

**FOR
AGENDA**

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April 18, 2008

To: Members of the Executive Board

From: The Secretary

Subject: **New Zealand—Selected Issues**

This paper provides background information to the staff report on the 2008 Article IV consultation discussions with New Zealand (SM/08/112, 4/17/08), which is tentatively scheduled for discussion on **Friday, May 9, 2008**. At the time of circulation of this paper to the Board, the Secretary's Department has not received a communication from the authorities of New Zealand indicating whether or not they consent to the Fund's publication of this paper; such communication may be received after the authorities have had an opportunity to read the paper.

Questions may be referred to Mr. Brooks (ext. 34454) and Mr. Hunt (ext. 36361) in APD.

Unless the Documents Section (ext. 36760) is otherwise notified, the document will be transmitted, in accordance with the procedures approved by the Executive Board and with the appropriate deletions, to the WTO Secretariat on Monday, April 28, 2008; and to the Asian Development Bank, the Food and Agriculture Organization, and the Organisation for Economic Cooperation and Development, following its consideration by the Executive Board.

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INTERNATIONAL MONETARY FUND

NEW ZEALAND

Selected Issues

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Approved by the Asia and Pacific Department

April 17, 2008

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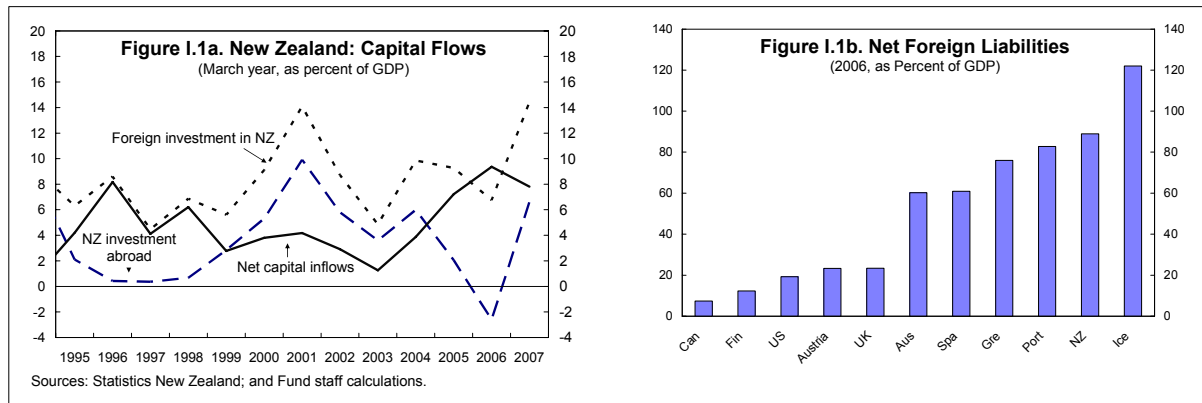
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I. ASSESSING THE IMPACT OF A DISRUPTION TO CAPITAL INFLOWS ON NEW ZEALAND¹

1. **Large capital inflows have funded New Zealand's current account deficits in recent years, raising concerns about how a disruption to inflows would impact the economy.** This chapter looks at the impact of a disruption to capital inflows by examining past episodes of capital inflows in New Zealand and other countries. The analysis suggests that a disruption to capital flows would likely slow GDP growth but that the risk of a hard landing is limited given New Zealand's sound monetary and fiscal frameworks and the strength of the banking system. Nonetheless, the rollover risk associated with banks' short-term offshore funding remains a vulnerability, which could be addressed over time by new liquidity guidelines for banks being considered by the authorities.

A. The Nature of Capital Inflows and Associated Vulnerabilities

2. **New Zealand's net capital inflows have averaged almost 5 percent of GDP per year over the past fifteen years, with particularly strong inflows in the mid-1990s and since 2004.** From 2004 to 2007, net capital inflows averaged more than 7 percent of GDP, primarily because of a pickup in gross inflows (Figure I.1a). In recent years, net capital inflows have exceeded the previous peaks in the mid-1990s and pushed net foreign liabilities to almost 90 percent of GDP, one of the highest levels among advanced economies (Figure I.1b).



3. **Net capital inflows have been dominated by private flows since 2004, primarily channeled through banks.** Equity inflows were sizable in 2001–02 but have fallen since then, while bank borrowing has increased significantly (Figure I.2). As a result, gross debt rose to 120 percent of GDP in 2007, of which almost two-thirds was bank debt (Table I.1).

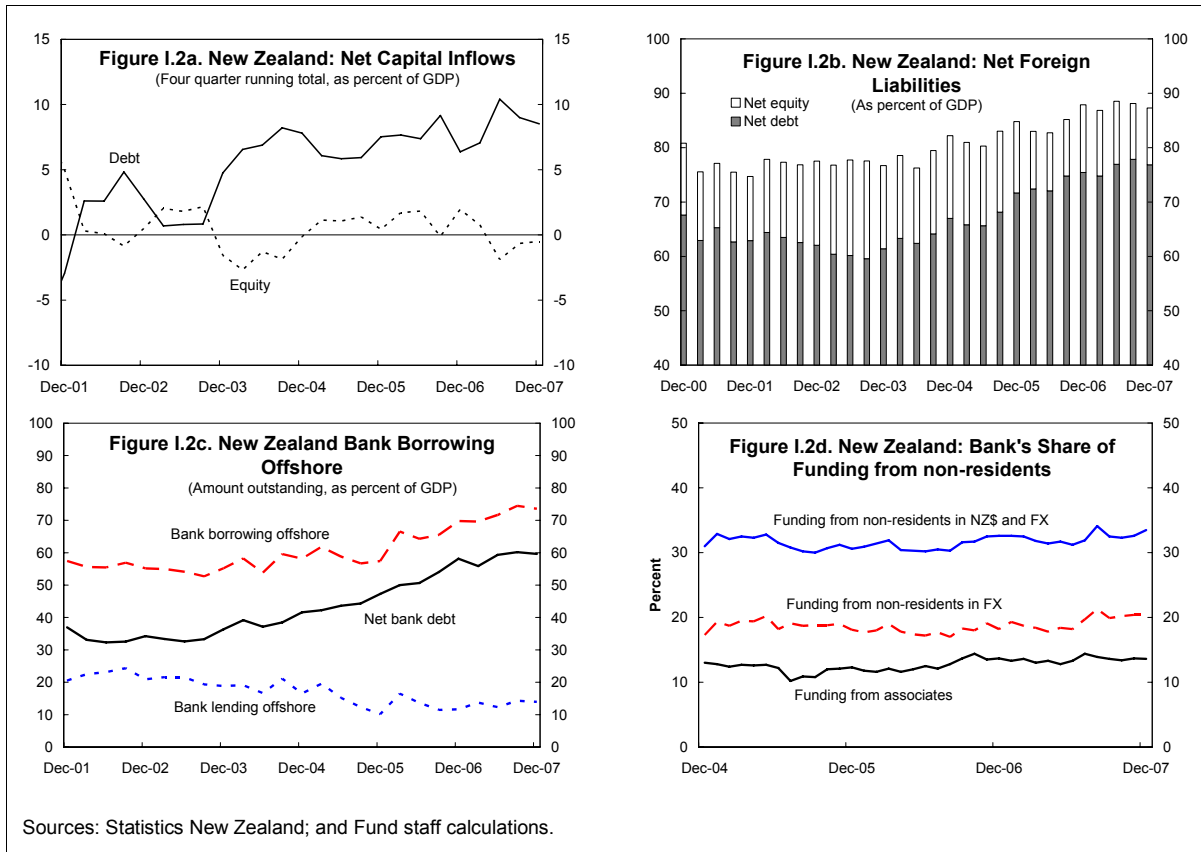
¹ Prepared by Ray Brooks (Ext. 3-4454).

Table I.1. New Zealand: Decomposition of Gross External Debt ^{1/}

	2000	2001	2002	2003	2004	2005	2006	2007
(In percent of GDP)								
Total gross external debt	109.3	108.7	109.8	103.8	107.3	106.3	115.1	119.9
By sector								
Official government	15.1	13.7	13.9	13.6	12.7	11.5	9.1	10.0
Private sector	94.2	95.0	95.9	90.2	94.6	94.7	106.0	110.0
By sub-sector								
Banks	50.9	57.5	55.3	55.2	58.2	57.4	69.8	73.5
Other private	43.3	37.5	40.6	35.0	36.4	37.3	36.3	36.4
By (residual) maturity								
Short term (under 1 year)	60.6	56.9	52.9	48.5	53.4	55.1	59.4	65.2
of which: 90 days or less	44.0	42.1	39.4	38.3	38.6	43.9	40.8	46.4
Medium term (1-5 years)	19.4	23.8	24.2	19.6	20.0	19.1	20.9	21.5
Long term (over 5 years)	22.3	22.6	26.3	29.2	28.7	28.4	30.1	27.6
Unallocated	7.0	5.4	6.4	6.5	5.2	3.6	4.7	5.6
(In percent of total gross external debt)								
Total gross external debt	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
By sector								
Official government	13.9	12.6	12.7	13.1	11.8	10.8	7.9	8.3
Private sector	86.1	87.4	87.3	86.9	88.2	89.2	92.1	91.7
By sub-sector								
Banks	46.6	52.9	50.3	53.2	54.2	54.1	60.6	61.3
Other private	39.6	34.5	37.0	33.7	33.9	35.1	31.5	30.4
By (residual) maturity								
Short term (under 1 year)	55.5	52.4	48.2	46.7	49.8	51.9	51.6	54.4
of which: 90 days or less	40.3	38.8	35.9	36.9	36.0	41.3	35.4	38.7
Medium term (1-5 years)	17.7	21.9	22.1	18.8	18.6	18.0	18.1	17.9
Long term (over 5 years)	20.4	20.8	23.9	28.1	26.8	26.8	26.2	23.0
Unallocated	6.4	4.9	5.8	6.3	4.9	3.4	4.1	4.7
By currency								
New Zealand dollar	42.5	43.3	52.3	51.0	52.0	51.7	54.2	51.1
Foreign currency	58.6	58.1	50.8	49.0	48.4	48.6	46.0	49.1
U.S. dollar	35.3	37.2	33.3	31.6	29.8	28.6	27.3	25.5
Japanese yen	7.3	6.5	2.5	2.2	1.7	1.5	1.3	1.9
Australian dollar	8.9	6.7	5.8	6.5	6.8	8.2	6.5	7.9
European Euro & UK Pound	3.5	4.1	4.3	6.4	8.1	7.6	8.4	11.4
Unallocated	3.7	3.8	4.9	2.2	1.9	2.7	2.5	2.6

Sources: Statistics New Zealand; and Fund staff estimates.

1/ Based on the International Investment Position (December quarter) comprising all official organizations known to have external debt, and corporates with external debt greater than \$NZ 50 million.

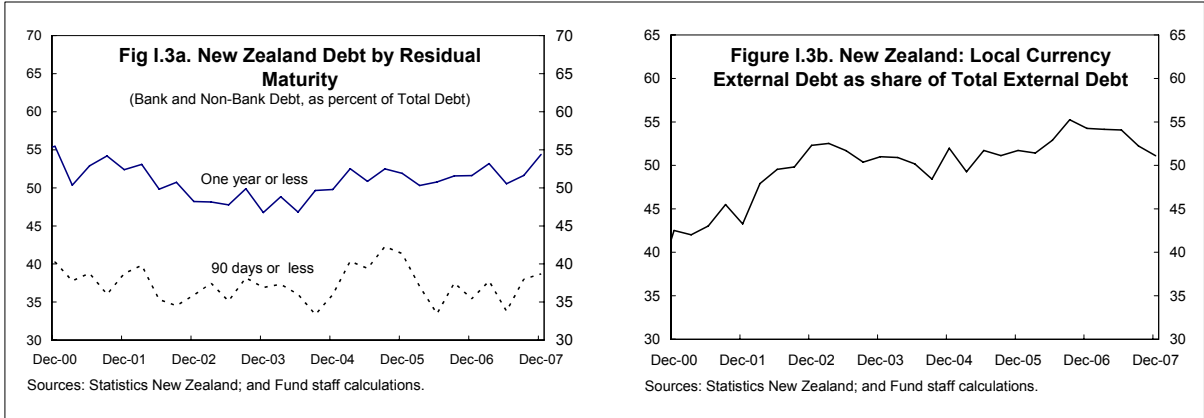


4. **New Zealand banks have increased foreign borrowing to help fund mortgage lending.** Funding from nonresidents comprised one-third of banks' total funding in 2007, well above the levels in the mid-1990s when foreign borrowing comprised one-fifth of banks' liabilities. The increase in foreign borrowing was facilitated by the development of the Eurokiwi and Uridashi markets that enabled retail borrowers in Europe and Japan to gain exposure to relatively high-yielding New Zealand dollar denominated securities (Edison, 2007). The development of these markets, together with growth in the foreign exchange swap market, enabled New Zealand banks to hedge foreign currency borrowing that was readily available offshore given abundant international liquidity. In turn, the increase in foreign borrowing helped finance a housing boom in New Zealand in the past 4–5 years.

5. **The large scale of foreign borrowing and its short-term nature leaves New Zealand vulnerable to an adverse shift in investor sentiment.** Two-thirds of banks' funding from nonresidents matures in less than a year, with almost $\frac{1}{2}$ maturing within 90 days (equivalent to 30 percent of GDP).² Given that most of the borrowing is undertaken through a relatively small number of banks that are able to tap the international market, the ability to roll over the funding is linked to their financial health and the financial health of their parents,

² Based on data provided by the RBNZ for mid-2007 for banks. Figure I.3a presents debt maturity data for banks and non-banks.

mostly domiciled in Australia (Woolford, Reddell and Comber, 2002). New Zealand banks have performed well in recent years, with strong profit growth and low nonperforming loans (Table I.2). Going forward, the quality of their mortgage book (at 45 percent of assets) will have a strong bearing on banks' credit rating and their ability to roll over offshore funding.



6. **Factors that mitigate some of the risks of banks' borrowing offshore include the widespread hedging against currency movements and the availability of credit from parent banks offshore.** A large portion of the debt is denominated in New Zealand dollars, with this share rising from about 40 percent of total debt in 2000 to more than 50 percent in 2007 (Figure I.3b). For the remaining foreign currency debt, survey data for 2007 show that banks hedged 97 percent of such debt using financial derivatives. Moreover, three quarters of non-bank foreign currency debt was hedged either naturally or through derivatives. A further factor that may limit the rollover risk is that parent banks are unlikely to curtail credit sharply in the event of difficulties with their New Zealand subsidiaries, unless they also face funding difficulties. At present, about 40 percent of banks' foreign debt is from associates offshore, but the share of funding from parent banks is unclear (most of the funding from associates is from special funding vehicles set up by New Zealand banks for tax purposes).

B. Experience with Capital Inflows in Other Countries

7. **Episodes of large capital inflows in other advanced economies were associated with a pick up in economic activity and subsequent slowing when inflows eased.** The October 2007 World Economic Outlook (IMF, 2007) examines 109 episodes of large capital inflows in 50 countries, including three episodes in New Zealand (1992, 1995–97, and 2000)

Table I.2. New Zealand: Financial Soundness Indicators of the Banking Sector

End of Year	1995	2000	2001	2002	2003	2004	2005	2006	2007 ^{1/}
(In Percent)									
Capital adequacy									
Total capital to risk-weighted assets	10.6	11.1	10.7	11.1	10.3	10.8	10.9	10.7	10.4
Tier I capital to risk-weighted assets ^{2/}	7.8	7.7	7.6	8.3	7.6	8.4	8.7	8.1	7.7
Asset composition (share of total)									
Financial securities	...	17.5	22.0	19.7	18.2	16.4	16.6	14.6	14.1
Residential mortgage loans	...	37.6	34.7	36.6	37.2	41.6	43.2	44.5	44.5
Other lending	...	37.9	36.9	38.0	38.3	35.7	34.5	35.1	34.9
Other assets	...	7.0	6.5	5.8	6.4	6.2	5.7	5.8	6.5
Asset growth									
Total assets	12.1	13.7	5.2	7.9	7.8	9.8	4.9	15.8	14.9
Total loans	13.7	7.7	9.4	8.1	9.5	10.2	9.4	13.3	14.6
Residential mortgages	17.6	7.4	4.7	8.6	17.3	14.8	16.1	13.8	14.8
Asset quality									
Impaired assets to total lending	1.3	0.4	0.4	0.3	0.2	0.2	0.2	0.1	0.1
Specific provisions to impaired assets	42.0	33.8	25.4	37.5	45.4	34.2	38.2	35.0	33.2
Earnings and profitability (year average)									
Return on average assets	1.0	1.1	1.2	1.4	1.2	1.2	1.1	1.2	1.1
Return on average equity ^{3/}	...	...	...	22.5	17.8	14.1	13.7	14.6	...
Aggregate lending margin	3.0	2.3	2.3	2.6	2.5	2.5	2.3	2.3	2.2
Total income to average assets	...	3.4	3.2	3.5	3.5	3.4	3.2	3.2	...
Net interest income to total income	...	62.2	63.3	67.6	67.7	68.8	67.8	69.0	69.2
Operating costs to income	66.1	54.8	48.4	45.5	46.1	47.6	48.0	45.9	44.2
Bank concentration (market share)									
Largest bank	...	...	...	32.7	32.9	33.2	33.3	34.6	33.1
Four largest banks	...	...	...	84.6	85.4	85.6	85.3	87.9	88.9

Source: RBNZ.

1/ Data for end-June.

2/ Tier I capital includes issued and fully paid common equity and perpetual non-cumulative preference shares, and disclosed reserves.

3/ For systemically important banks.

and 12 in other advanced countries.³ Capital inflows in the advanced countries were associated with an increase in real GDP growth, domestic demand, current account deficits and CPI inflation (Table I.3). But as inflows slowed, GDP growth fell by almost 2 percentage points, and for the next two years was $\frac{3}{4}$ percentage points below the growth rate before the episodes began.

8. **The WEO study, however, does not determine that a slowing in capital inflows causes a fall in GDP growth and a narrowing of the current account deficit.** Capital inflows may be driven by an upswing in the domestic economic cycle that increases the current account deficit which in turn requires funding by capital inflows. This implies that domestic demand, the current account deficit and capital inflows would fall as the domestic cycle cools. Debelle and Galati (2005) argue along these lines, providing evidence that current account reversals in industrial countries mostly reflect domestic economic cycles rather than shortfalls in net capital inflows driven by a loss in external confidence. Nonetheless, the results of the WEO study for advanced countries are similar to those for emerging market countries, where shortfalls in capital inflows were in many cases driven by a loss in external confidence.

9. **Capital inflow episodes characterized by weaker post-inflow GDP growth in advanced countries were associated with a faster acceleration in domestic demand, a sharper rise in inflation and a real exchange rate appreciation during the episodes (Figure I.4).** These episodes lasted longer and involved higher cumulative inflows. GDP growth in the weaker cases fell by 2 percentage points in the two years following the capital inflows episode compared with GDP growth during the episode.

³ Capital inflows episodes were identified on the basis of deviations from trend inflows and were typically greater than 4 percent of GDP per annum for advanced countries (see WEO October 2007, Appendix 3.1). The episodes for advanced countries include Australia (1988-90, 1995-99), Canada (1997-98), Denmark (1994, 1997, 1999), Iceland (1996-2000), Malta (1993-2000), New Zealand (1992, 1995-97, 2000), Norway (1993, 1996-97), and Sweden (1988-90, 1998-2000). In addition, four advanced countries are experiencing ongoing capital inflows: Australia (2003-), Iceland (2003-), Malta (2005-) and New Zealand (2004-).

Table I.3. Large Capital Inflow Episodes in Advanced Countries, Selected Macro Economic and Policy Indicators ^{1/}

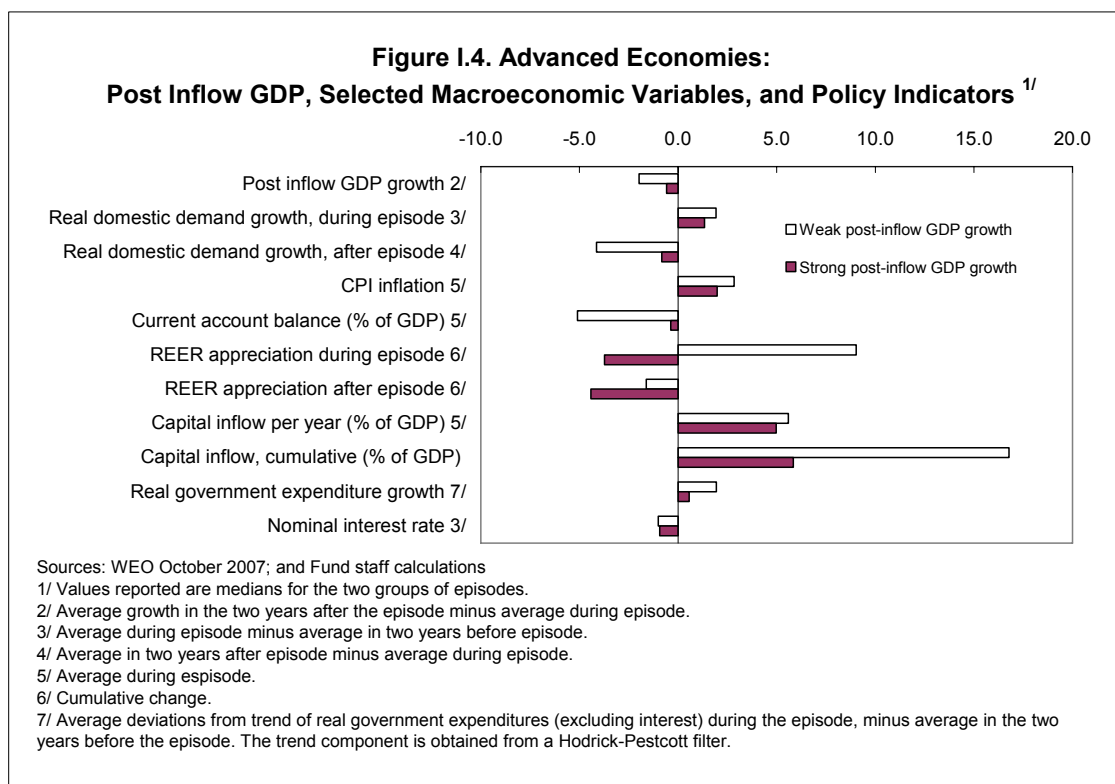
		Advanced Countries ^{2/}	New Zealand 1995-97	New Zealand 2000
GDP growth (percent)	Before	2.9	5.5	2.1
	During	4.0	3.5	3.9
	After	2.1	2.1	4.0
Real domestic demand growth (percent)	Before	2.7	5.6	2.7
	During	4.4	4.6	2.5
	After	1.6	2.7	3.5
Current account balance (as percent of GDP)	Before	0.4	-3.9	-5.0
	During	-0.4	-5.7	-5.1
	After	0.3	-5.1	-3.4
Real effective exchange rate 3/ (percent)	Before	-2.3	-1.3	-4.3
	During	0.6	14.8	-9.3
	After	-1.3	-1.8	-6.9
Terms of Trade (percent)	Before	...	-0.5	-0.7
	During	...	-4.2	1.1
	After	...	-3.9	6.1
CPI inflation (percent)	Before	1.9	1.5	0.6
	During	2.3	2.4	2.6
	After	2.3	0.6	2.6
Net private capital inflows (as percent of GDP)	Before	-1.9	3.2	3.1
	During	5.0	6.3	5.9
	After	-0.2	3.1	2.8
Nominal interest rates (percent)	Before	5.6	7.3	6.3
	During	5.1	9.6	6.2
	After	5.3	6.3	5.6

Sources: WEO October 2007, Chapter 3: Managing Large Capital Inflows; and Fund staff calculations.

1/ Values reported are medians for the country groupings. "Before" denotes values in the two years before the episodes. "After" denotes values in the two years after the episode.

2/ Excluding New Zealand.

3/ Cumulative change within periods.



10. **From the policy perspective, it is notable that harder landings were associated with strong increases in government spending during the capital inflow episodes in advanced economies.** An increase in real government spending during episodes were associated with a larger increase in domestic demand and inflationary pressures, and subsequently a sharper fall in domestic demand and GDP after capital inflows slow.⁴ The policy message is that maintaining fiscal discipline in the face of buoyant revenues, rather than allowing procyclical growth of public spending, may help ensure a soft landing when capital inflows slow.

C. How Does New Zealand's Experience with Capital Inflows Differ from Other Countries?

11. **Capital inflow episodes in New Zealand were associated with a smaller change in GDP growth than in other countries.** Real GDP growth fell by 1½ percentage points after the 1995–97 episode (with only a shallow recession in 1998 despite a serious drought), but the fall was smaller than the 2 percentage point fall in advanced countries. With the 2000 episode, real GDP growth actually rose slightly in New Zealand. The more muted changes in growth in New Zealand may be because swings in capital inflows were smaller than in other

⁴ The WEO study found that the association between higher government spending and a hard landing was statistically significant for the wider group of 50 countries. The smaller group of advanced countries does not have enough observations to test the statistical significance of this link.

advanced countries. Capital inflows in advanced country episodes typically increased by 7 percent of GDP and fell by 5 percent of GDP after the episodes, about twice the variation experienced in New Zealand.

12. **The post-inflow adjustment of the current account was markedly different in the two capital inflow episodes in New Zealand.** After the 1995–97 episode, the current account adjustment was relatively small (0.6 percent of GDP) and took place mainly through the income deficit, driven by a sharp fall in domestic interest rates that lowered the funding cost of New Zealand dollar-denominated external debt. Following the second episode in 2000, the trade balance was the source of the 1¾ percent of GDP current account adjustment, due to an improvement in the terms of trade and a fall in the real effective exchange rate.

13. **Movements in the exchange rate in New Zealand were more marked than in other countries.** The real exchange rate appreciated by 15 percent during the 1995–97 episode, well in excess of that experienced during capital inflow episodes in other countries. Moreover, New Zealand's exchange rate depreciated after the 1995–97 episode came to an end, and continued to depreciate throughout the 2000 episode and beyond. In part, this reflected a decrease in the supply of capital as the Asian financial crisis in 1997–98 affected capital flows globally (WEO, 2007). The depreciation of the exchange rate also reflected a slowing in New Zealand's domestic demand and an easing in non-tradable goods inflation, which allowed a reduction in short-term interest rates.

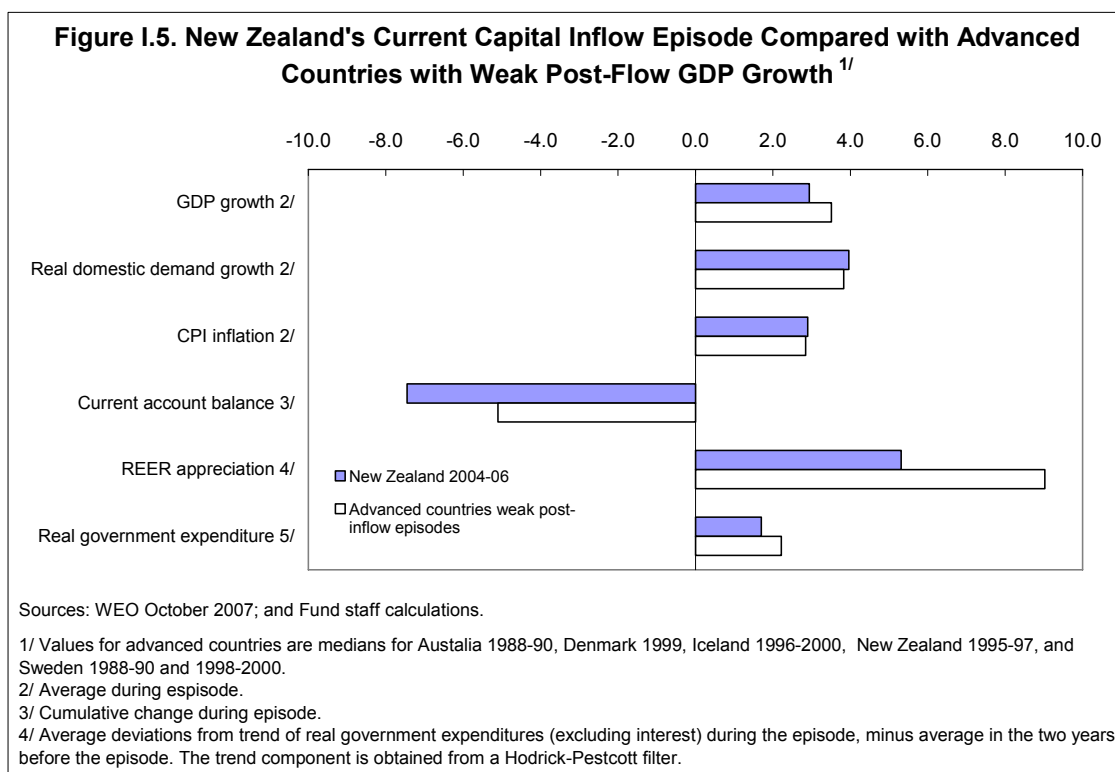
14. **The fall in the exchange rate and swings in capital inflows in New Zealand had little impact on banks.** The exchange rate fell by 25 percent in real effective terms from the peak in 1997 to 2001, but banks' nonperforming assets remained low and bank profit was largely unaffected. This was due to the short-lived nature of the recession in 1998 and the widespread hedging of foreign currency denominated debt, not only by banks but by their corporate clients.

D. How Does the Current Episode of Capital Inflows Differ from Earlier Episodes?

15. **The current episode of capital inflows is larger and longer lasting than earlier episodes in New Zealand, which increases the vulnerabilities.** Capital inflows have financed current account deficits that have averaged almost 8 percent of GDP per annum for the past four years, more than 2 percentage points of GDP larger than during the mid-1990s. Moreover, the current episode so far has lasted one year longer than the mid-1990s episode.

16. **The current episode in New Zealand is similar to that experienced by countries that had weak post-inflow growth outcomes.** GDP growth, domestic demand and inflation, and real government expenditure growth are about the same as in other advanced countries that experienced weak post-inflow growth outcomes (Figure I.5). What is notable is that the current account deficit in New Zealand has been larger than in other countries, and large

deficits were associated with weaker outcomes in other countries. In other countries with weak post-inflow GDP growth, capital inflows fell by 4 percent of GDP in the two years following the episodes and were associated with a fall in domestic demand growth by 4 percentage points and GDP growth by 2 percentage points over the following two years.



E. How Might a Disruption to Capital Inflows Play Out in New Zealand?

17. **New Zealand's large current account deficit will need to adjust to a lower level to reduce external vulnerabilities.** A soft landing scenario would see the current account deficit falling over time as domestic demand eases and the real exchange rate depreciates. A depreciation is likely to occur in response to a decline in capital inflows as the RBNZ reduces interest rates to a more neutral setting when inflation pressures abate. Staff analysis suggests a norm for the current account deficit in the range of 4–5 percent of GDP, implying an adjustment of 3-4 percent of GDP from present levels (Brooks, Edison, and Vitek, 2008).

18. **The adjustment in the current account, however, may not be smooth if capital inflows are disrupted.** The recent global financial market turmoil provides some insight into how a disruption to capital inflows may play out. While New Zealand banks have managed to maintain adequate access to offshore money markets in the face of the global turmoil, they did face a higher cost of funding which raised domestic short-term interest rates by around

25–50 basis points and five-year credit default swap spreads by almost 100 basis points by early April 2008.⁵ As investors' appetite for risk shifted and some "carry trades" were unwound, the U.S./N.Z. dollar exchange rate depreciated by 13 percent from late July 2007 through end August 2007. The exchange rate has since appreciated to near the mid-2007 peaks but the shifts in funding costs and the exchange rate are indicative of the impact on the financial markets of a future disruption to capital inflows. Future disruptions could take the form of a global credit squeeze as seen recently, or could be a more specific loss of investor confidence in New Zealand.

19. **A depreciation of the real exchange rate, if sustained, would improve the external trade balance and reduce the need for capital inflows.** A depreciation of the exchange rate would be welcomed by the tradable goods sector given that Fund staff analysis suggests the exchange rate was overvalued at end-2007 by 5–15 percent (Brooks, Edison, and Vitek, 2008).

20. **The scale of the depreciation would depend on the extent of disruption to capital inflows.** A loss of market access to foreign funding for several months may present a challenge, as two-thirds of short-term debt falls due within 90 days (i.e., bank and non-bank debt equivalent to 46 percent of GDP). Foreign exchange reserves of 12 percent of GDP would provide some buffer for the foreign currency denominated share of short-term debt under this scenario.

21. **A complete loss of access to foreign funding, however, is unlikely given the good credit rating of New Zealand banks.** The banks' credit rating (AA/Aa2 for the big four banks) is backed by New Zealand's strong fiscal position, its sound monetary policy framework, and flexible exchange rate and labor market. Moreover, New Zealand's largest banks are owned by Australian banks, which provides an alternative line of credit, as long as Australian banks are not adversely affected by a similar shock.

22. **Where banks may be vulnerable is if the quality of their mortgage book declines sharply and this in turn harms their credit rating and increases their cost of funding.** The concentration of loans in mortgages (45 percent of bank assets) exposes banks to a fall in house prices and a reduction in households' ability to service debt that may accompany an economic slowdown and a rise in bank funding costs. Stress tests in the Financial System Stability Assessment (FSSA) that combined a 20 percent fall in house prices, a 4 percent increase in the unemployment rate and a 4 percentage point decline in household income, shows a loss of ¼ of annual bank profits on average, and at most half of annual bank profits

⁵ Medium-term funding costs, as indicated by five-year credit default (CDS) swap spreads for the four large Australian banks, spiked in March 2008 at more than 150 basis points, before easing to about 90 basis points in early April 2008. Before the turmoil broke out in late 2007, five-year CDS spreads for the four Australian banks were less than 10 basis points.

in the case of the most affected banks (IMF, 2004). In addition, the FSSA stress tests show that banks would suffer significant losses from a sharp rise in funding costs, but the results show that no individual bank's capital position would be endangered by the scenario.⁶ Preliminary updates of these stress tests by the RBNZ suggest the results remain valid (Rozhkov, 2007). The resilience of banks' capital to stress tests suggest that more extreme shocks to house prices, unemployment, household incomes and funding costs than in the FSSA stress test scenarios would be needed to prompt a downgrade in bank's credit rating.

23. A sharp cooling in the housing market may contribute to an adjustment in the current account deficit, through increased household saving and a reduction in residential investment. A drop in house prices would have negative wealth effects on consumption, as would a decrease in the availability of home equity financing. In the past, private saving and investment have adjusted to a fall in capital inflows. In 2001–03, following the 2000 capital inflow episode, half the 2½ percentage point of GDP improvement in national saving came from the private sector.

24. Higher funding costs would worsen the current account deficit and offset some of the impact of a cooling in the housing market. For instance, a 100 basis point increase in the cost of funding of external debt could worsen the income deficit by 0.7 percent of GDP in the short-term.⁷ This would imply a somewhat larger adjustment in the trade balance would be needed to reduce the current account deficit in face of lower capital inflows and higher cost of existing debt.

F. What Policy Action Might Reduce Vulnerabilities Ahead of a Disruption to Capital Inflows?

25. The current mix of macroeconomic policies that focus on addressing inflationary pressures will help reduce capital inflows over time. If the adjustment in the current account takes place in line with the soft landing scenario discussed above, foreign liabilities would fall over time as a share of GDP, reducing external vulnerabilities. To illustrate, a current account deficit of 4 percent of GDP (the lower end of staff estimates of the norm) would reduce net foreign liabilities to 80 percent of GDP over the medium-term from the nearly 90 percent of GDP in 2007 (Brooks, Edison, and Vitek, 2008).

⁶ The funding-costs-stress scenario in the FSSA assumes an increase in short-term interest rates to 18-20 percent, a depreciation of the New Zealand dollar by 40 percent, and a permanent increase in the risk-premium for New Zealand dollar denominated debt.

⁷ Gross external debt stood at 120 percent of GDP at end-2007, with debt maturing in one-year or less at 65 percent of GDP. A 100 basis point increase in the cost of the short-term debt would imply a 0.7 percent of GDP increase in income debits in the balance of payments after one year, if all the debt were rolled over at the higher funding cost.

26. **The experience of other countries suggests that fiscal restraint during episodes of high capital inflows was associated with a soft landing.** This would imply the need for fiscal restraint in New Zealand during the current capital inflows episode, in order to take pressure off monetary policy.

27. **Lessons from the recent global financial market turmoil point to the need for central banks to think ahead about their strategy for dealing with exceptional disruptions to liquidity.** The RBNZ broadened the range of collateral in response to the turmoil in August 2007 by allowing banks to use a wider range of instruments in the overnight reverse repurchase facility. The RBNZ may want to consider ahead of time what further steps could be taken to increase liquidity, if disruptions arise.

28. **The introduction of liquidity guidelines for banks planned by the RBNZ should help reduce vulnerabilities.** The IMF's Global Financial Stability Report (April 2008) argues that the apparent under-insurance of large banks to the risk of liquidity shocks suggests the need to consider stricter prudential norms (Box I.1). Given the relatively low level of liquid assets that New Zealand banks hold (only 3-4 percent of assets were in cash and government securities in 2007), the introduction of liquidity guidelines has the potential to reduce liquidity stress that may arise from a disruption of access to offshore money markets.⁸

29. **In addition, the RBNZ, as the main supervisor of financial institutions, will need to guard against declining credit standards.** Maintaining access to foreign funding depends crucially on the good credit rating of New Zealand banks. Therefore, the supervisor should guard against a deterioration in banks' lending standards, especially for their mortgage book, as this may undermine their credit rating.

G. What Would be the Appropriate Policy Response to a Disruption to Capital Flows?

30. **The appropriate monetary policy response to a disruption in capital inflows would depend on the medium-term inflation outlook under the RBNZ's inflation targeting framework.** A temporary disruption to capital inflows that raises demand for liquidity should be accommodated through RBNZ action to increase the supply of liquidity. A more fundamental challenge for the inflation-targeting framework would be a sharp depreciation of the exchange rate and an increase in funding costs along the entire yield curve. A sharp depreciation of the exchange rate would have a direct impact on tradable goods inflation in the near term, but the slowing in domestic demand as a result of the disruption to capital inflows

⁸ In August 2007, the RBNZ began to accept New Zealand bank bills in its overnight reverse repurchase facility. This increased banks' liquid assets, as a bank could agree to hold another bank's bills in exchange for its own bills. Both banks could then use the bills to gain liquidity from the RBNZ in the reverse repurchase facility. However, banks may be unwilling to lend to each other during a disruption to capital inflows.

would reduce non-tradable inflation.⁹ On balance, if underlying inflation pressures ease, it may leave scope for the RBNZ to reduce the Official Cash Rate (OCR). This would facilitate the depreciation of the exchange rate and associated adjustment of the current account. However, a reduction in the OCR may have only a limited impact on medium and long-term interest rates which are influenced more by the cost of funding offshore. If longer-term interest rates rise significantly, the RBNZ may need to reduce the OCR more aggressively.

31. **Fiscal policy could play a role in responding to a disruption in capital inflows.** The strong fiscal position, with large surpluses and positive net financial assets, provides significant flexibility for fiscal policy to respond. If growth and inflation slow with a disruption to capital inflows, the automatic stabilizers should be allowed to work in a counter-cyclical manner. In addition, a slowing in growth would provide an opportunity for fiscal policy to transition to the lower level of surpluses targeted for the medium-term. But care should be taken to ensure the current medium-term fiscal objectives are met, as sound fiscal policy underpins New Zealand's strong credit-rating. Moreover, a sharp fall in public saving over the medium-term would work against the rise in private saving needed to help adjust the saving-investment imbalance.

⁹ Looking back at the previous capital inflow episodes in New Zealand shows that in the two years following the 1995-97 episode, headline CPI inflation fell sharply, while in the two years following the 2000 episode, headline CPI inflation was unchanged.

Box I.1. Enhancing Liquidity Management

New Zealand banks are required to publish information about their risk-management policies, but the detail of the reporting is largely at the bank's own discretion. Apart from the reporting requirement, no liquidity requirements, limits, or rules exist in New Zealand at present for registered banks. However, the RBNZ is planning to introduce liquidity guidelines in 2008.

Prudential steps outlined in the Global Financial Stability Report (IMF, 2008) with regard to funding liquidity that may be considered in New Zealand, include:

- minimum liquid assets requirements,
- limits on maturity mismatches in bank's asset/liquidity structures,
- rules governing diversification of funding sources.

Systemically important banks and other financial institutions should also be encouraged to change their practices. In particular:

- Greater transparency is needed regarding commercial bank liquidity management policies and practices, including liquidity risk appetite, funding sources, liquidity commitments (especially to off-balance sheet entities), maturity mismatches and contingency plans.
- More severe stress testing of funding liquidity should be adopted, taking account the possible closure of multiple wholesale markets (both secured and unsecured) and widespread calls on liquidity commitments. Results of these liquidity stress tests should be made publicly available.
- Banks should take greater account of multi-currency funding liquidity shocks, taking into account potential stress in foreign currency swap markets.

The Global Financial Stability Report (IMF, 2008) also notes that care will need to be taken if a more rules based approach is adopted. First, it would be difficult to define a single norm that applies well to banks with very different business models, such as predominantly wholesale- or retail financed banks. Second, if very costly liquidity requirements are imposed, supervisors will need to take account of the incentives for banks to circumvent them, including via off-balance sheet entities and other counterparties, and the welfare loss from increasing the cost of financial intermediation.

The Financial Stability Forum's April 2008 report on enhancing Market and Institution Resilience also discussed liquidity management. The report noted that the Basel Committee on Banking Supervision plans to issue for consultation sound practice guidance on the management and supervision of liquidity by July 2008. The guidance will cover the identification and measurement of liquidity risks, together with stress tests.

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II. THE IMPACT OF COMMODITY PRICES ON NEW ZEALAND'S EQUILIBRIUM REAL EFFECTIVE EXCHANGE RATE: SOME INSIGHTS FROM GEM¹⁰

A. Introduction

32. **Over the last several years, both New Zealand's real commodity price index and real effective exchange rate have been rising.** Although a variety of factors underlie these developments, an important question is how much of the currency appreciation is likely to be permanent if real commodity prices remain elevated. In this chapter, the IMF's new Global Economy Model (GEM), is used to provide some estimates of the equilibrium relationship between New Zealand's real effective exchange rate and real commodity prices.

33. **The analysis suggests that permanent changes in non-energy commodity prices can have a significant impact on New Zealand's equilibrium exchange rate.** Under plausible assumptions about key behavioral parameters and a range of alternative factors driving commodity prices, it is possible to generate elasticities of New Zealand's equilibrium real effective exchange rate with respect to permanent changes in real commodity prices in the range of 0.1 to 0.6. Consequently, understanding the source of the commodity-market imbalance as well as the ease with which New Zealanders' can substitute between domestic and imported goods is necessary to determine where in the range the elasticity is likely to be. A consideration of worldwide developments that are most likely driving the current increase in commodity prices suggests that the impact on New Zealand's equilibrium exchange rate is likely to lie in upper portion of the range.

B. The Global Economy Model and Commodities

34. **Two key aspects of GEM make it particularly useful for examining the relationship between commodity prices and the real exchange rate.**¹¹ First, because of its multi-good structure, GEM can be configured to include a tradable commodity good that is used as an input into the production of other goods. This fully-specified structure for commodity supply and demand enables analysis of how the source of the commodity-market imbalance driving price developments influences the magnitude of the impact on the exchange rate. Second, because GEM is derived completely from optimizing foundations, it is possible to consider how key behavioral parameters influence the equilibrium impact of commodity prices on the exchange rate.

35. **The model has been configured to contain three types of goods; a nontradable good, a tradable non-commodity good; and a tradable non-energy commodity good.** For

¹⁰ Prepared by Ben Hunt (Ext. 3-6361).

¹¹ The Appendix contains a brief overview of GEM. For a complete descriptions of GEM's structure and dynamic adjustment properties see Laxton and Pesenti (2003) and Hunt and Rebucci (2005).

ease of exposition the tradable non-commodity good will be referred to as manufactures and the tradable non-energy commodity good will be referred to as commodities. The model has been calibrated to represent five regions: New Zealand; Australia; the United States; emerging Asia; and the rest of the world. To provide insights on the long-run relationship between commodity prices and the exchange rate, the focus of the calibration has been on the trading relationship among these blocks and the production and use of commodities.

36. In the regions considered, commodities are the most important for New Zealand from both the production and export perspectives. Table II.1 contains some key shares of GDP illustrating the importance of commodities in New Zealand. Exports of goods and services in New Zealand represented roughly 29 percent of GDP in 2006 and, as can be seen from the table, commodity-based exports accounted for over half of total exports.

Table II.1: Non-Energy Commodity Shares of GDP (in percent)

	New Zealand¹	Australia	Emerging Asia	United States	Rest of World
Production	18.1	11.0	2.8	1.6	2.2
Exports	17.6	8.3	2.1	1.5	0.8
To NZL		0.2	0.0	0.0	0.0
To AUS	2.3		0.1	0.0	0.0
To E.A.	4.1	3.3		0.3	0.3
To U.S.	2.8	0.3	0.3		0.5
To R.W.	8.5	4.5	1.7	1.2	

Sources: National Accounts data; and Fund staff calculations.

¹ For New Zealand calculations are based on data from 2006 and commodities were defined to include agriculture, forestry, fishing and mining, plus: food, beverages, and tobacco; wood and paper; plastics and rubber; non-metallic minerals; and metal products. Traditional commodities account for 7.8 percent of GDP and adding food, beverages, and tobacco takes it up to 12.9 percent of GDP.

37. Given the fully specified structure for supply and demand, it is possible to generate a permanent increase in prices from two types of commodity-market imbalance. First, the imbalance can be generated from productivity growth increasing demand for the commodity input, which in the presence of a fixed factor in commodity production—land—drives up the real price of commodities. Two alternative growth scenarios are considered:

- balanced growth, where productivity increases in all three sectors; and
- unbalanced growth, where productivity increases only in manufactures.

The second type of imbalance could arise from negative supply shocks that reduce the quantity of land used in commodities production. For example, global warming could be reducing the quantity of agricultural land as it affects weather patterns, as suggested by the recent droughts in Australia.

38. **In GEM, the real exchange rate is the key relative price that adjusts to ensure long-term external balance.** In the short-run, domestic versus foreign interest rate differentials as well as risk premium can drive the exchange rate away from its long-run fundamental value. However, in the long run, real exchange rates adjust to stabilize current accounts and net foreign asset positions. In the simulation analysis below, when permanent changes in real commodity prices arise, the equilibrium real exchange rate adjusts to ensure that current accounts and net foreign asset positions return to their baseline ratios to GDP.

C. Simulation Results

39. **Permanently higher commodity prices increase New Zealand's equilibrium exchange rate, but the magnitude depends on the source of the commodity market imbalance (Table II.2).**

- If increased demand for commodities is widespread across sectors in New Zealand's trading partners (balanced growth), the impact on the exchange rate will be the largest (column 1, row 1). When demand is driven by faster productivity growth in only manufactures (column 1, row 2), the relative price of New Zealand's imports decline in foreign currency terms and there is less need for the exchange rate to appreciate to increase import demand to balance the current account.
- If growth also increases in New Zealand, the impact on the exchange rate is smaller (column 2, rows 1, and 2). Increased domestic growth helps stimulate import demand, particularly in investment goods which are import intensive, leaving less need for currency appreciation to balance the current account.
- If rising commodity prices are due to a reduction in land, then the required appreciation is close that when rising commodity prices are driven by growth outside of New Zealand. However, if land in New Zealand declines as well then the required appreciation is quite small.

Table II.2: Equilibrium Real Effective Exchange Rate Elasticity w.r.t. Commodity Prices
(Elasticity of Substitution for Manufactures = 1)

Source of Imbalance	Extent of Global Economy Affected	
	All regions but New Zealand	All regions including New Zealand
Economy-wide Growth	0.6	0.3
Growth in Manufactures	0.4	0.3
Reduction in Land	0.5	0.1

Source: GEM simulations.

40. **If the elasticity of substitution among factors of production in commodities production is higher, New Zealand's real exchange rate is more responsive to commodity prices.** For the scenario where growth is balanced, but concentrated in New Zealand's trading partners (row 1 column 1 in Table II.2), the impact on the exchange rate increases from 0.6 to 0.7 if the elasticity of substitution among factors in commodities production is increased to 0.9 from 0.6. This increase occurs when the higher elasticity is just in New Zealand, or world wide, which reflects the high importance of commodities in New Zealand's export basket.

41. **The elasticity of substitution for manufactures has an important impact on the elasticities.** All the scenarios from Table II.2 are repeated and presented in Table II.3 but with firms' and households' elasticity of substitution between domestically and foreign produced manufactures is increased to 2 from 1.¹² The result is that the required increase in the real effective exchange rate in response to higher commodity prices declines. With demand between domestic and foreign manufactures much more responsive to price, the exchange rate needs to move by less to increase import demand sufficiently to balance the current account. Interesting, with the higher elasticity of substitution across manufactures, the Balassa-Samuelson effect becomes more evident and the downward impact on the elasticity when growth also occurs in New Zealand is smaller.

Table II.3: Equilibrium Real Effective Exchange Rate Elasticity w.r.t. Commodity Prices (Elasticity of Substitution for Manufactures = 2)		
	Extent of Global Economy Affected	
Source of Imbalance	All regions but New Zealand	All regions including New Zealand
Economy-wide Growth	0.4	0.3
Growth in Manufactures	0.1	0.2
Reduction in Land	0.3	0.1
Source: GEM simulations.		

42. **Most econometric-based estimates of the impact of commodity prices on New Zealand's equilibrium real effective exchange rate fall within the simulated range.** In IMF (2006), pooled estimation across a large range of countries yields an elasticity of real effective exchange rates with respect to commodity prices of 0.4. Other New Zealand specific estimated elasticities include 0.5 in Wren-Lewis (2004), 0.8 in Reserve Bank of New Zealand (2007), 0.5 to 1.1 in Chen and Rogoff (2003), and 0.4 in Brooks, Edison, and Vitek (2008).¹³

¹² A value of 1 would be the most often used calibration for this parameter in the literature. However, some studies have used values between 2 and 3.

¹³ Using the terms of trade rather than commodity prices, MacDonald (2001), reports an elasticity of 1.85.

43. **Several factors suggest that assuming elasticities toward the top of the simulated range would likely be prudent.** In the simulation analysis, three key factors drive the magnitude of the elasticity and considering each in turn provides some guidance.

- First, if rising commodity prices are growth driven, the location of the growth is important, both in terms of sectors within countries and across countries. The more balanced is the growth across sectors within countries, the larger will be the elasticity, and the more growth is concentrated outside of New Zealand, the larger will be the elasticity. In New Zealand's major trading partners, productivity growth has been faster in tradable goods than in nontradable goods which argues for elasticities lower than the top of the range.

However, productivity growth has generally been faster outside of New Zealand, which argues for an elasticity toward the top of the range.

Average Annual Labor Productivity Growth 1995 to 2004					
	New Zealand	Australia	Emerging Asia	United States	Rest of World ¹
Tradables	2.6	2.9	6.5	3.5	3.2
Nontradables	0.7	1.5	2.6	2.0	0.5

Source: Fund staff calculations.

¹ The Euro Area, the United Kingdom, and Japan are used to proxy the rest of the world.

- Second, the easier it is for New Zealanders to substitute toward foreign produced manufactures, the lower will be the elasticity. The quickening pace of globalization has likely made it easier to substitute toward foreign-produced goods, which argues for an elasticity below the upper end of the simulated range.
- Third, if negative supply shocks are driving the rising commodity prices, the elasticity will be toward the top of the range provided it is not affecting New Zealand as well.

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Appendix: Brief Overview of GEM

44. **GEM is a multi-region, multiple-good model of the world economy that is derived completely from optimizing foundations.**¹⁴ 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 either non-energy commodities or land to maximize the net income from goods production. Governments consume goods financed through non-distorting taxes and adjust short-term nominal interest rates to provide nominal anchors.

Households

45. **Households are infinitely lived, consume goods, and 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. Because of adjustment costs in wage contracts, aggregate nominal rigidities arise through wage bargaining. Households own all domestic firms, the domestic capital stock, and the land, which they rent to domestic firms. The markets for capital and land are competitive. Capital accumulation is subject to adjustment costs that contribute to gradual economic adjustment. The supply of land is fixed.

Firms

46. **Firms produce three types of goods: a nontradable good; a tradable non-commodity 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.

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

$$Y = f(A, K, L, Q_C, M_C), \tag{1}$$

where Y denotes the output of the non-commodity tradable good and the nontradable good, A denotes the level of productivity, K is the capital input, L is the labor input, Q_C is the

¹⁴ For a detailed descriptions of GEM's structure and dynamic adjustment properties see Laxton and Pesenti (2003) and Hunt and Rebucci (2005).

domestically produced commodity input, and M_C is the imported commodity input. The production technology, f , embodies constant elasticity of substitution. For this application, non-commodities goods production is calibrated to be Cobb Douglas. Producers have a very high elasticity of substitution between imported and domestically produced commodities (10) capturing the notion of a single world market for commodities.

48. **Commodities are produced combining capital, labor, and a fixed factor, land.** The production technology is given by:

$$Q_C = f(A, K, L, Land), \quad (2)$$

where Q_C is domestically produced commodities, A denotes the level of productivity, K represents the capital input, L denotes the labor input, and $Land$ is the fixed factor. The production technology, f , embodies constant elasticity of substitution. For this application, $Land$ is calibrated to be the most important input into commodities production and the elasticity of substitution among land, labor, and capital is low (0.6).

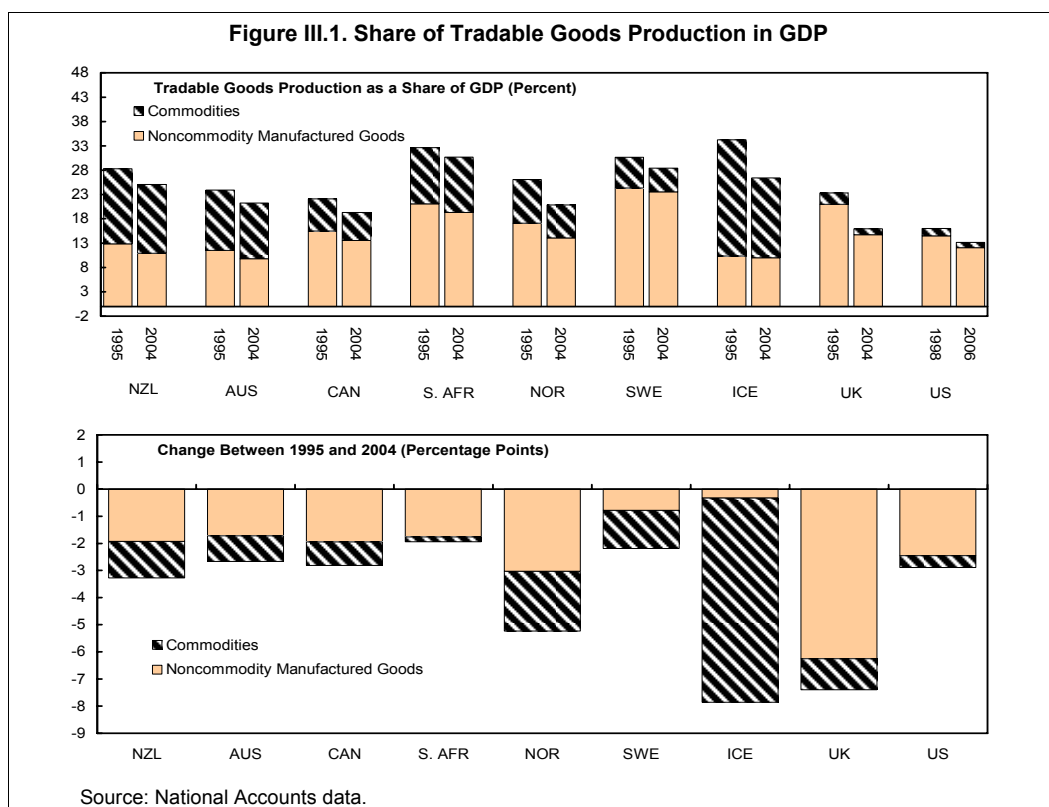
Government

49. **Government spending falls exclusively on non-tradable goods.** Government spending is financed through a non-distorting tax. The government controls the national short-term nominal interest rate with the objective of providing a nominal anchor for the economy. The nominal anchors in New Zealand, Australia, the United States and the rest of the world are inflation rates. For emerging Asia, the nominal anchor is stability in the nominal exchange rate between the Asian currency and the U.S. dollar.

III. THE DECLINING IMPORTANCE OF TRADABLE GOODS MANUFACTURING: HOW MUCH CAN GROWTH THEORY EXPLAIN?¹⁵

A. Introduction

50. New Zealand, like most industrial countries, has been experiencing a decline in the relative importance of tradable goods production. Based on a 3-year moving average, goods production as a share of New Zealand GDP declined by $3\frac{1}{4}$ percentage points between 1995 and 2004, from roughly $28\frac{1}{4}$ percent to 25 percent.¹⁶ Although this decline is toward the high side when compared to some other industrial countries (bottom panel in Figure III.1), the decline in the non-commodity based manufactured goods is quite similar to many other countries. The difference in New Zealand is largely accounted for by a slightly larger decline in the share of commodities, which was exceeded only by Norway, Sweden, and Iceland.¹⁷



¹⁵ Prepared by Ben Hunt, (Ext. 3-6361).

¹⁶ Given the year-to-year volatility in GDP shares, 3-year moving averages present a more reliable picture of the trend change. For Canada and the United States, data limitation prevented using a moving average. Further, for the United States the change is between 1998 and 2006. For Canada, Norway, the U.S., and the U.K., oil production is removed from commodities because the large increase in oil prices distorts the picture.

¹⁷ Commodities were defined to be agriculture, fishing, forestry, mining and the production of food and beverages. It was not possible to include food and beverage production in commodities for South Africa, the United Kingdom, and the United States.

51. **As laid out in Baumol (1967), the declining relative importance of goods production can arise from more rapid technological progress in the goods sector.**¹⁸ Notionally, there is more scope for adopting labor-saving technological advancements in goods production. Despite faster productivity growth in the goods sector, labor mobility between the goods and services sectors enforces nominal wage equality. The required lower real producer wage in the service sector (because of lower productivity) is achieved with a rising relative price of services and, therefore, an increase in the share of services in output. Globalization is the open economy extension of Baumol, further driving down the relative price of tradable manufactured goods. In this note, simulations with the IMF's Global Economy Model (GEM) are used to estimate how much of the historical decline in goods production in New Zealand can be accounted for by differing rates of productivity growth between the goods and services sectors in New Zealand and its major trading partners.

52. **The simulation analysis suggest that faster tradable sector productivity growth in New Zealand and its major trading partners accounts for a large portion of the relative decline in tradable goods production.** Simulating GEM over a ten-year period incorporating the productivity gap between the tradable and nontradable sectors seen between 1995 and 2004 results in a decline in tradables production in New Zealand of close to 3 percent, just under the 3.3 percent seen historically. Roughly 2/3 of the decline is accounted for by manufactured goods with the remainder accounted for by commodities.

B. GEM and the Simulation Experiment

53. **GEM is a multi-region, multiple-good model of the world economy that is derived completely from optimizing foundations.**¹⁹ The version of the model used here has been configured with three types of goods: a nontradable good; a tradable non-commodity good (manufactures); and a tradable commodity good (commodities). Because the model is derived from optimizing foundations, changes in the relative importance of each good will be driven by technology and tastes. The model has been calibrated to represent five regions: New Zealand; Australia; the United States; Emerging Asia; and the rest of the world.

54. **Over the 1995 to 2004 period, productivity growth has been faster in the tradables sector than in nontradables, and fastest in Emerging Asia.** The annual growth in labor productivity in the tradables and nontradables sectors for select countries and regions

¹⁸ Other theories advance to explain the relative decline in the importance of tradable goods production are specialization (which leads to outsourcing and thus reclassification of activities previously performed in-house by manufactures) and changing consumer preferences as income rises.

¹⁹ For a detailed descriptions of GEM's structure and dynamic adjustment properties see Laxton and Pesenti (2003) and Hunt and Rebucci (2005).

are in graphed in Figure III.2 and summarized in Table III.1.²⁰ In all countries/regions, tradable sector productivity has exceeded that in the non-traded sector by roughly 1½ to 4 percentage points. The smallest gap being in the United States and the largest in emerging Asia, with New Zealand and Australia having gaps close to that in the United States.

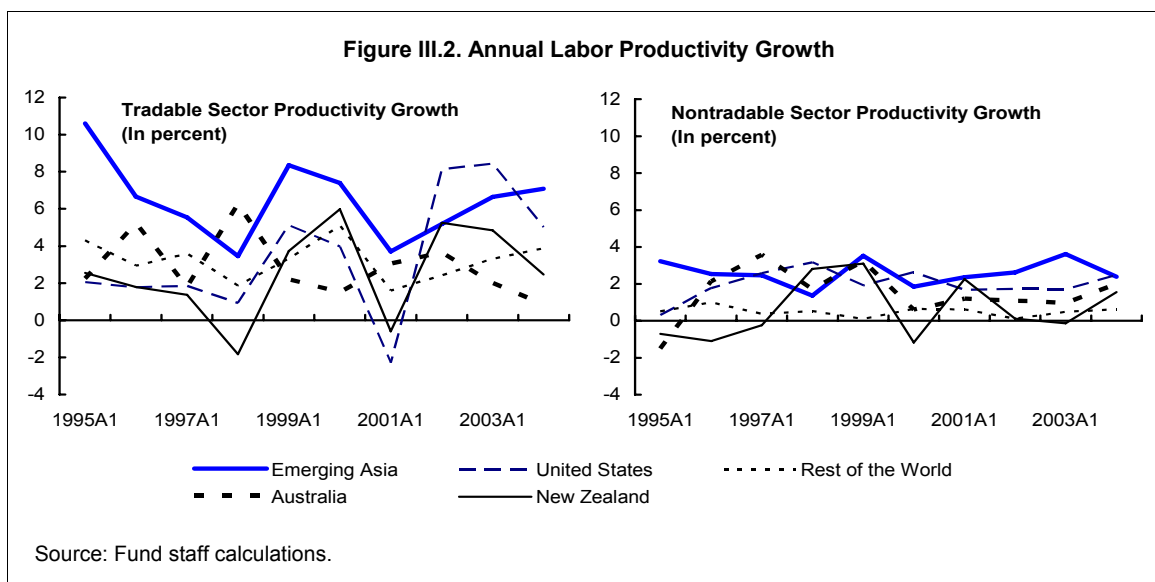


Table III.1: Average Annual Labor Productivity Growth 1995 to 2004					
	New Zealand	Australia	Emerging Asia	United States	Rest of World ¹
Tradables	2.6	2.9	6.5	3.5	3.2
Nontradables	0.7	1.5	2.6	2.0	0.5
Productivity Gap	1.90	1.4	3.9	1.5	2.7

Source: Fund staff calculations

¹ The Euro Area, the United Kingdom, and Japan are used to proxy the rest of the world.

55. **The simulation experiment is set up to replicate the trend productivity gap between the tradable and nontradable sectors in New Zealand and its major trading partners over the 1995 to 2004 period.** It is assumed that the productivity growth gap exists equally in the commodities and manufactures tradable sectors. Ideally the shock would be implemented by matching the actual historical gaps between non-tradables and each of the

²⁰ The computations are derived using the database maintained in the IMF's Research Department to support the assessment of real effective exchange rates.

two tradable goods in the model. However, the available data does not split the tradable goods sector into these two components.²¹

C. Simulation Results

56. **The declines in the shares of tradable goods resulting from the tradable sector productivity gap simulation broadly match the data.** The simulation results for New Zealand, Australia and the United States are presented in Table III.2. In terms of the total decline in the share of tradable goods in GDP, the simulation results match the data surprisingly well for both New Zealand and Australia. In the cases of New Zealand and Australia, the simulated declines are just slightly below what occurred, while for the United States, the simulated decline is only about 75 percent of the decline in the data. This could reflect the fact that the region configuration used here does not adequately capture the trading relationships of most importance for the United States, for example that with Canada.

Table III.2: Change Over Ten Years in Share of GDP (In Percent)						
	New Zealand		Australia		United States¹	
	Simulated	Actual	Simulated	Actual	Simulated	Actual
Manufactures	-1.9	-1.9	-1.3	-1.7	-2.0	-2.5
Commodities	-1.0	-1.4	-0.9	-1.0	-0.1	-0.4
Total	-2.9	-3.3	-2.2	-2.7	-2.1	-2.9
Sources: GEM simulations and Fund staff calculations						
¹ Due to data limitations, the calculations for the United States are not based 3-year moving average but rather the decline between 1998 and 2006.						

57. **Looking at the 2004 to 2007 period, unbalanced growth can explain only about half of the estimated decline in the share of tradable goods production in New Zealand GDP.** Using real volumes and computing nominal shares with slightly imperfect deflators suggests that tradable goods production relative to GDP in New Zealand declined by 1.9 percentage points over the 2004 to 2007 period. Commodities production declined by roughly 0.8 percentage points, with manufactures declining by 1.1 percentage points. Extending the simulation for an additional three years and assuming that the relative gaps in productivity growth were identical to those over the 1995 to 2004 period results in a

²¹ The shock is implemented assuming that people must learn about the persistence in productivity growth. When agents have perfect foresight under long-lived shocks that have significant implications for wealth, rational expectations models, like GEM, can produce adjustment dynamics unlike that seen in actual data. To address this and generate closer-to-real-world adjustment dynamics, the shock is implemented assuming that each period, agents must generate forecasts of the persistence in productivity growth. Here the learning is calibrated so that agents initially learn slowly about the persistence. However, as the duration of the shock increases, agents start to learn more quickly. See Hunt (2007) for a description of the uncertainty framework and an illustration of the speed of learning.

simulated decline in tradable goods production as a share of GDP of 0.9 percentage points. Roughly 1/3 of this occurs in commodities with the remaining 2/3 coming in manufactures. Because the time period is quite short and the data is estimated, this difference should be interpreted cautiously. However, this result does suggest that the experience in the last three years is beyond what unbalanced growth can explain. Time will tell if this is simply short-term volatility, potentially reflecting the impact of competitive pressures on margins, or a more permanent decline resulting from the temporarily elevated exchange rate.

D. Conclusions

58. GEM simulations suggest that unbalanced growth can explain much of the relative decline in the share of tradable goods in GDP in New Zealand, Australia and the United States over the 1995 to 2004 period. Simulations incorporating the historical gap between productivity growth in the tradables and non-tradable sectors lead to declines in the relative share of tradable goods broadly matching the declines contained in the data. However, there are some differences that arise in the decomposition of the declines into their commodities and manufactures components. These differences should not be surprising as they likely reflect the fact that other macroeconomic shocks, not considered in this analysis, have undoubtedly had important effects over the sample period examined.

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