

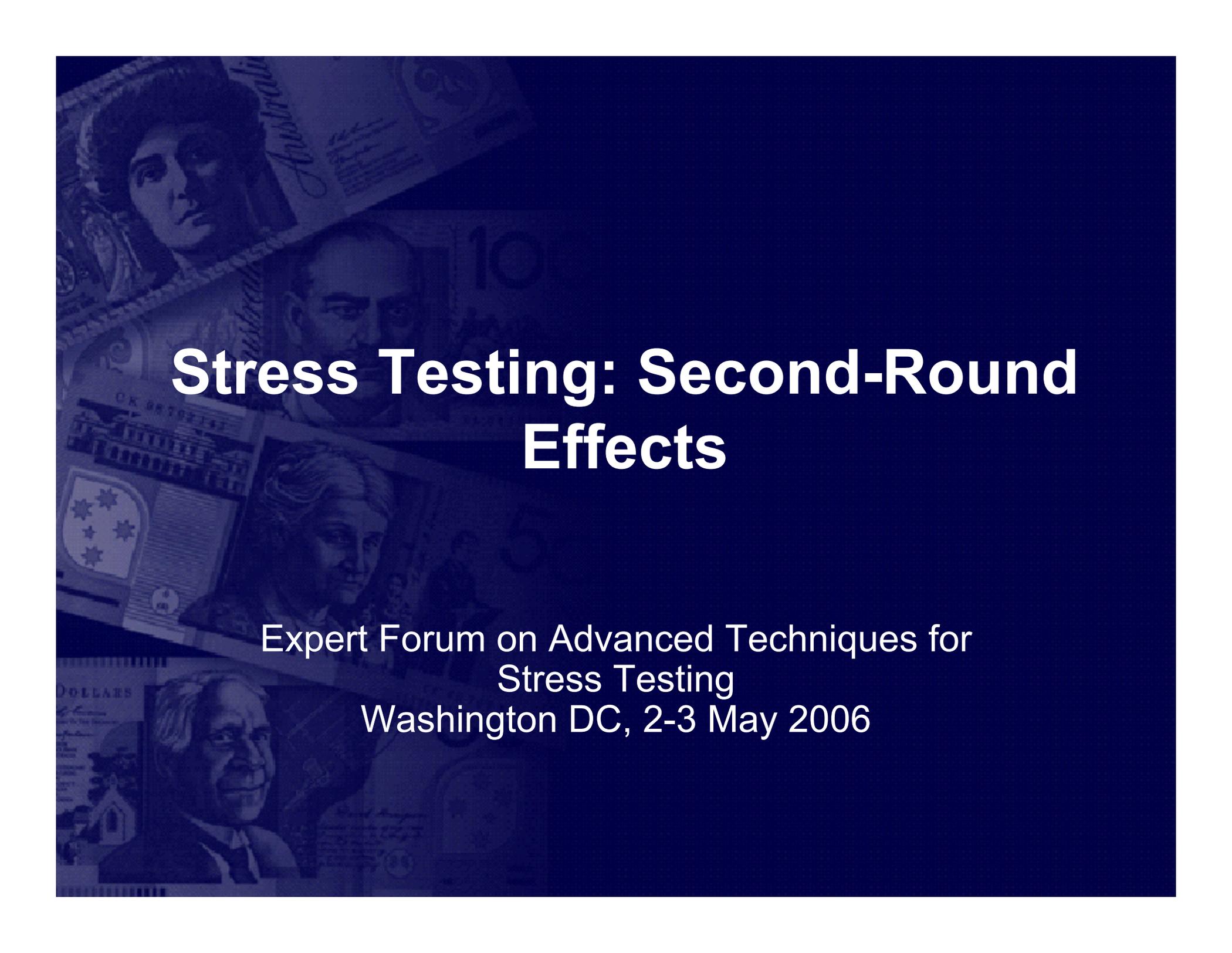
Stress Testing: Second-Round Effects

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Reserve Bank of Australia

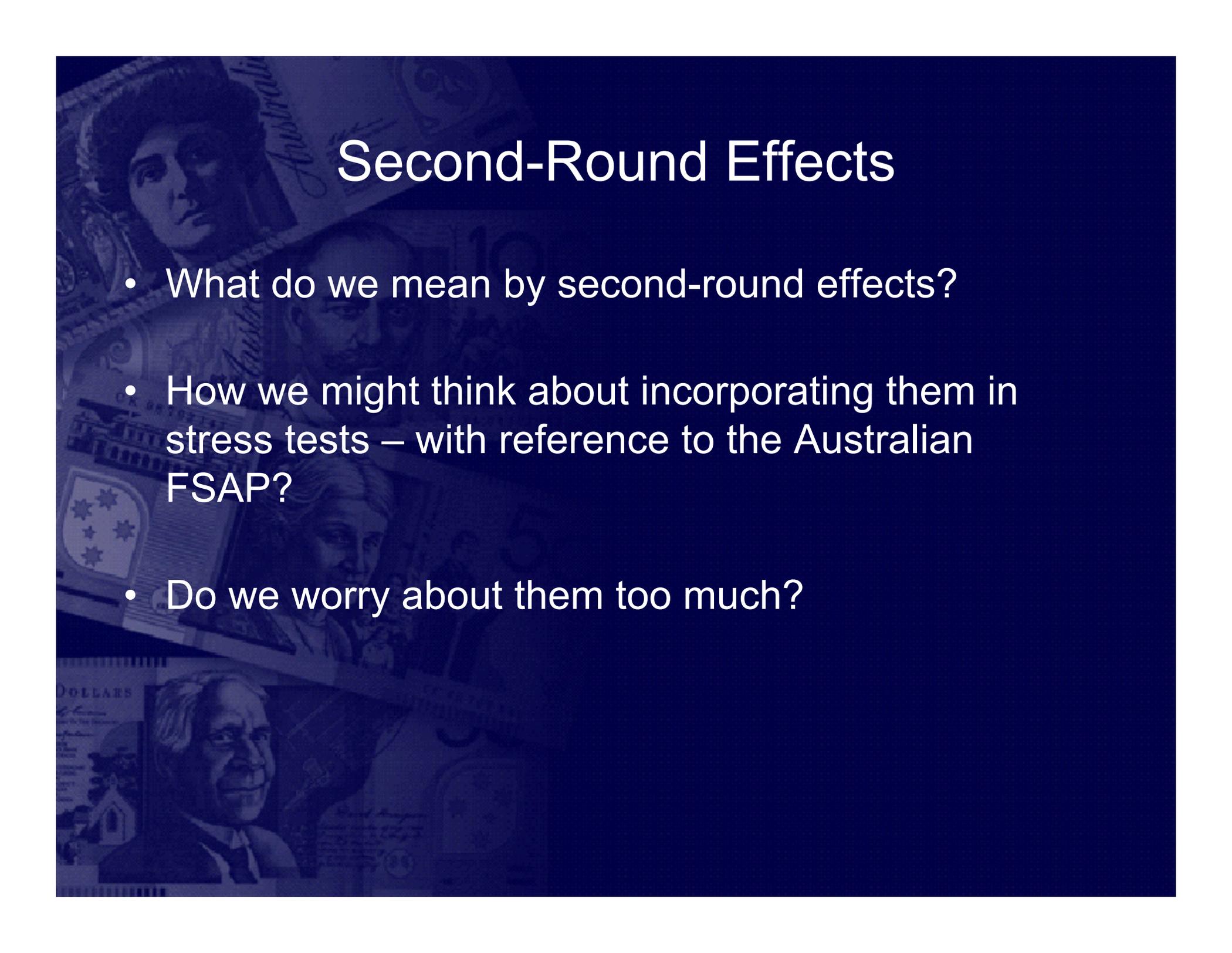
Paper presented at the Expert Forum on Advanced Techniques on Stress Testing: Applications for Supervisors
Hosted by the International Monetary Fund
Washington, DC– May 2-3, 2006

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Stress Testing: Second-Round Effects

Expert Forum on Advanced Techniques for
Stress Testing
Washington DC, 2-3 May 2006

The background of the slide is a dark blue gradient with a faint, overlapping pattern of Australian banknotes. Visible details include the portrait of Queen Elizabeth II on the top left, the portrait of a man on a middle note, and the portrait of another man on a bottom note. The word 'AUSTRALIA' is visible on the top note, and 'DOLLARS' is visible on the bottom note.

Second-Round Effects

- What do we mean by second-round effects?
- How we might think about incorporating them in stress tests – with reference to the Australian FSAP?
- Do we worry about them too much?

What do we mean by second-round effects?

- ‘First-round’ – our best estimate of how a scenario will play out in both the real and financial sectors *based on existing statistical relationships*.
- ‘Second-round’ – changes in the estimated trajectory of key economic and financial variables as financial institutions, firms, households and policy-makers respond endogenously to the unfolding scenario.
- If the stress test replicates a recent adverse event then statistical relationships will incorporate both ‘first’ and ‘second-round’ effects.

Examples of second-round effects

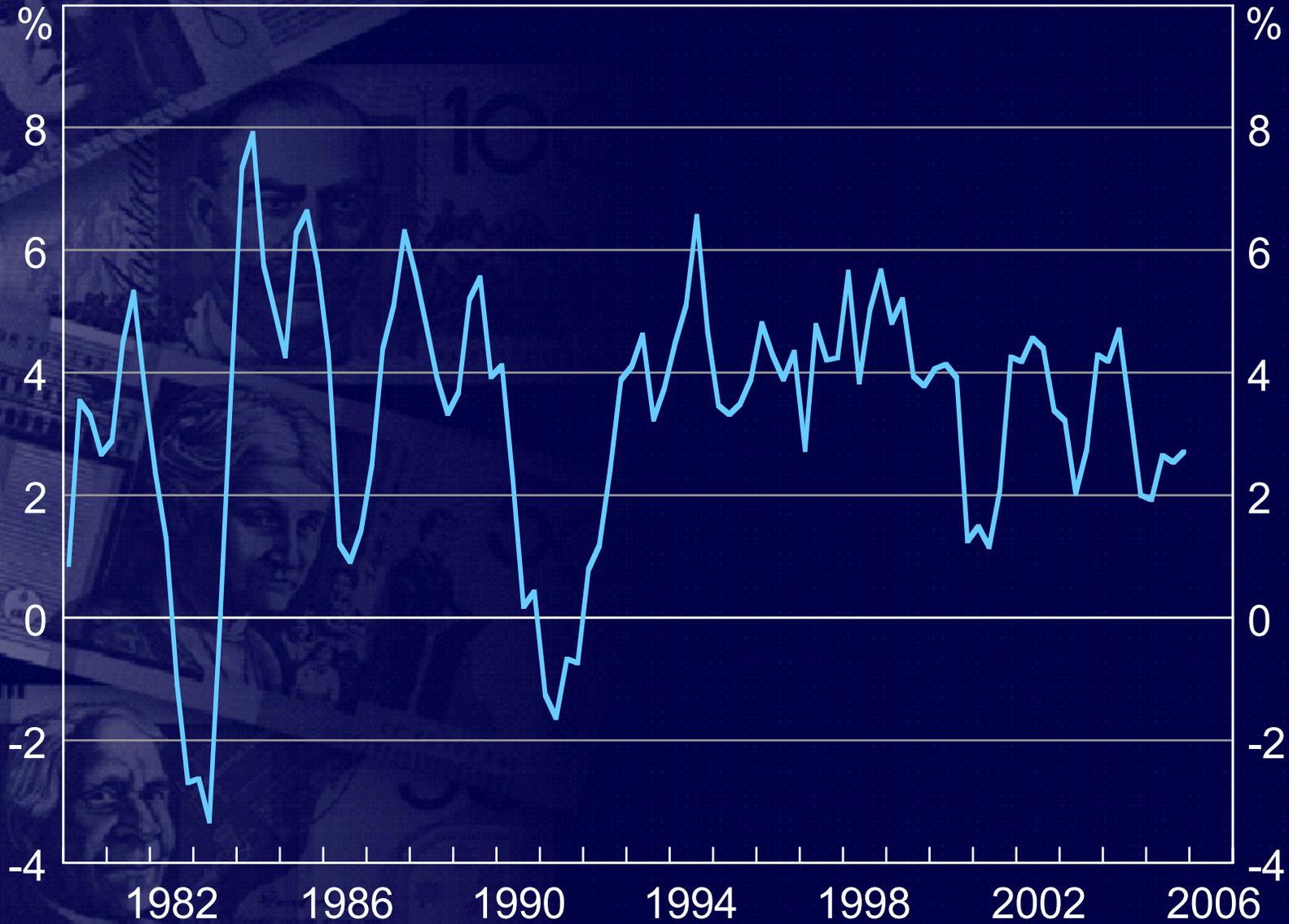
- **Individual banks:** price and volume adjustments in response to an increase in risk – **behavioural** or strategic effects.
- **Banking system:** **contagion** effects arising from individual bank distress and, *in extremis*, failure; ‘flight to quality’ as depositors move from weaker to stronger institutions.
- Market participants: credit rating adjustments may trigger adverse **financial market** effects driving up funding costs for banks.
- **Monetary authorities:** policy adjustments in response to the **feedback** effects from the financial sector to the real economy e.g. credit crunch.

The background of the slide is a dark blue gradient with a faint, overlapping pattern of Australian banknotes. Visible details include the portraits of Queen Elizabeth II on a \$50 note, a man on a \$10 note, a woman on a \$5 note, and a man on a \$20 note. The word 'AUSTRALIA' is visible on the \$50 note, and 'DOLLARS' is visible on the \$20 note.

Background to Australia's FSAP

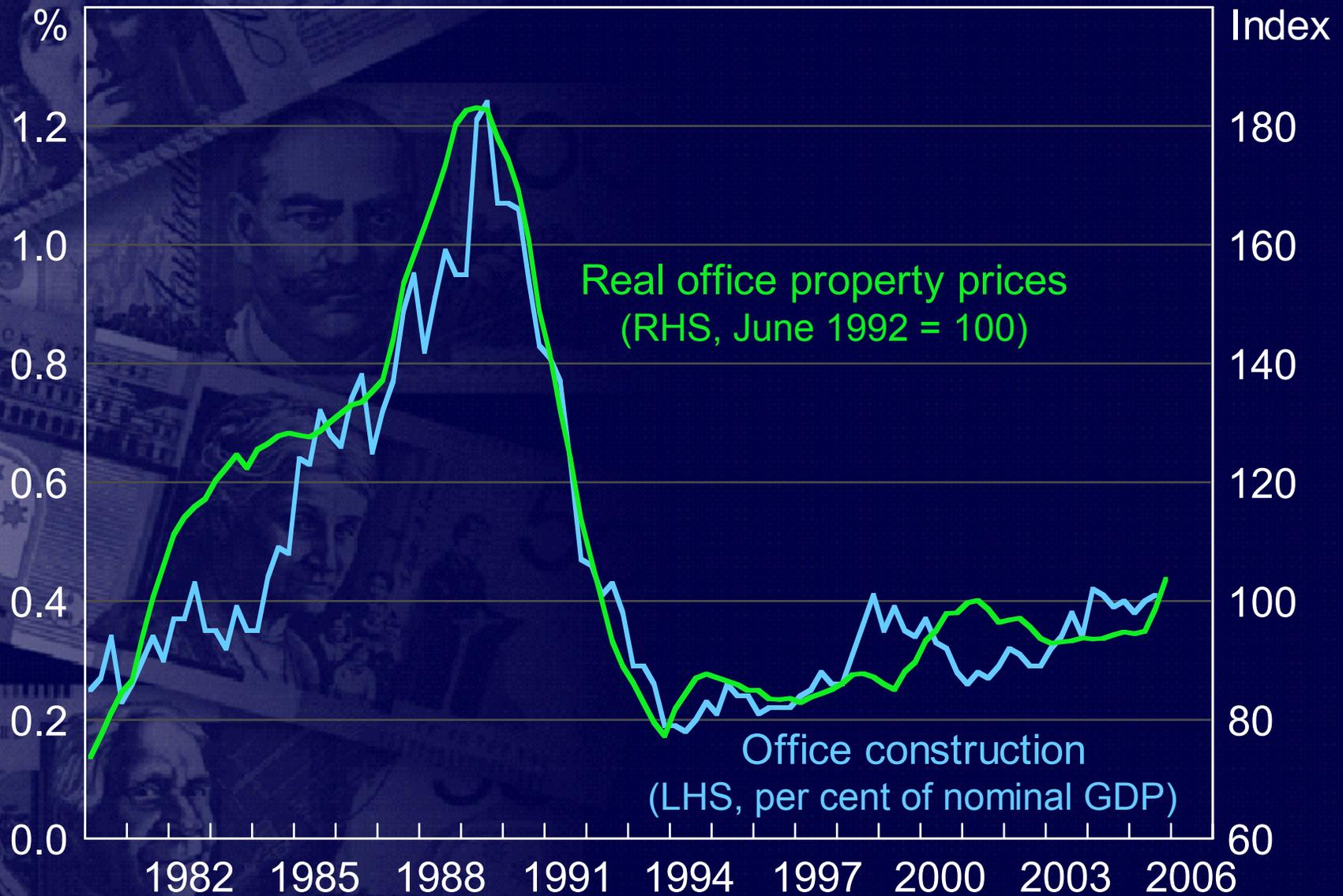
Real GDP

Year-ended percentage change



Source: ABS

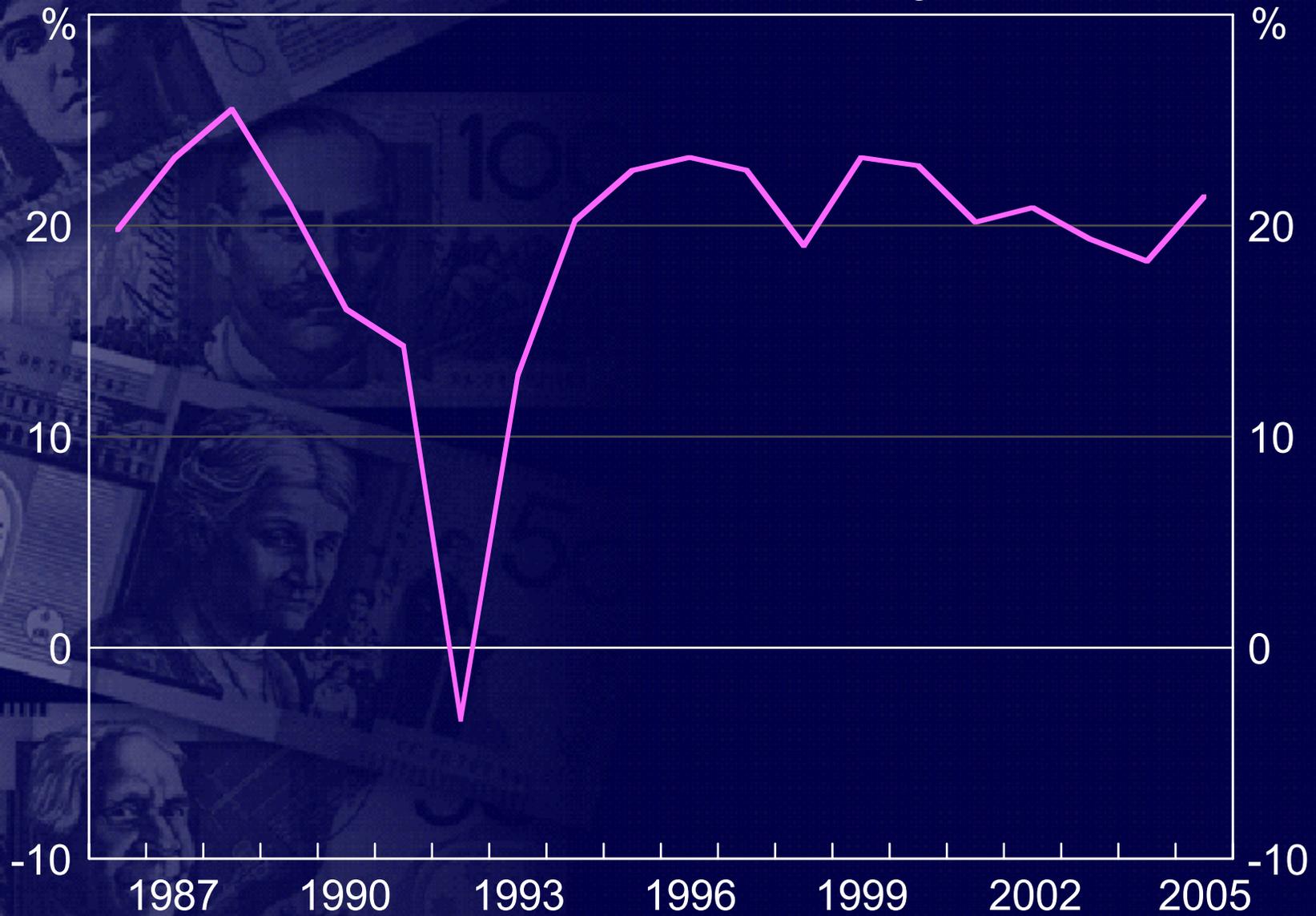
Office Property Indicators



Sources: ABS; Jones Lang LaSalle; RBA

Profit before Tax

Return on shareholders' funds, five largest banks*

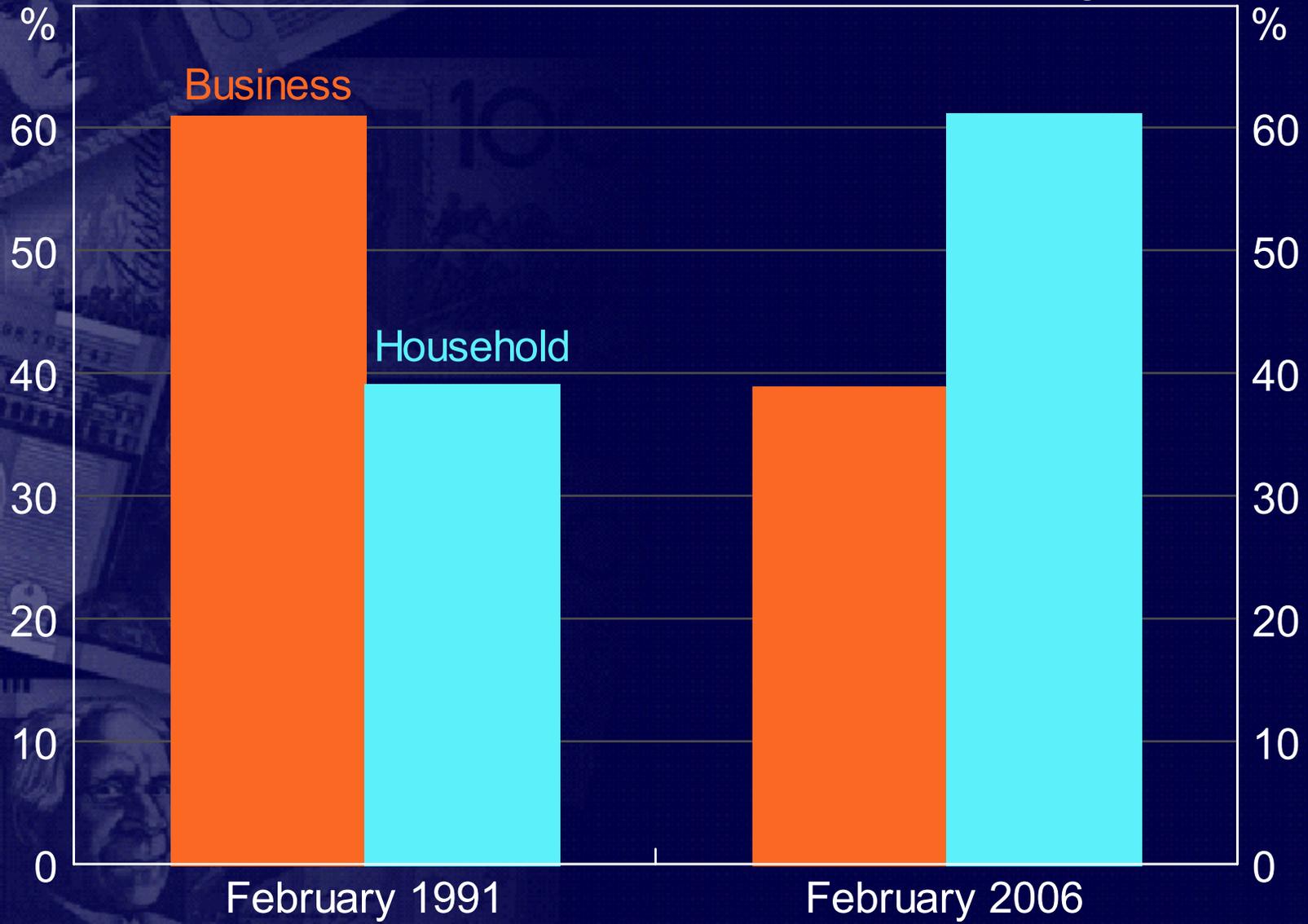


* Four largest banks only prior to 1993

Sources: Banks' annual reports

Bank Lending by Type

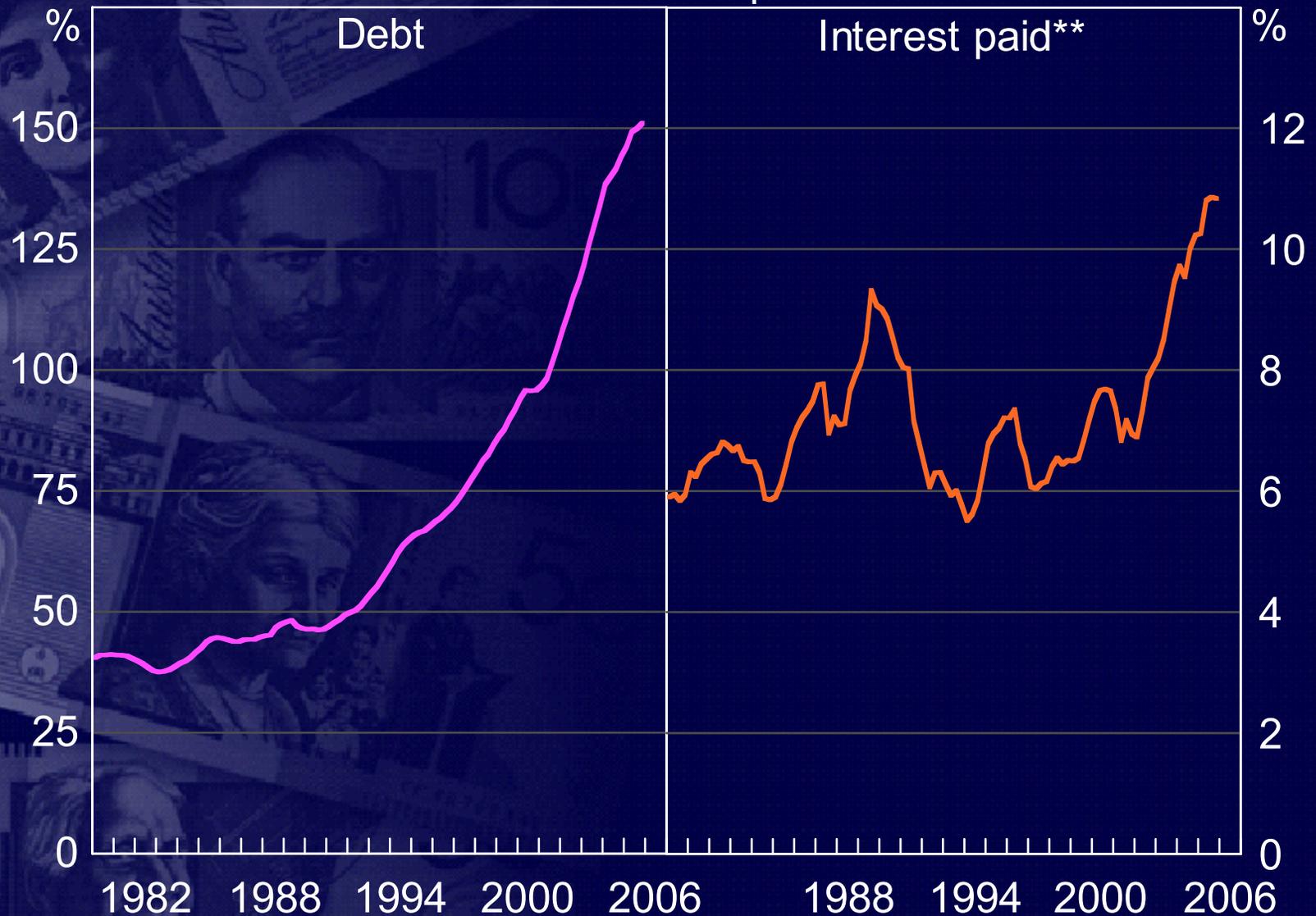
Per cent of total on-balance sheet bank lending



Source: APRA

Household Indebtedness

Per cent of household disposable income*



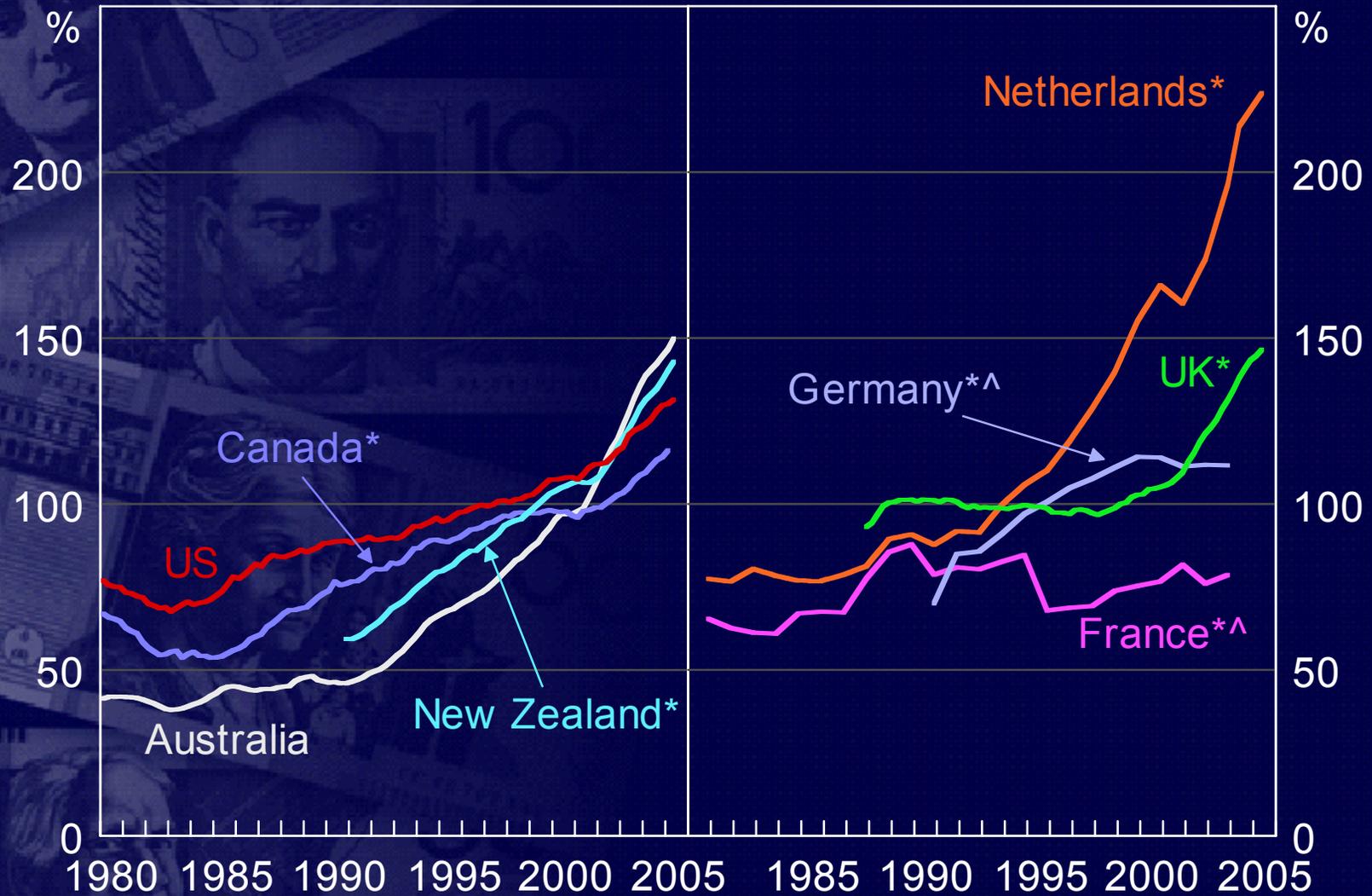
* Household sector excludes unincorporated enterprises. Disposable income is after tax and before the deduction of interest payments.

** Includes the imputed financial intermediation service charge.

Sources: ABS; RBA

Household Debt

Per cent of household disposable income



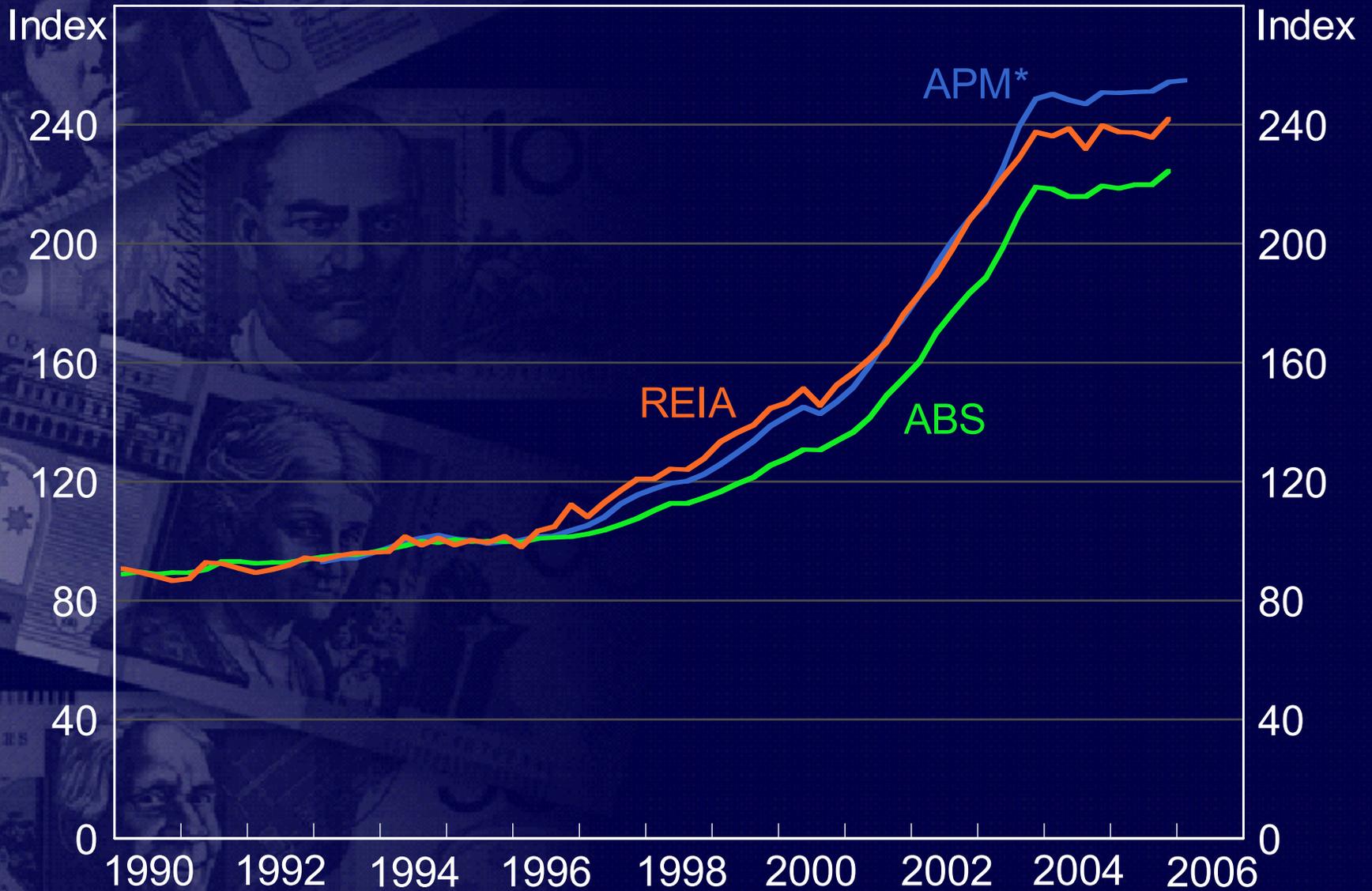
* Includes unincorporated enterprises.

^ Disposable income is after the deduction of interest payments.

Sources: National sources; OECD; RBA

House Prices

1995 = 100



* Composition-adjusted median

Sources: ABS; APM; REIA

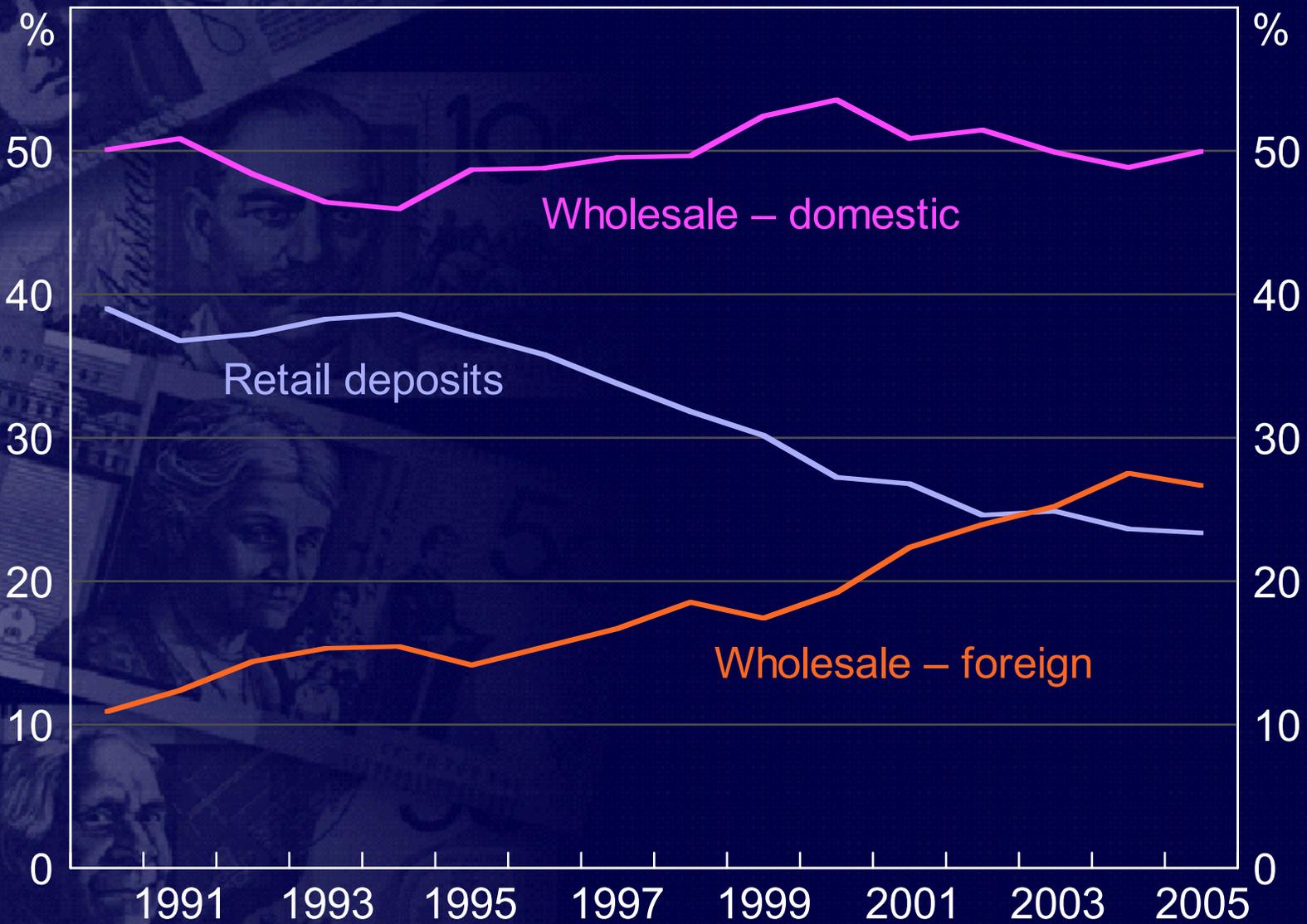
The background of the slide is a collage of US dollar bills, including a \$100 bill, a \$20 bill, and a \$5 bill, all in shades of blue and white. The bills are slightly faded and overlaid with the text.

Structural developments: changes in residential lending standards.

- Increased reliance on brokers to originate loans.
- Rapid growth in 'low doc' lending.
- An increase in permissible debt-servicing burdens.
- Maximum LVRs raised – low and no deposit loans.
- Genuine savings requirements sometimes waived.
- Use of alternative property valuation methods.

Banks' Liabilities*

Per cent of total liabilities



* All banks (domestic operations, on-balance sheet)

Source: APRA

The FSAP Scenario: 'The Perfect Storm'

A multi-variable scenario in which:

- an exogenous shock triggers a sharp fall in house prices;
- negative wealth effects undermine consumption spending bringing the economic expansion to an abrupt end; and
- offshore investors lose confidence in Australian banks resulting in a sharp capital-account-induced fall in the exchange rate and widening of credit spreads

FSAP stress test: how we went about it.

- Harnessed three capabilities:
 - the macro-modelling capabilities of the Australian Treasury and the RBA;
 - the micro-modelling capabilities of APRA – the prudential regulator; and
 - the internal modelling capabilities of the five largest banks seeking accreditation for advanced IRB status under Basel II.

Macro-modelling capabilities: the Australian Treasury Macro-economic model (TRYM)

- Small quarterly model with 30 behavioural equations
- Supply (neo-classical) determined long-run and demand (Keynesian) determined short-run
- Three production sectors: enterprise, household and Government
- In financial markets, Australia is treated as a small open economy so that in the long run interest rates are determined by world interest rates and exchange rate is determined by uncovered interest parity



Macro-modelling capabilities: TRYM

What TRYM delivers:

- A good national accounting framework for checking the internal consistency of the macro-economic variables in the scenario.
- Smooth quarterly profiles
- Buy-in from Treasury (Ministry of Finance)

Macro-modelling capabilities: TRYM

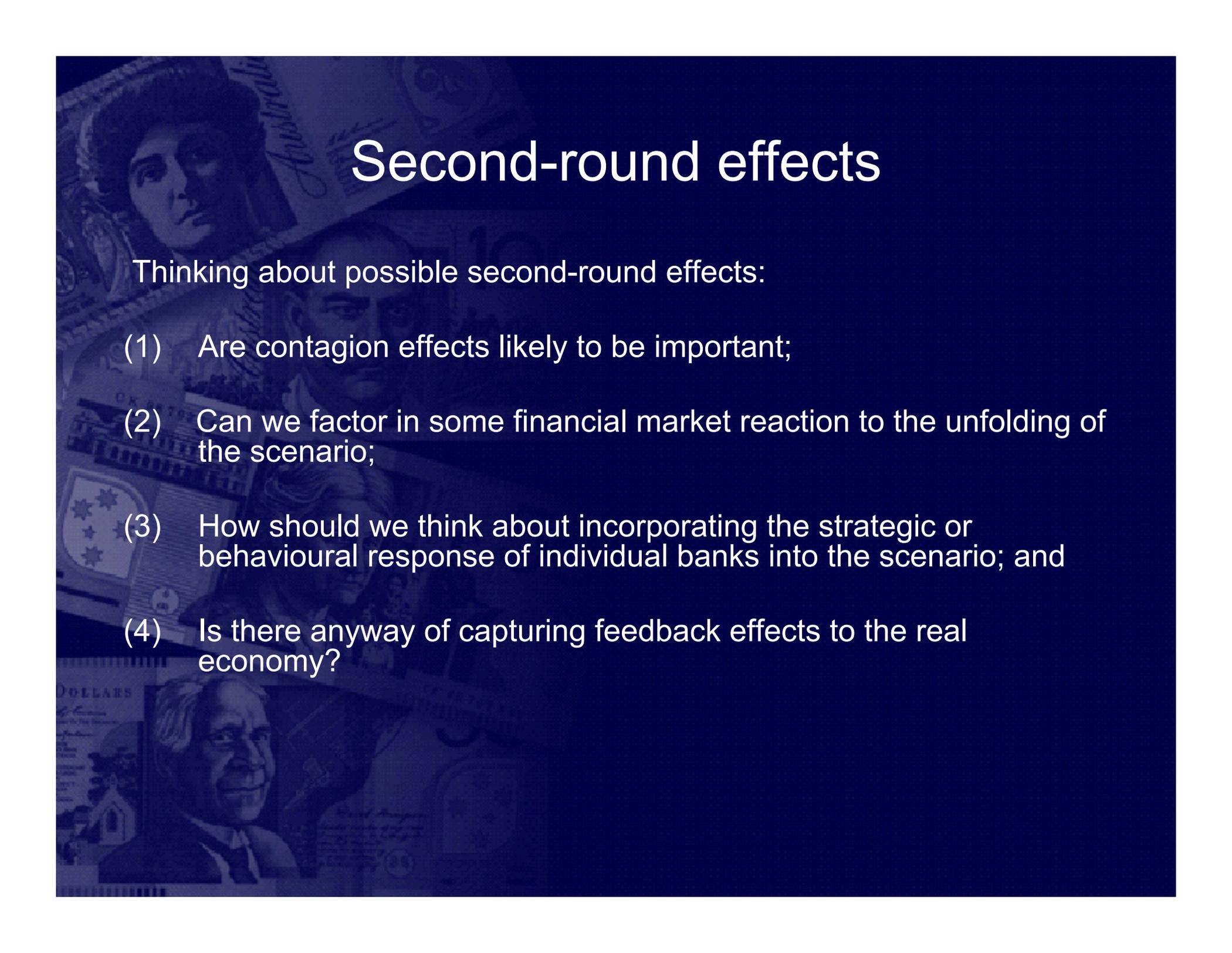
What TRYM *doesn't* deliver:

- An explicit credit channel
- A number of key variables requested by banks e.g. industrial production and retail sales. So need some off-model estimations.
- An answer to the familiar issues of non-linearity and the time variability of key statistical relationships in reduced form models (i.e. you need to inject a fair amount of 'expert judgement' along the way).

'Perfect Storm' Scenario

	Scenario horizon			
	Current	Q4 2006	Q4 2007	Q4 2008
Year-ended house price growth (%)	-0.4	-30	0	2½
Year-ended commercial property (%)	9.6	-10	0	0
Nominal TWI (May-1970 = 100)	64	41	45	48
Year-ended real GDP growth (%)	2.6	-1	2	4
Year-ended consumption growth (%)	3.0	-2½	0	2¼
Year-ended industrial production* (%)	2.2	-8½	¼	5½
Trade balance (% of GDP)	-2.2	½	1	-¼
Year-ended CPI inflation (%)	2.5	5	3¼	2½
Unemployment rate (%)	5.1	7	9	8¾
3 year swap rate (%)	5.8	8	7¼	6¾
Year-ended housing credit growth (%)	15	0	--	--
Year-ended business credit growth (%)	12	1	--	--

* Measured as the sum of gross value added of manufacturing, electricity, gas and construction.



Second-round effects

Thinking about possible second-round effects:

- (1) Are contagion effects likely to be important;
- (2) Can we factor in some financial market reaction to the unfolding of the scenario;
- (3) How should we think about incorporating the strategic or behavioural response of individual banks into the scenario; and
- (4) Is there anyway of capturing feedback effects to the real economy?

(1) Second-round effects: contagion

Pre-positioning work – three questions:

- (i) What were the chances of ‘first round’ casualties in this scenario – remembering that only the largest (strongest) banks would be involved directly in the ‘bottom-up’ stress test?
- (ii) Are smaller banks likely to be more vulnerable – which may; generate some ‘flight to quality’; and
- (iii) *In extremis*, do we have any feel for the direct credit effects from individual bank failures?

(1) Second-round effects: contagion

Used APRA's microeconomic model to assess the resilience of individual banks to a mortgage shock.

- Expected loss = (PD x LGD x Exp) – mortgage insurance
- PD f(LVR, Age, Loan Size, Loan Type) and LGD f(LVR, Age)
- Built up a PD and LGD matrix for different types of mortgages
- Stressed the base case for a 30% fall in property prices.

(1) Second-round effects: contagion

APRA's modelling work suggested that:

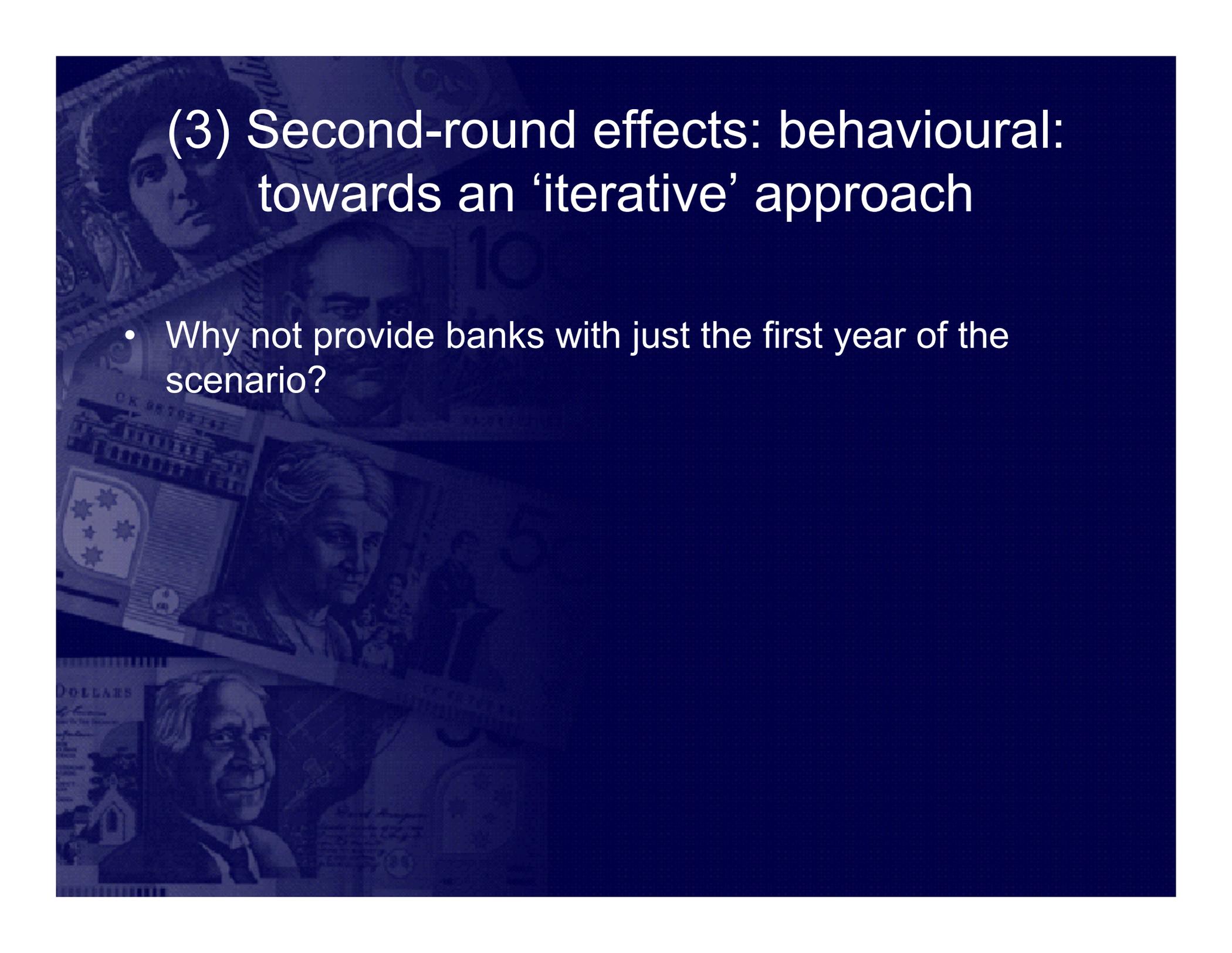
- Banks could ride out a very large jump in mortgage default rates without failing, or coming close to failing.
- Banks that have been pursuing aggressive lending strategies will suffer more. (So flight to quality considerations can't be ruled out.)
- So our 'prior' was that a shock to household balance sheets and a sharp fall in house prices would not lead to solvency issues *in the first-round*.
- Nonetheless, still wanted a 'feel' for the size of any 'direct' contagion effects through inter-bank exposures.

(2) Second-round effects: financial markets

- Scenario assumed that overseas investors would be reluctant to roll-over their holdings of Australian bank paper at current exchange rates and interest rates. This acts as the trigger for *a sharp capital account-induced depreciation*.
- Although no change in cash rate, the scenario incorporated a significant increase in the cost of funds for banks. Based on historical experience, *the three- and ten-year swap rates assumed to rise by around 250 basis points*.

(3) Second-round effects: behavioural

- Banks provided with the full macro-economic profile and asked to model the impact on balance sheet and profit and loss accounts.
- A 1st 'run' with no restrictions on the endogenous response – each bank free to adjust key funding and lending rates and capital management policies.
- A 2nd 'run' to then provide for some commonality in key variables.
- If you provide banks with the full scenario and they can see the good times returning – the behavioural response is muted.

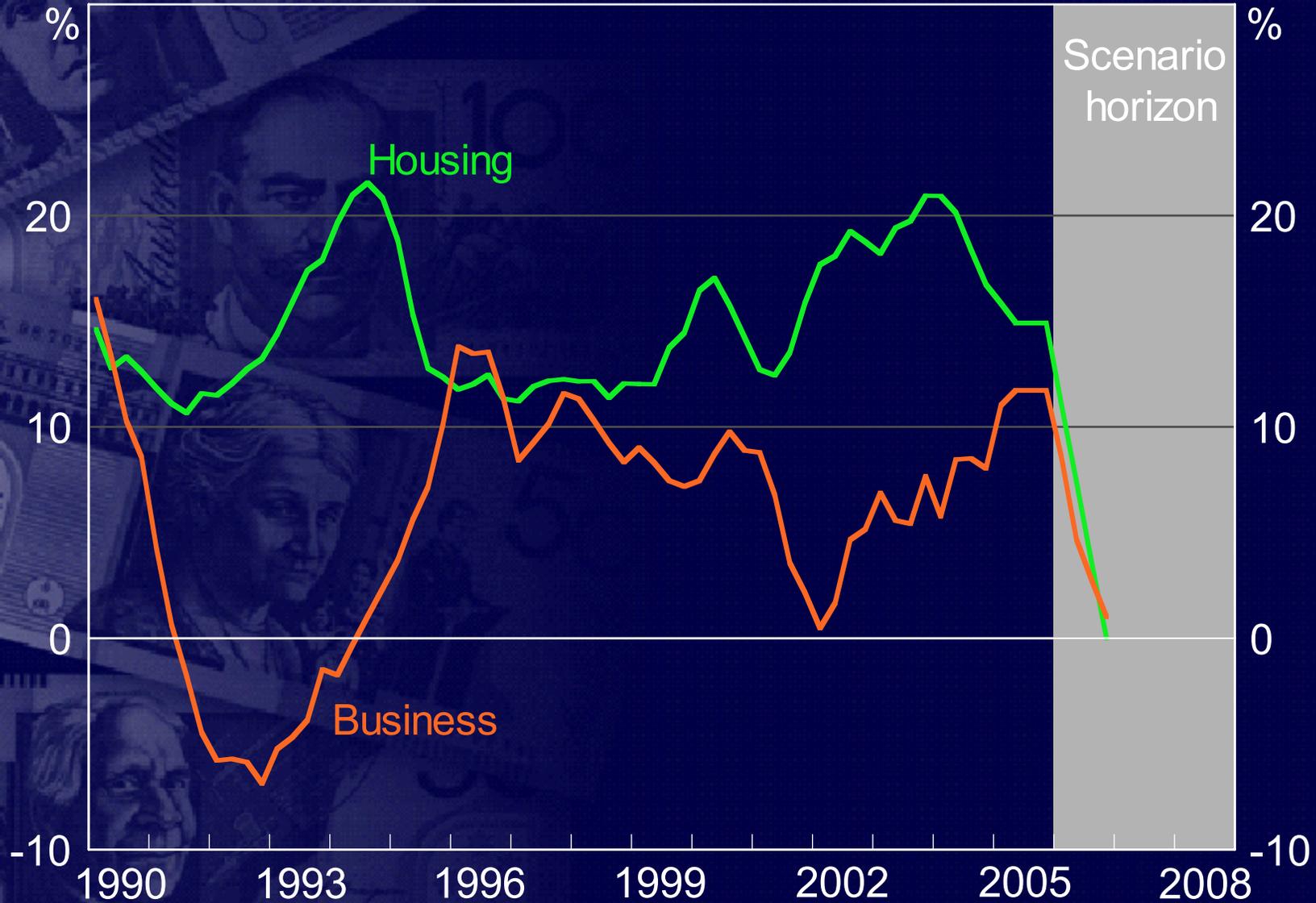


(3) Second-round effects: behavioural: towards an 'iterative' approach

- Why not provide banks with just the first year of the scenario?

Credit

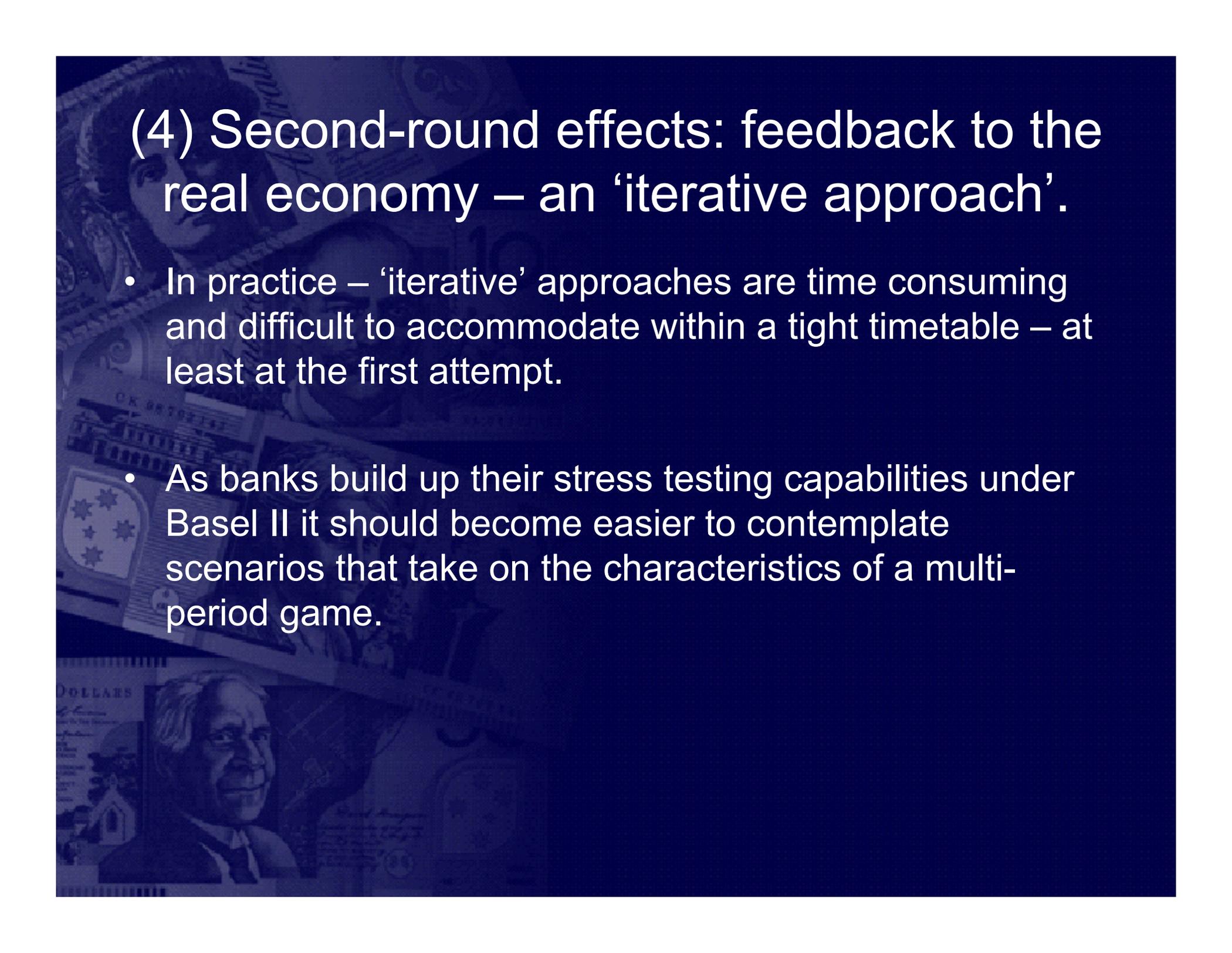
Year-ended percentage change



Source: RBA

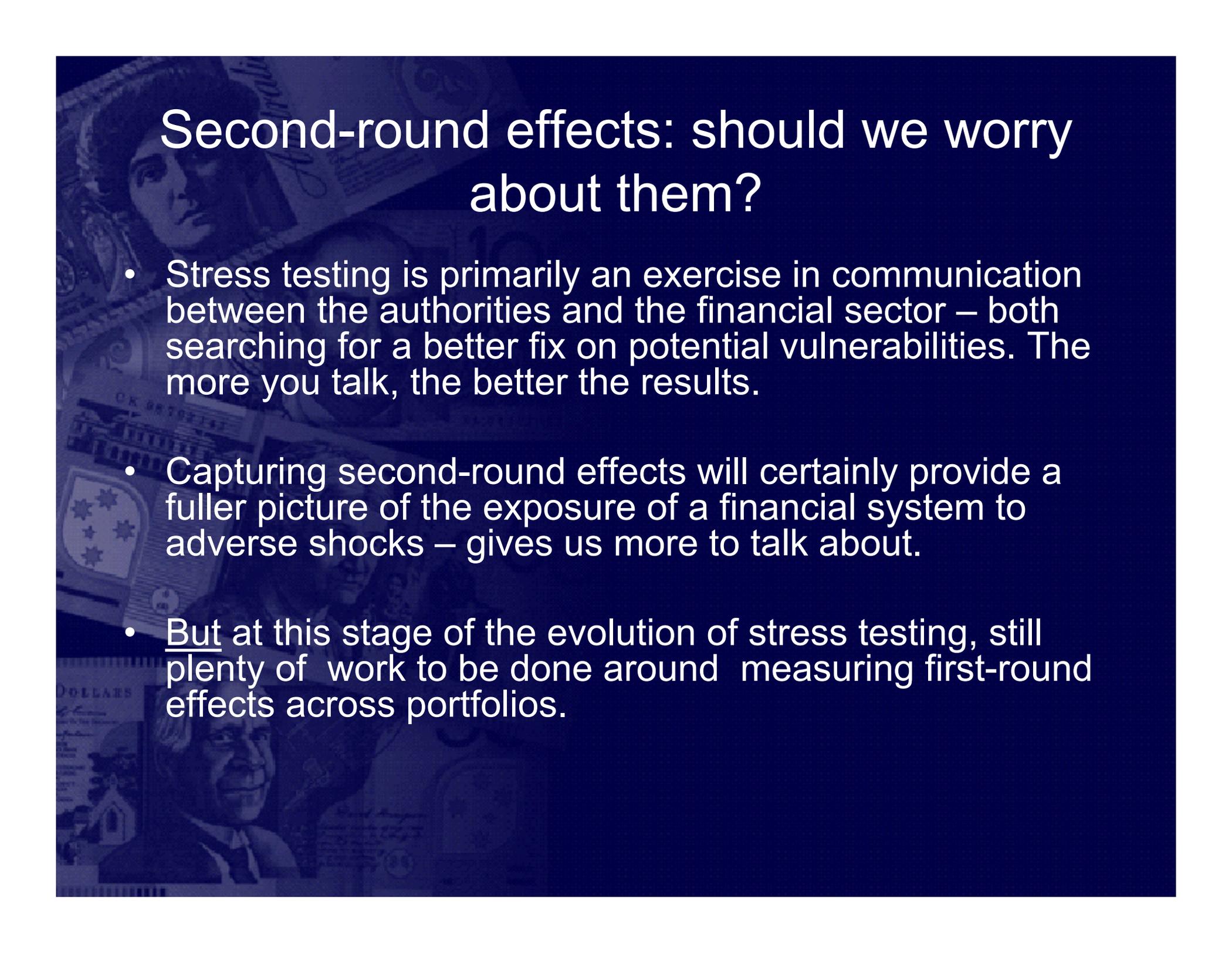
(4) Second-round effects: feedback to the real economy – an ‘iterative approach’.

- Provide banks with only the first year of the scenario – which will include a demand side shock to household and business credit.
- Credit growth will be subsequently shaped by the banks’ strategic response to the new demand conditions and their ability to generate acceptable rates of return on various business lines.
- Adjust macro-forecasts in response to banks’ forecasts for financial variables – provide 2nd year profile.....
- Introduce policy adjustments to the scenario when and where appropriate.

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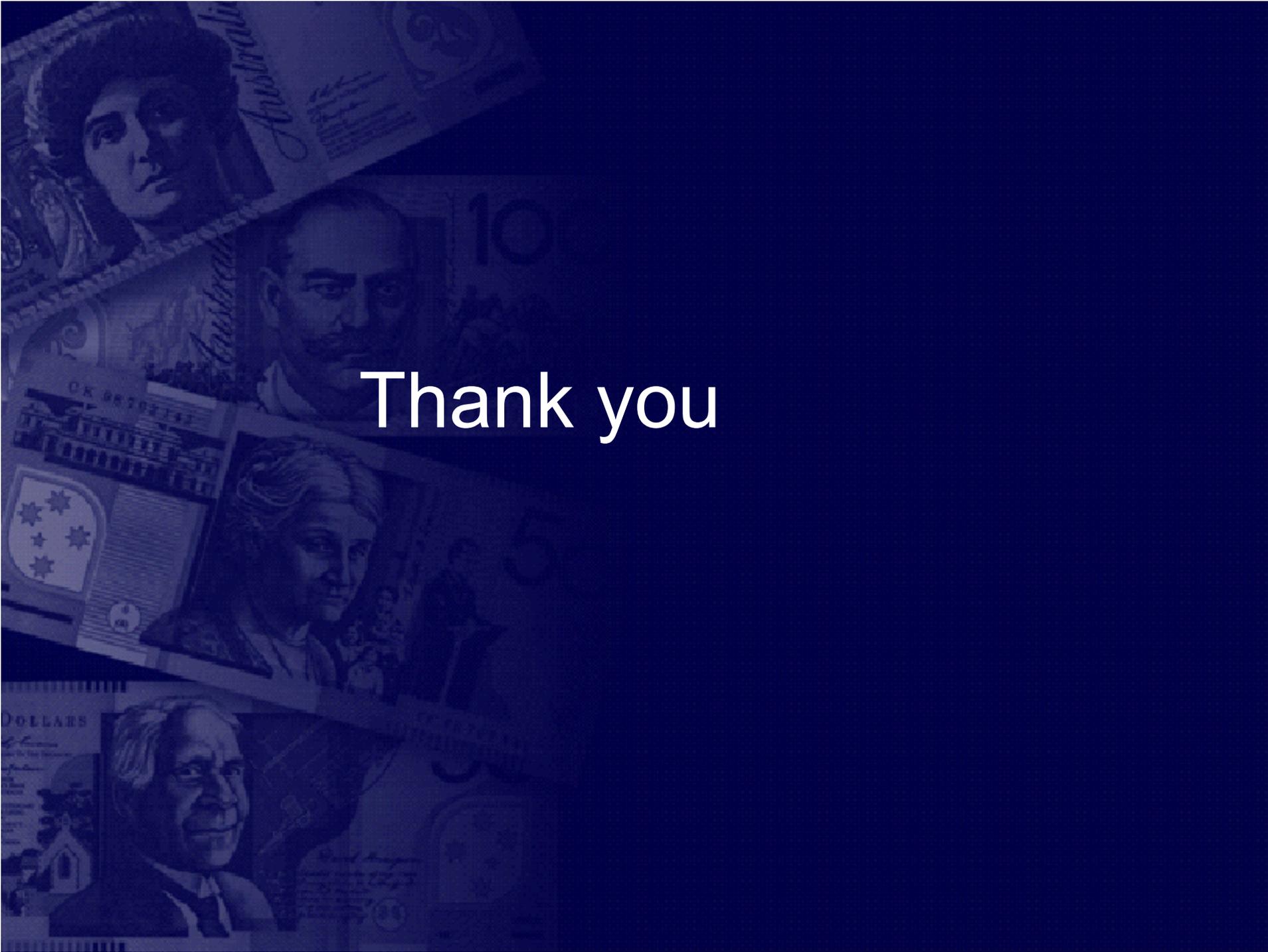
(4) Second-round effects: feedback to the real economy – an ‘iterative approach’.

- In practice – ‘iterative’ approaches are time consuming and difficult to accommodate within a tight timetable – at least at the first attempt.
- As banks build up their stress testing capabilities under Basel II it should become easier to contemplate scenarios that take on the characteristics of a multi-period game.

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Second-round effects: should we worry about them?

- Stress testing is primarily an exercise in communication between the authorities and the financial sector – both searching for a better fix on potential vulnerabilities. The more you talk, the better the results.
- Capturing second-round effects will certainly provide a fuller picture of the exposure of a financial system to adverse shocks – gives us more to talk about.
- But at this stage of the evolution of stress testing, still plenty of work to be done around measuring first-round effects across portfolios.



Thank you