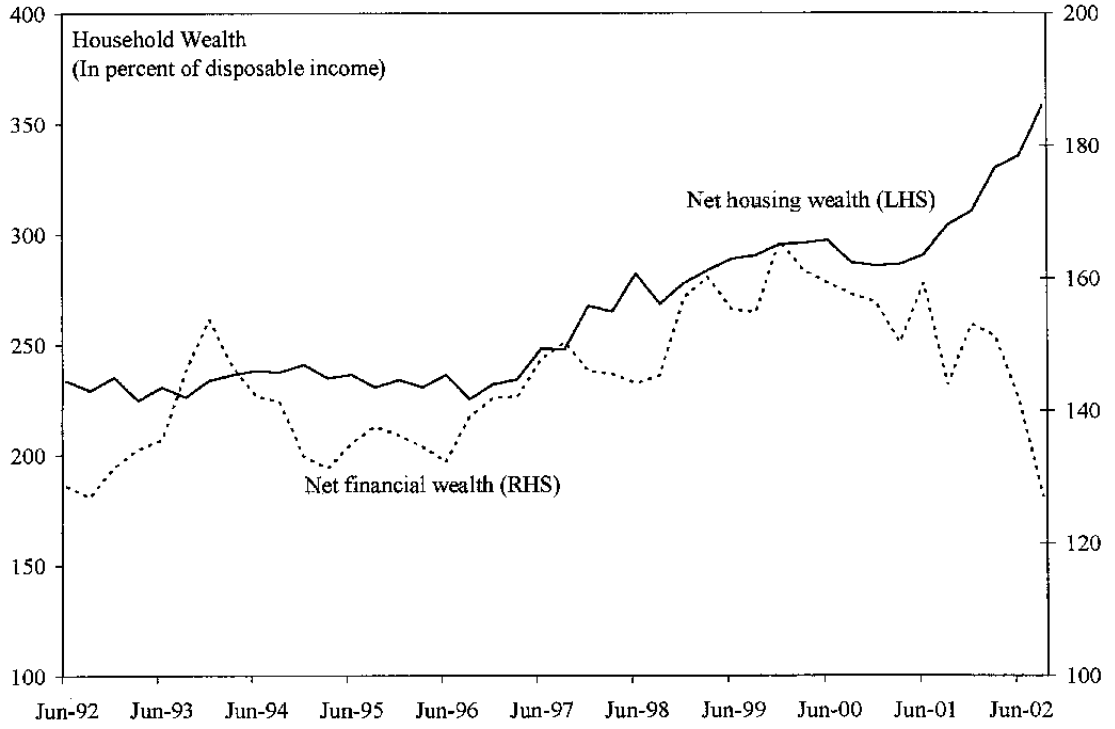


Figure 3. Australia: Household Wealth Indicators



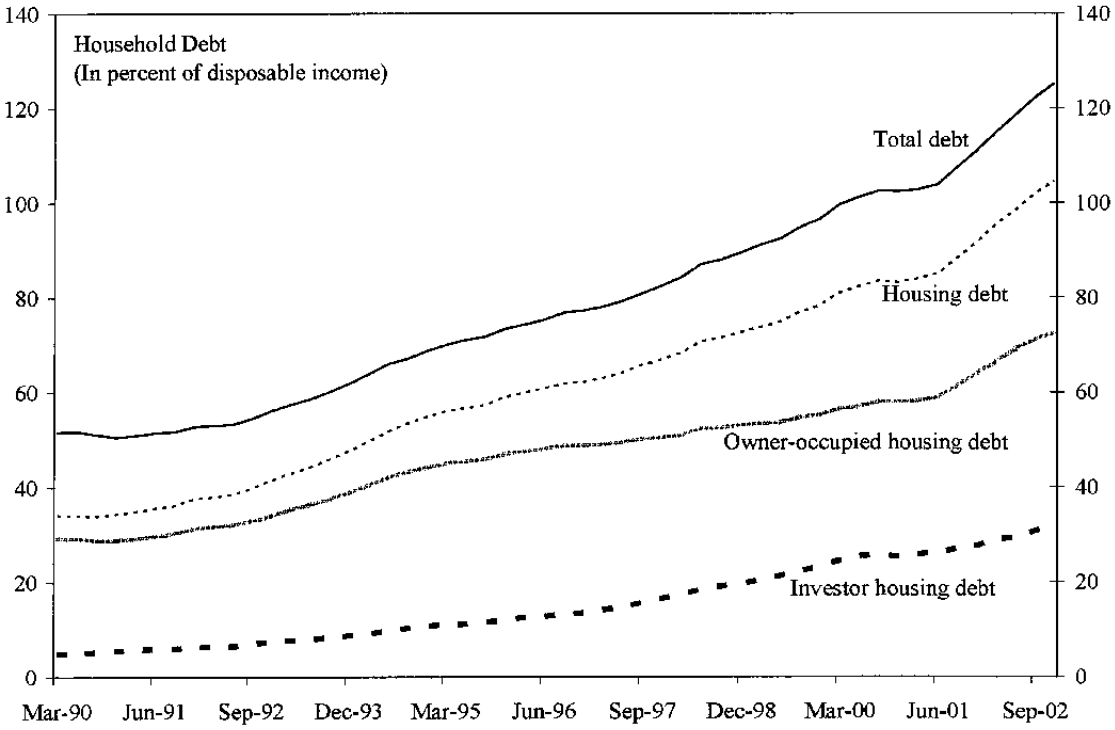


Figure 4. International Comparison of Housing Price Developments

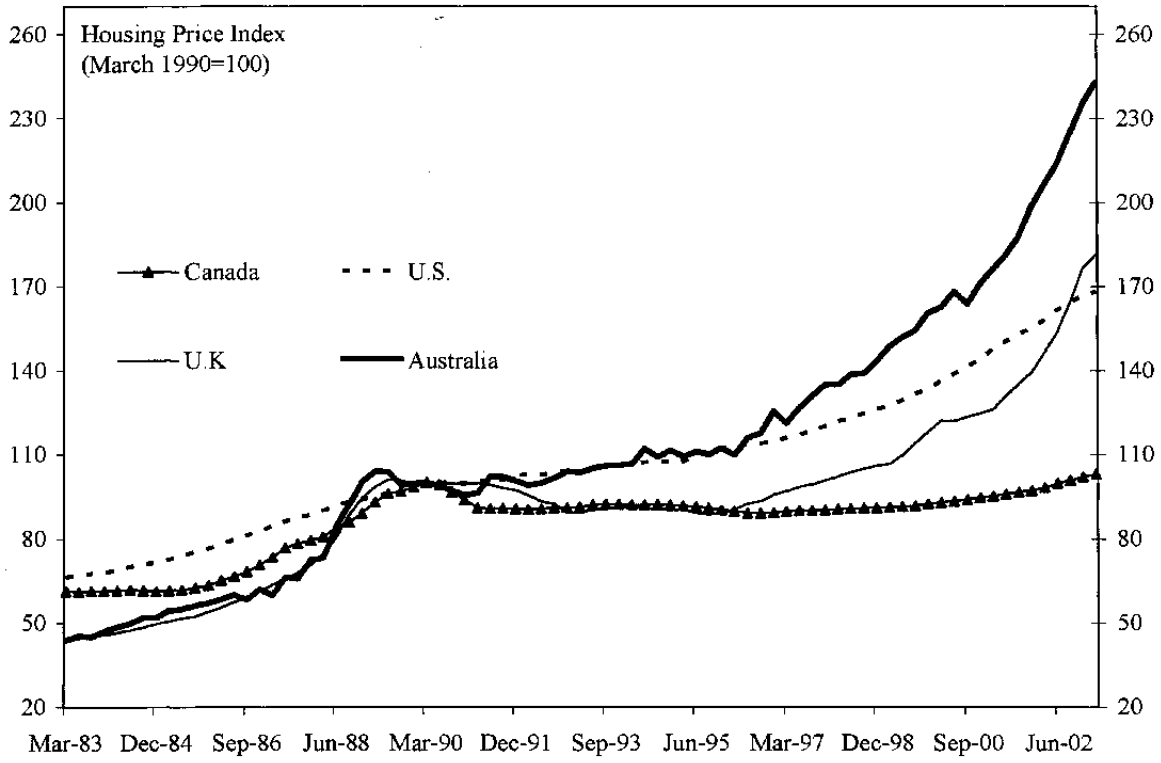
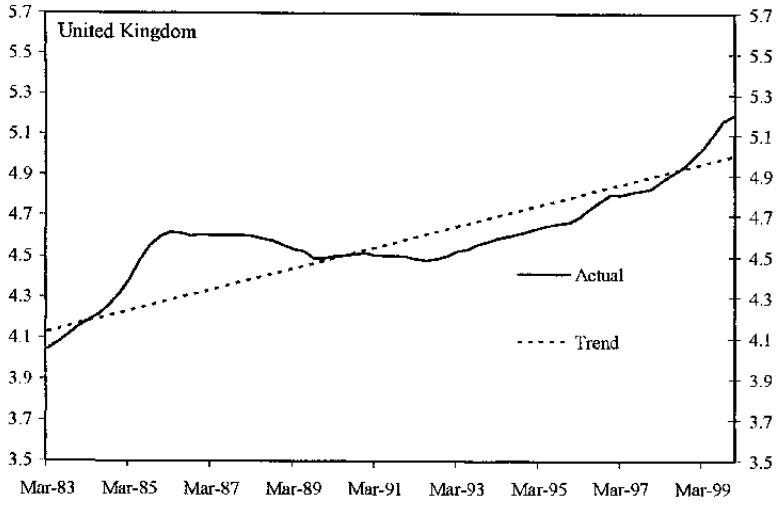
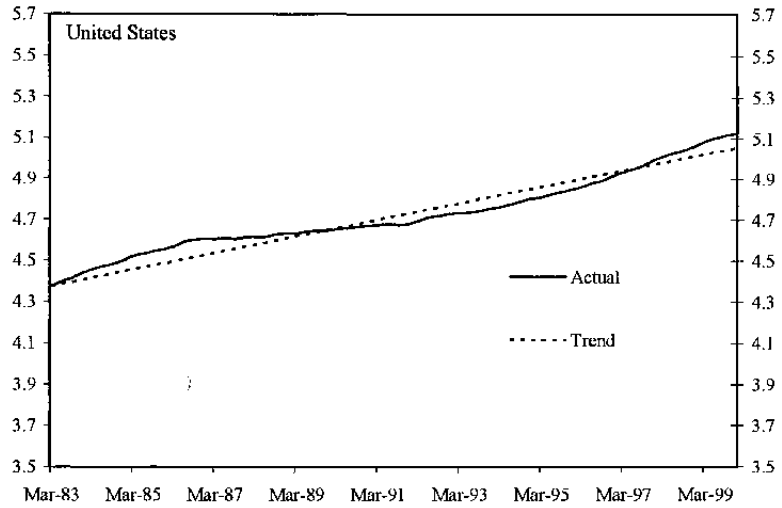
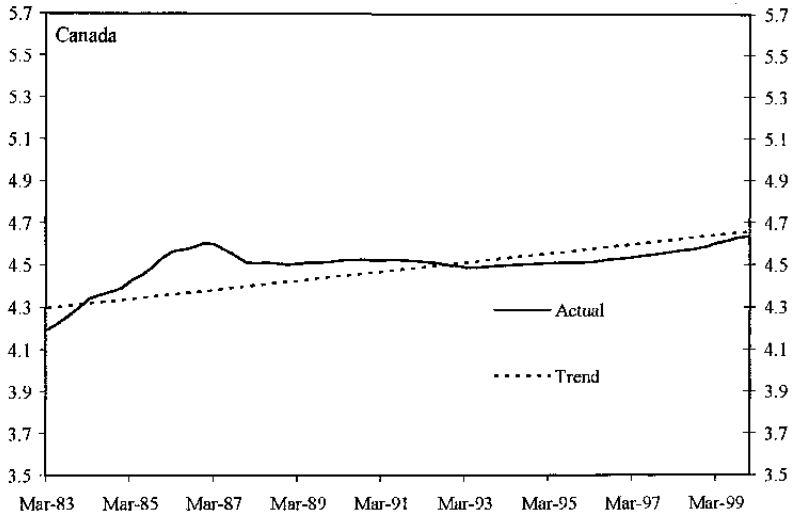


Figure 5. International Comparison of Actual and Trend Housing Prices
(In logs)







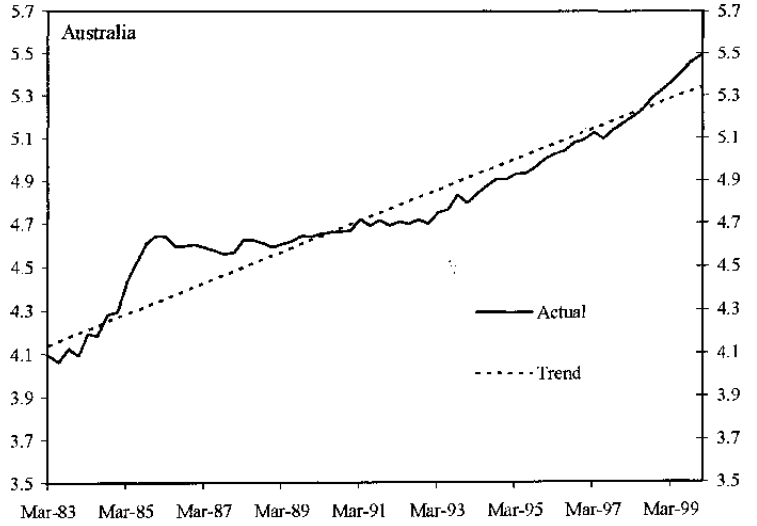
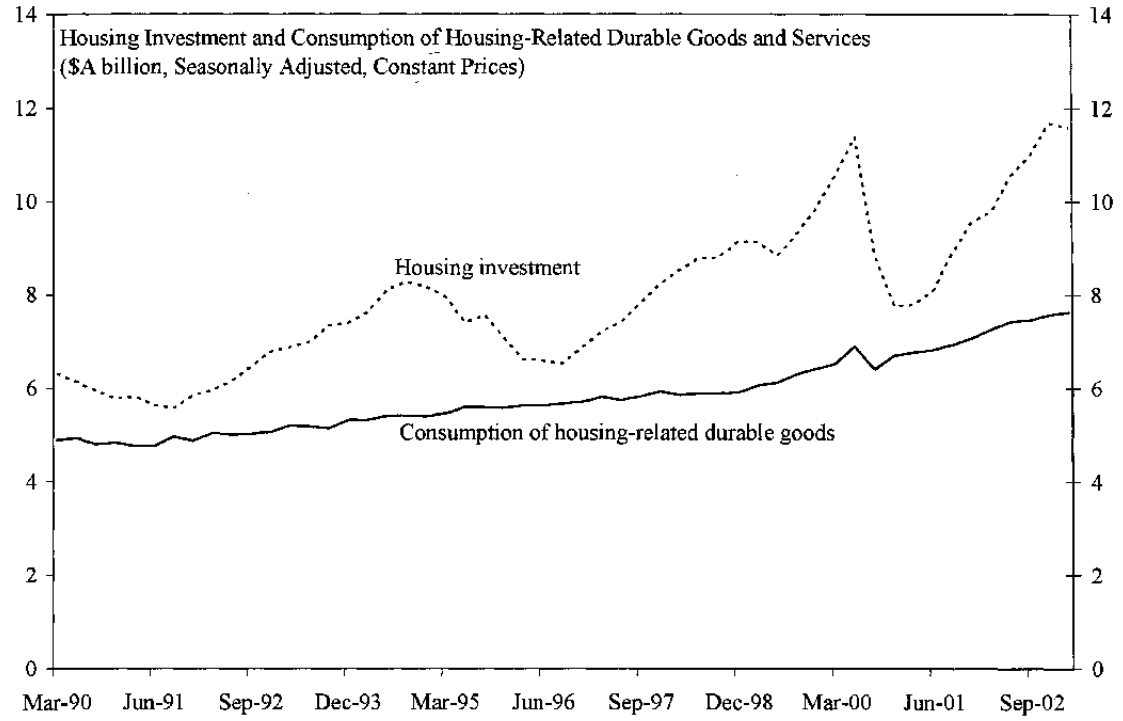


Figure 6. Australia : Housing-Related Consumption



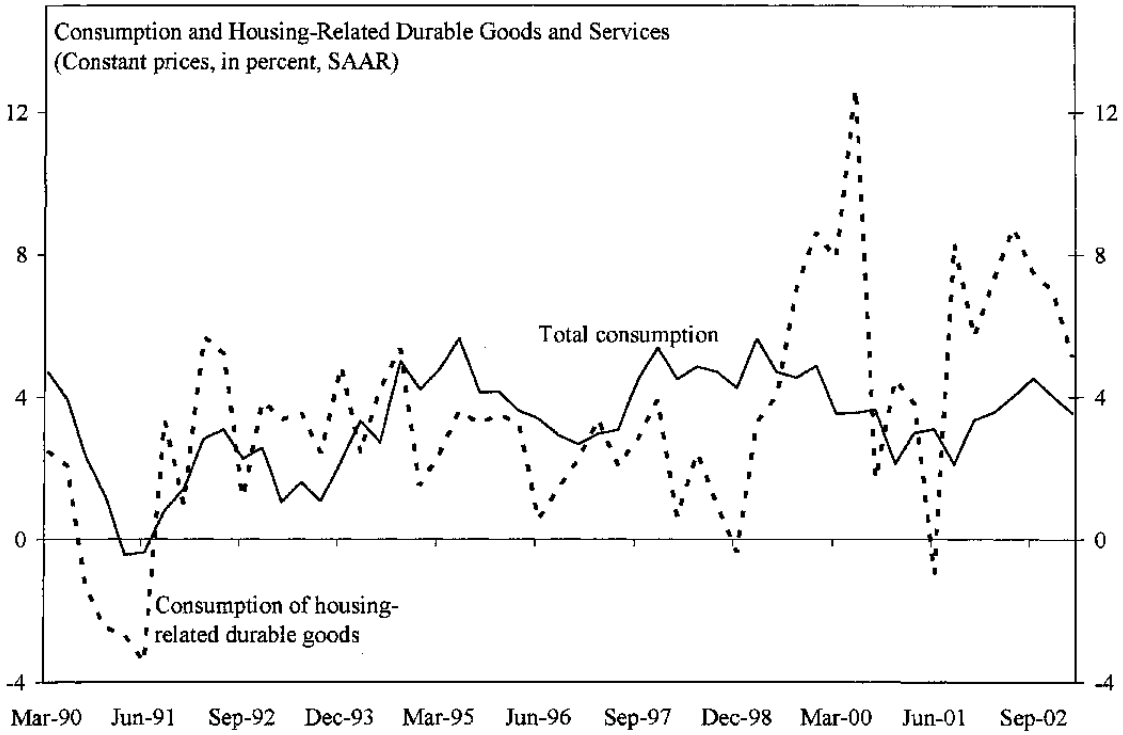


Figure 7. Australia: Estimates of Household Consumption

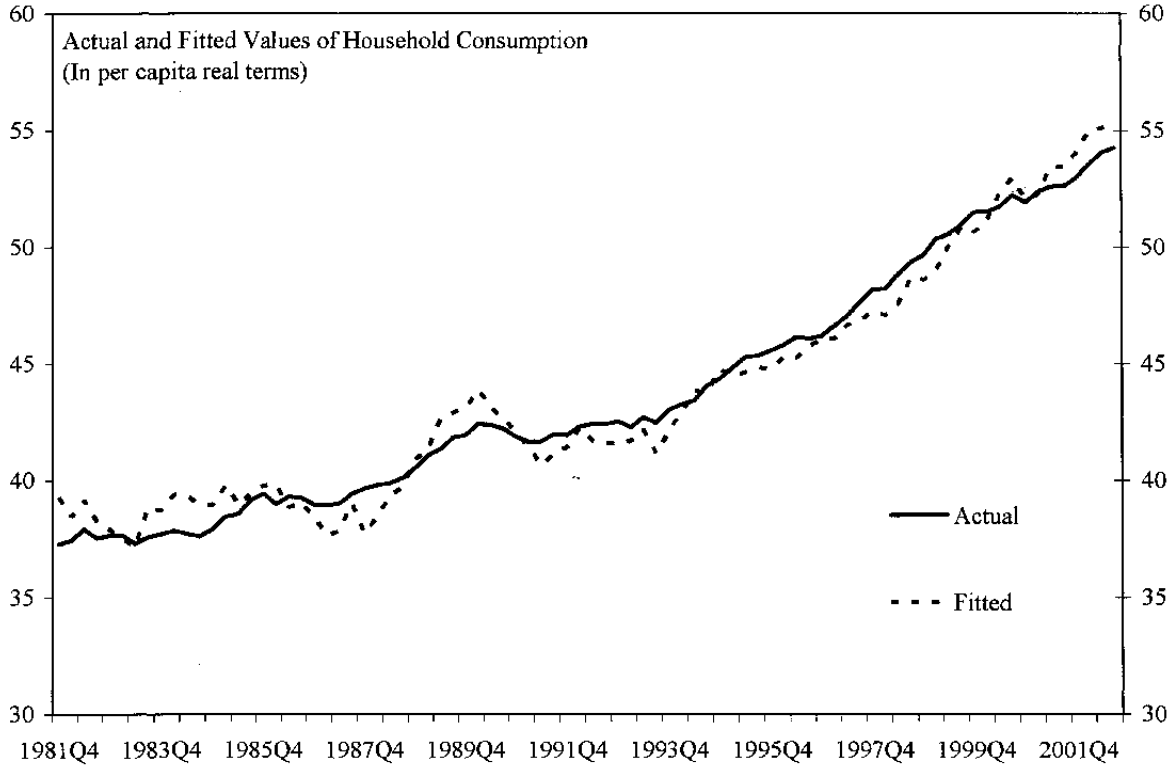
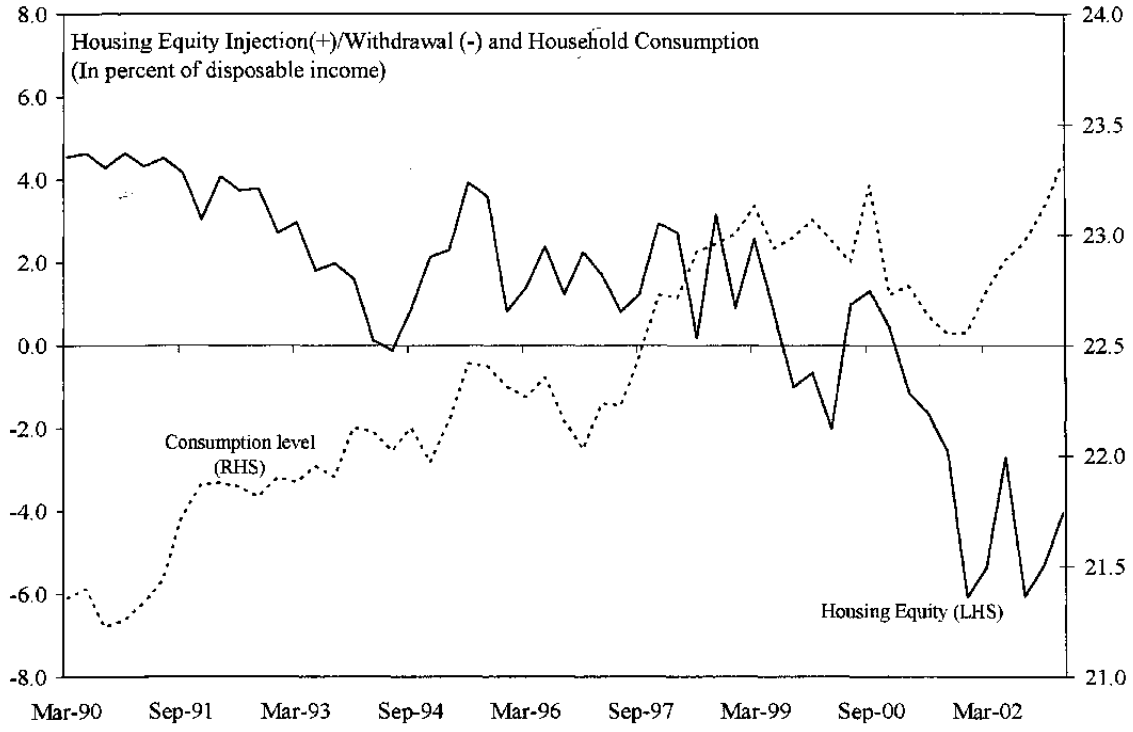


Figure 8. Australia: Housing Equity Withdrawal and Lending Rates



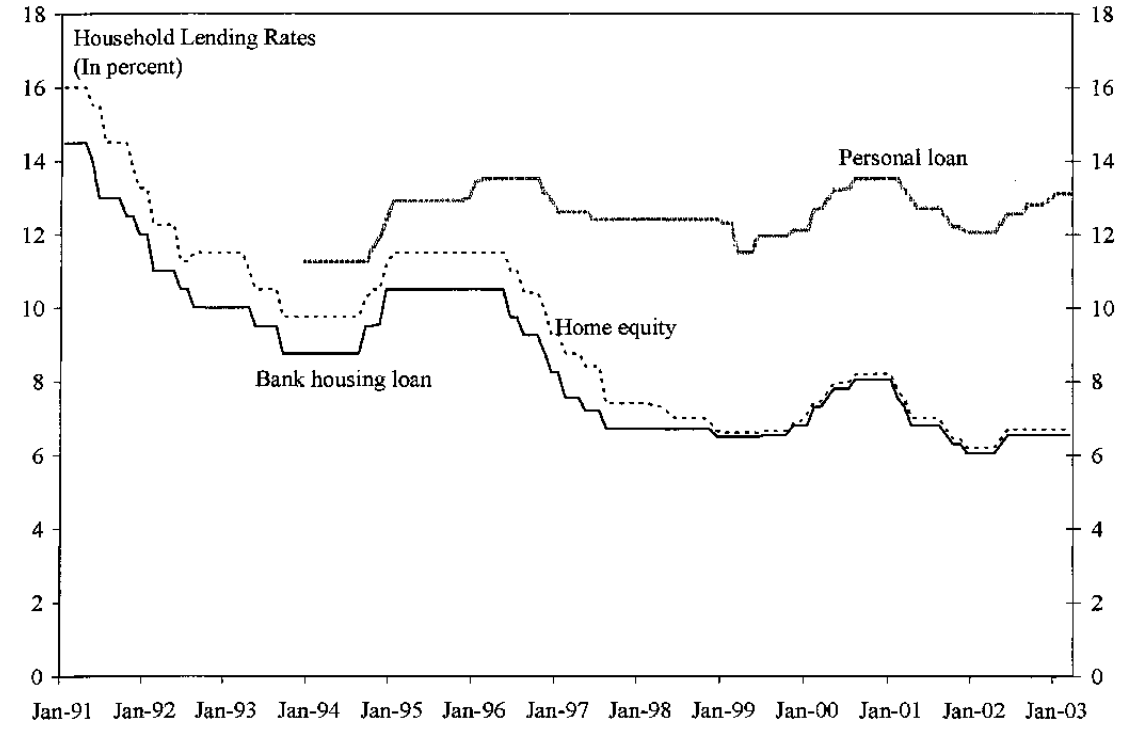


Table 1. Australia: Consumption Equations

Estimated Equation for Household Consumption 1/

$$C_t = \alpha_1 + \alpha_2 Y_t + \alpha_3 NHW_t + \alpha_4 CREDIT(-1) + u_t$$

Estimation period: 1981:4–2002:3

	Coefficient	Std. error	Prob. Value
Intercept	-5.523	5.053	0.278
Disposable income	0.802	0.150	0.000
Net housing wealth	0.012	0.004	0.011
Access to credit (-1)	0.061	0.036	0.094

Source: Fund staff estimates based on Phillips-Hansen Fully Modified OLS.
1/ All variables except access to credit are in real per capita terms.

Table 2. Australia: Reasons for Refinancing, 1997-1999

	In percent
Better interest rate	23.3
Better loan conditions	25.1
Extension of loan period	5.1
Home renovations	9.5
Other purchase (car, holiday)	21.0
Consolidation of debts	15.2
Business related reasons	7.5
Other reasons	17.4
All homeowners who refinanced 1/	100.0

Source: ABS Cat. No. 4102, Australian Social Trends, 2001.
1/ Some owners report more than one reason for refinancing. Thus, components do not add up to total.

Data Sources and Definitions

The definition and data sources for the variables in the estimations are provided below.

All variables except access to credit are in real per capita terms.

Private consumption is the seasonally adjusted household consumption in current prices. Data from 1981:2 to 2002:4. Source: Australian Bureau of Statistics.

Disposable income is the seasonally adjusted household disposable income in current prices. Data from 1981:2 to 2002:4. Source: Australian Bureau of Statistics.

Net housing wealth is households' housing assets minus lending for housing to persons. Data from 1981:2 to 2002:3. Source: Reserve Bank of Australia.

Access to credit is the ratio of total household credit to total banking credit. Data from 1981:2 to 2002:3. Source: Reserve Bank of Australia. The variable is lagged one period in the regression because households are expected to react with some delay to developments in banking sector lending policies.

Price deflator is the seasonally adjusted household consumption deflator. Data from 1981:2 to 2002:4. Source: Australian Bureau of Statistics.

Housing equity withdrawal is the net cash flow generated by the household sector from transactions in housing assets and mortgage debt. If the household sector in aggregate increases its mortgage debt by more than its net spending on housing assets, housing equity withdrawal is said to have taken place. Source: "Housing Equity Withdrawal", Reserve Bank of Australia Bulletin, February 2003."

III. An Approach to Long-term Fiscal Policy Analysis[1]

1. **Most industrial countries face significant fiscal pressures over the longer term associated with population aging and rising health care costs**. While it is important to factor these long-term costs into medium-term fiscal policy decisions, it may be difficult to do so because of uncertainties as to the magnitude of these costs and the timing of their impact. At the same time, in setting a fiscal rule to accommodate these pressures, there are problems in evaluating economic tradeoffs and social welfare over extended periods of time. It effectively entails trying to determine an optimal level for the ratio of government debt to GDP and the appropriate time path for reaching this ratio, questions that have been particularly difficult to answer.

2. **Attempts to capture the uncertainties associated with longer-term projections of fiscal costs have involved looking at the sensitivity of these projections to changes in key population and economic variables (such as fertility, mortality, migration, labor force participation, and productivity growth rates) and parameters affecting the cost of government programs (for example, program participation rates and benefit payouts)**. A pragmatic approach to evaluate alternative debt-to-GDP ratios and time paths for achieving them has involved looking at simulations of models for a country's economy. By linking these two approaches, a framework for incorporating longer-term fiscal policy issues into medium-term fiscal policy formulation might be established. The combination of the two could narrow the range of policy choices on which a medium-term strategy could be derived and periodically reviewed.

3. **Long-term fiscal projections from the Intergenerational Report (IGR) published as part of the Australian budget in May 2002 are used in a simple model of the Australian economy to illustrate some of the tradeoffs that need to be considered**. These illustrative simulations in particular point out the importance of smoothing fiscal adjustment over time, and hence, the need for careful planning. The results presented here represent a very preliminary and partial application of a more comprehensive framework for incorporating longer-term fiscal policy issues into medium-term fiscal policy formulation. They point to many useful areas for further work.

A. Uncertainties in Estimating and Dealing with Long-Term Fiscal Pressures

4. **Significant uncertainty surrounds projections of future fiscal costs**. Because of delays in the implementation and impact of policy actions on macroeconomic variables and considerations of equity and efficiency, measures to counteract effects of population aging have to be taken today based upon projections of future paths of key variables such as: fertility, mortality, migration, and labor force participation rates. They also entail important assumptions regarding key parameters affecting the cost of government programs.

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[1] Prepared by Papa N'Diaye (Ext. 39751) and Steven Dunaway (Ext. 37343).

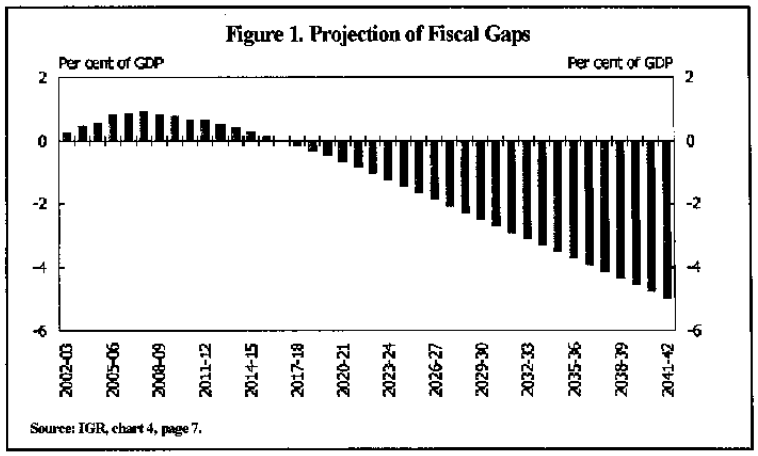
5. **One comprehensive way to take account of this uncertainty for formulating policy decisions is through stochastic simulation**. It consists in assigning probabilities to a large sample of key input parameters/variables combination, solving for the variables of interest (outcomes) for each sample, and then evaluating how these variables (outcomes) change within that sample, and draw conclusions about the probability distributions of the variables of interest (Congressional Budget Office 2001). Simply put, this approach helps to determine the relative weight that should be given to each outcome when making budgetary choices to deal with the longer-term effects of population aging. A similar study has been done by Creedy and Scobie (2002) for New Zealand using detailed demographic estimates covering fertility, migration, and mortality rates disaggregated by age and gender. They evaluate the impact of alternative hypothesis about health costs, incorporating distributional parameters for all of the major variables to build up probabilistic projections for social expenditure as share of GDP. Their results show a great deal of uncertainty surrounding projections of future increases in expenditures.

6. **Even if longer-term costs were known with greater certainty, there would still be a problem in deciding on a fiscal policy rule or policy actions and their timing to effectively deal with these prospective costs**. In essence, this problem involves trying to determine an optimal level for the ratio of public debt to GDP and the appropriate time path for achieving that ratio. The economic literature does not provide much in the way of definitive answers to solving this problem. Specific conclusions about optimal public debt levels and time paths have to be derived from hard-to-quantify economic tradeoffs (particularly, intergenerational transfers) and alternative criteria for evaluating social welfare. Consequently, results vary widely depending on the approach adopted and the parameters assumed in the models. A more pragmatic (and practical) approach is to use economic model simulations of alternative debt paths to assess potential tradeoffs (Swagel et. al. 1998). Robson and Scarth (1999) took this type of analysis a step further by factoring in the effects of uncertainties about future economic outcomes and the structure of the economy. In an analysis of fiscal policy rules for Canada, they simulate their economic model using a large set of random disturbances to mimic economic cycles and the effects of transitory shocks. They also simulate using alternative values for key parameters in the model to capture the potential effects of mismeasurement of the structure of the economy.

7. **By linking the approaches to estimating costs reflecting uncertainties to the approaches used to evaluate tradeoffs associated with alternative policy actions, a framework for incorporating longer-term fiscal policy issues into medium-term fiscal policy formulation might be established**. Combining both sides could define a set of choices from which a medium-term policy strategy could be derived. This strategy would need to be re-evaluated at discrete intervals to reflect changes in the country's economic situation (which, for example, may be policy induced, such as measures to raise labor force participation rates or sustain productivity growth) and perhaps the increased certainty of some future costs as time passes. For instance, at five-year intervals the analyses of costs and policy tradeoffs could be repeated and the medium-term fiscal strategy adjusted to reflect new information and circumstances.

B. Sources of Long-Term Fiscal Pressures for Australia

8. **Over the longer term, Australia could face renewed fiscal pressures due to rising health and aged care costs and the aging of the population.** The Intergenerational Report estimated that, based on future demographic trends, declining labor force participation in older age brackets, and productivity growth at its historical average, a budget deficit would reemerge in the next decade which could widen to about 5 percent of GDP by the end of a 40-year projection period (Figure 1). In the absence of adjustment, the ratio of net debt to GDP could reach 55 percent, an order of magnitude well above historical levels. Higher debt could raise real interest rates, lower investment, and ultimately have significant negative effects on output growth. This could add to the projected decline in output growth resulting from lower labor force participation in older age brackets and a return to the long-term trend rate of productivity growth.



9. **With an aging population and rising health and aged care costs, the IGR estimates that Commonwealth spending could reach 27½ percent of GDP by 2041/42, compared to around 23 percent in 2001/02, with most of the increase expected to begin in the early 2020s.** Some of the increase in spending would be due to increased pensions as the population ages. However, because government pensions provide only a supplemental safety net to retirement income from privately funded superannuation funds and voluntary savings, the resulting increase in pensions costs is envisaged to be moderate.[2]

10. **Health and aged care cost is the main driver of longer-term Commonwealth spending.** Over the last 30 years, Commonwealth spending on health and aged care has increased markedly, reaching almost 5 percent of GDP in 2001/02 from around 2 percent in the early 1970s. The key cost driver has been the Pharmaceutical Benefit Scheme. Commonwealth spending on health and aged care is projected to almost double by 2041/42, reaching about 10 percent of GDP (Figure 2).

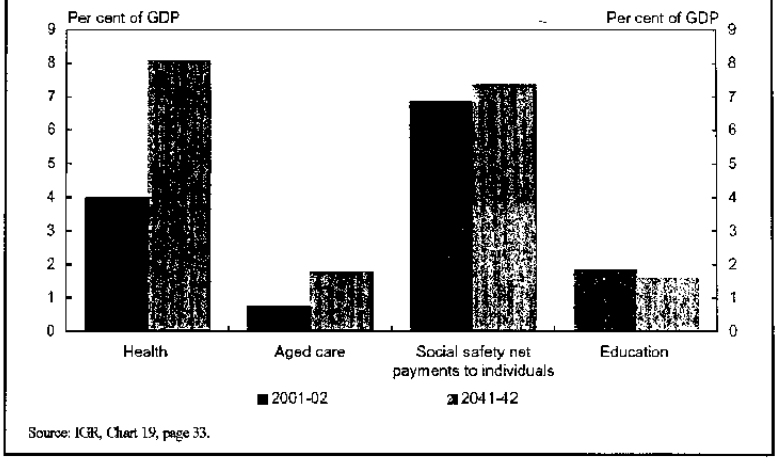
11. **Rising health care costs and population aging could lower growth in living standards and weaken budget balances.** Various scenarios presented in the IGR show

[2] For a detailed discussion, see Carey (1999).

population aging would slow growth in real GDP per person to about 1½ percent per annum by the next decade, if recent trends in lower labor force participation in older age brackets continued and if productivity growth fell back to the average of the last 30 years (about 1¾ percent). Not only would the economy grow more slowly than currently, but also growing age-related public expenditures combined with revenues in line with the slower-growing GDP would increase fiscal pressures.

12. **Substantial uncertainties surround the estimate of future fiscal costs in the IGR.** For example, alternative scenarios in the IGR suggest that higher participation rates over the next 20 years, (towards the top of the OECD countries' current experience) could increase the level of GDP per capita by over 9 percent relative to the baseline scenario in the IGR by 2041/42. Reaching productivity growth of 2 percent per annum (halfway between the 30 year average of 1¾ percent, and the 2¼ percent recorded over the past decade) could potentially provide a further 9 percent gain in the level of output. Under such scenarios, there would be no need for a fiscal adjustment to meet long-term fiscal costs, beyond what is dictated by maintaining Australia's current fiscal policy framework of targeting budget balance over the cycle. These results illustrate the sensitivity of funding requirements to changes in underlying assumptions.

Figure 2. Projected Spending by Category



Source: IGR, Chart 19, page 33.

C. An Illustrative Assessment of Long-Term Fiscal Policy Choices for Australia

13. **Taking the cost estimates from the IGR as given, economic tradeoffs from alternative fiscal adjustment paths can be examined using a simple model of the Australian economy based on the general specification in MULTIMOD, the IMF's multi-country macroeconomic model (key supply-side relationships for investment and output are explained in Box 1).** In the model, higher longer-term government spending is associated with increases in future government liabilities in the absence of offsetting fiscal policy action, raising the level of debt. The increase in debt affects output mainly through its impact on the interest rate premium, defined as the difference between long-term interest rates on Australian government bonds and U.S. government bonds of comparable maturities. In addition, the premium is modeled as being influenced by the government debt-to-GDP ratio and a variable that captures other factors that may affect the relative riskiness of Australian dollar denominated assets. The relationship between the risk premium and the debt-to-GDP ratio is alternatively specified as a linear and a non-linear relationship. Static simulations show the model properties under each type of relationship (Figure 3). With a

linear relationship, a 10 percentage point increase in the debt-to-GDP ratio leads to a 10 basis point increase in the risk premium and lowers the level of output by about 0.4 percent. Under the assumption of a non-linear relationship, an increase of a similar magnitude in the debt-to-GDP ratio, raises the risk premium by about 21 basis points and lowers output by about 0.8 percent.

14. **Dynamic simulations of the model were performed for four alternative scenarios** (Figure 4).[3] The first scenario, the "baseline" scenario, uses IGR projections of future Commonwealth spending that reflect changes in demographics and health and aged care costs and future revenues, which are assumed to remain a constant share of GDP, to derive the debt path. It is assumed that no actions are taken to offset the projected increase in spending relative to revenue (i.e. the budget is allowed to go into deficit). In this baseline scenario, the net debt-to-GDP ratio increases sharply over time, reaching 55 percent in 2042 from roughly zero in 2003. The bulk of the increase in debt occurs in the early 2020s, reflecting the expected steep rise in expenditures. The net debt-to-GDP ratio is assumed to remain constant at 55 percent beyond 2042.

15. **The second scenario, the "balanced budget" scenario, assumes that the government tries to maintain the debt-to-GDP ratio at zero by making the necessary fiscal adjustment (raising taxes and/or cutting expenditures) to counteract deviations of the projected increase in debt-to-GDP ratio from a zero-debt**. In this scenario, the debt-to-GDP ratio reaches its target around 2008 and remains at that level thereafter, which

[3] In these simulations the linear specification of the risk premium is used. In addition to the risk premium channel, output costs arise from the negative effects of the fiscal adjustments on aggregate demand. Individual consumers have model-consistent expectations about their future after-tax income streams, but have also finite lives.

Box 1. Australia: Supply Side of The Model - Key Equations

$$Y_t = \xi_t K_t^{\beta} L_t^{1-\beta} \quad (1)$$

$$K_t = I_t + (1-\delta)K_{t-1} \quad (2)$$

$$I_t = \left(\delta + g + \frac{q_t - 1}{\chi} \right) K_{t-1} \quad (3)$$

$$q_{t+1}K_t = q_t K_{t-1}\left[1 + r_t + \delta + rprem_t + (K_t / K_{t-1} - 1)\right] - \left[(1-\tau)\beta Y_t - \frac{\partial A_t}{\partial K_{t-1}} K_{t-1} \right] \quad (4)$$

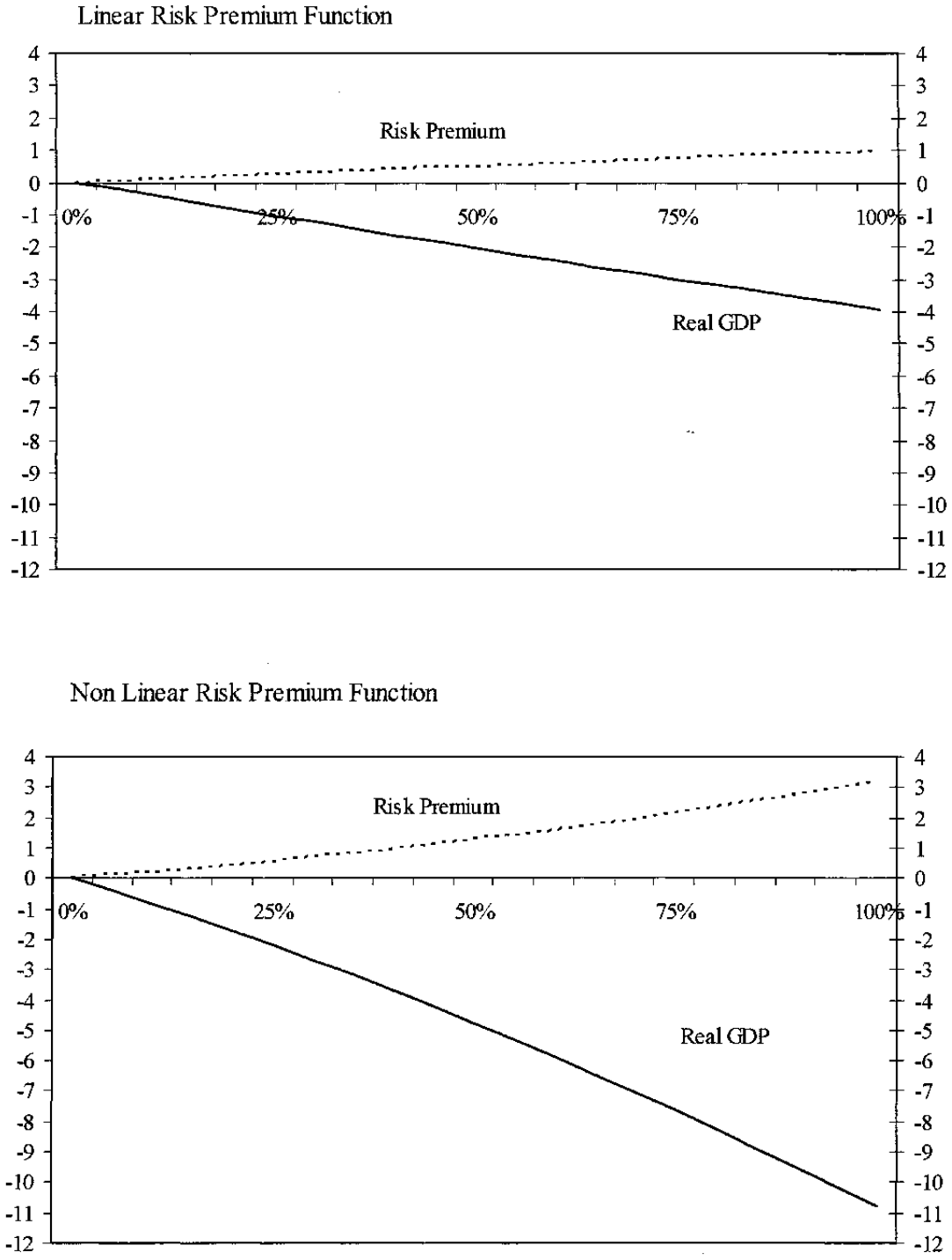
$$A_t = \frac{\chi}{2}\left[\frac{I_t}{K_{t-1}} - (\delta + g) \right]^2 K_{t-1} \quad (5)$$

In equation (1), output is produced using a Cobb-Douglas production function with capital and labor as inputs. ξ, K, and L represent the level of total factor productivity, the stock of capital, and labor supply, respectively. β, the share of capital, is set to one-third. Labor supply is assumed to be exogenous and derived from the IGR projections of labor force and the unemployment rate.

In equations (2)-(5), the dynamics of the capital stock and investment are determined according to Tobin's Q theory, in which new investment is based on the relationship between the market value of capital and its replacement cost. In addition, it is assumed that there are costs to adjusting the capital stock.

- Equation (2) defines the relationship between investment and the capital stock, where δ denotes the rate at which the stock of capital depreciates over time.
- Equation (3) sets investment as a function of Tobin's Q, and states that it is profitable to invest in new capital as long as q_t is greater than one; g is the growth rate of output.
- Equation (4) states that the market value of the firm for each unit of capital today is determined by its expected value tomorrow, corrected for depreciation, and the difference between the expected discounted marginal profit and the marginal cost of adding new capacity. It indicates that the real value of today's capital stock is given by its discounted expected value tomorrow, augmented by the discounted after-tax income accruing to capital net of the real resources used to adjust the capital stock. The discount factor depends upon the real short-term interest rate, r_t, the rate of depreciation, the yield premium on capital, $rprem_t$, and the growth rate of the capital stock.
- Equation (5) defines the costs of adjusting the capital stock, which depends on the value of the parameter χ.

Figure 3. Australia: Long-Term Cost of Debt



Source: Multimod.

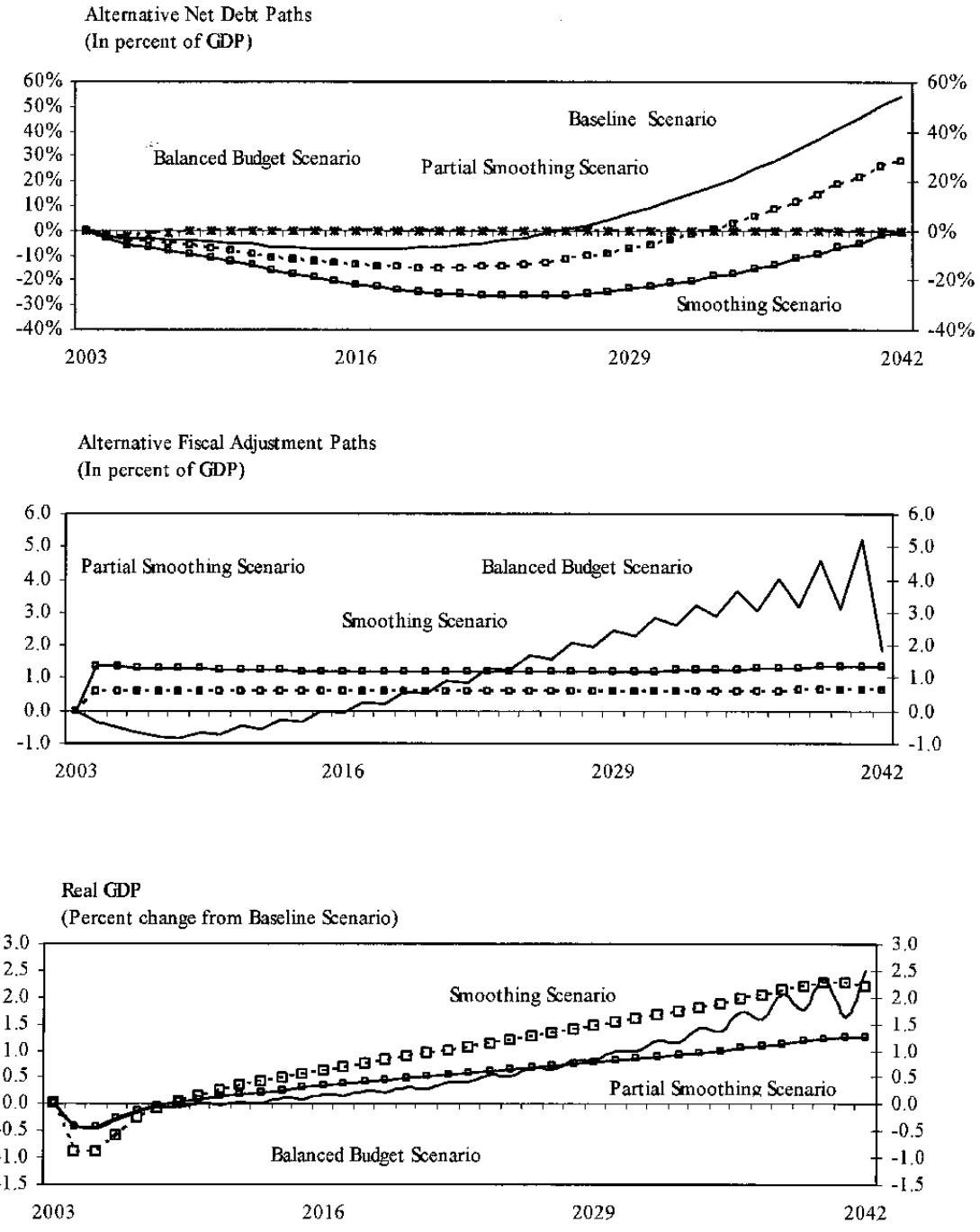
requires fiscal policy adjustments. Such adjustments entail substantial economic costs. As Figure 4 illustrates, output is highly volatile.

16. **In the third scenario, "the adjustment with smoothing" scenario, the government deals with the problem of output volatility and achieves a zero-debt target over the long-run by smoothing fiscal adjustment over the period to 2042**. The smoothing is achieved by using the 39-year period (2004–2042) to determine the required annual adjustment rate relative to baseline, amounting to about 1¼ percent of GDP. Although there are transitional output costs associated with this adjustment, they are shorter-lived than in the "balanced budget" scenario. This scenario entails a substantial build-up of government assets during the period, reaching a peak of around 26 percent of GDP in 2021, before going back to the zero-debt target in 2042.

17. **In the final scenario, "the partial adjustment with smoothing" scenario, the government aims to smooth the fiscal adjustments**. However, uncertainties regarding future costs and time preferences (reflecting burden sharing across generations and some time discount factor since the heaviest burden of population aging comes roughly 20 years in the future) lead the government to only partially adjusting for the fiscal costs over the entire period to 2042. In this scenario, an average annual fiscal adjustment of ½ percent of GDP is assumed. Accordingly, the net debt-to-GDP ratio is higher at 27½ percent of GDP in 2042 than in the third scenario. This scenario engenders output marginally lower than in the smoothing scenario but higher than in the balanced budget scenario, suggesting potential trade-offs between the smoothing rule and the objective for the net debt-to-GDP ratio.

18. **Smoothing fiscal pressures over time can also be viewed as a means of sharing the burden across generations.** To do so, however, raises equity considerations, involving the question as to which expenditures should be spread across generations and which should be borne largely by individual generations alone. No attempt has been made to answer this question in the scenarios presented here.

Figure 4. Australia: Alternative Fiscal Adjustment Scenarios



Source: Multimod.

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