

**People's Republic of China—Hong Kong Special Administrative Region:
Selected Issues**

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PEOPLE'S REPUBLIC OF CHINA—
HONG KONG SPECIAL ADMINISTRATIVE REGION

Selected Issues

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Approved by the Asia and Pacific Department

April 25, 2003

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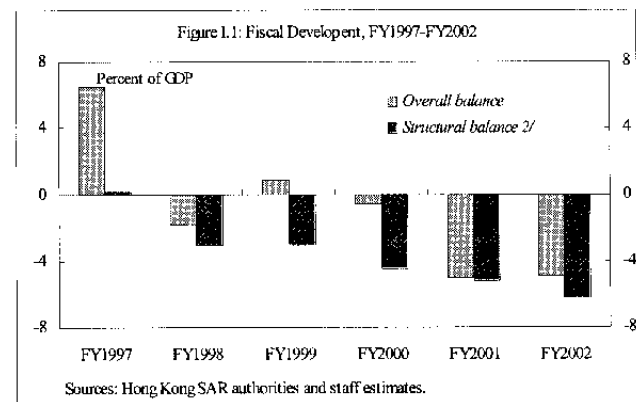
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I. FISCAL OUTLOOK AND POLICY OPTIONS IN HONG KONG SAR¹

A. Introduction

1. **Fiscal policy in Hong Kong SAR has traditionally been conservative.** The fiscal balance had remained in surplus between FY1985 and FY1997, resulting in an accumulated fiscal reserve of about 35 percent of GDP in FY1997. In addition, fiscal policy had not been used as a countercyclical tool before the Asian crisis.

2. **However, the fiscal position has gradually deteriorated since FY1998.** A cyclical rise in the budget deficit has been combined with a structural weakening of the fiscal position, leading to consolidated deficits of 5 percent of GDP in FY2001 and 5½ percent of GDP in FY2002. In February 2002, a government Task Force on Public Finances found rising structural deficits in recent years primarily owing to (1) lower revenues from land sales and taxes, (2) falling investment income, and (3) the government expenditure deflator rising faster than the general price level. The report noted that operating account had been in deficit since FY1998. Furthermore, without the investment income, the operating deficits since FY1998 would have been much larger (Table I.1). IMF staff estimates also indicate that substantial structural deficits have emerged, increasing from 5½ percent of GDP in FY2001 to 6½ percent in FY2002.²



	FY1991	FY1992	FY1993	FY1994	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001
Operating Balance after investment income	4.2	4.4	4.8	4.0	2.7	2.9	3.3	-0.1	-0.1	-1.2	-3.9
Investment Income	0.4	0.2	0.4	0.5	0.6	0.4	1.1	2.5	3.0	1.6	0.0
Operating Balance before investment income	3.8	4.2	4.4	3.5	2.1	2.5	2.2	-2.6	-3.1	-2.8	-4.0

Source: Data provided by the authorities.

¹ Prepared by Hong Liang.

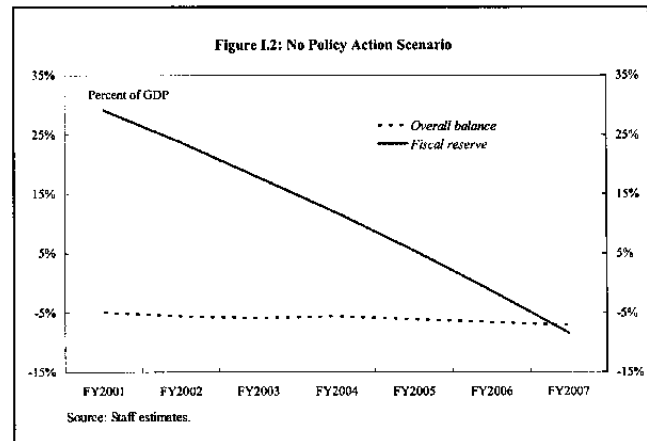
² The structural balance is used to measure the impact of discretionary fiscal policy on domestic demand. The IMF's definition excludes asset-related transactions, land premium, investment income, privatization receipts, equity injections, and the impact of cyclical fluctuations.

3. **This chapter aims to:**

- Provide indicative estimates of how revenue and expenditure might evolve in the next five years under two fiscal consolidation scenarios with a different mix of revenue/expenditure measures to bring the fiscal position to balance by FY2006.
- Examine different revenue raising measures in light of the findings by the Advisory Committee on new Broad-Based Taxes.
- Discuss features of major government expenditure components (civil service pay, education, health, and welfare) with comparative perspectives, highlighting their rapid growth in both nominal and real terms in recent years.
- Offer some thoughts on areas where potential expenditure savings could be made.

B. Medium-term Fiscal Outlook

4. **The findings of the Task Force on Public Finances illustrate the precarious fiscal situation in Hong Kong SAR in the medium term.** The budget model developed by the Task Force takes into account the prevailing government expenditure and revenue developments, notably that government expenditure has been growing faster than nominal GDP, and the likely impact arising from the consolidation of property market and ageing population. It concluded that, without corrective measures, continued sizable deficits in the range of 4–5 percent of GDP per annum are projected in the medium term, leading to a depletion of fiscal reserves at latest by FY2008, followed by a rising debt burden.³ IMF staff projections indicate that, in the absence of specific measures, the fiscal reserves could be depleted as early as FY2006 owing to higher projected deficits in FY2002 and FY2003 compared with the Task Force (Figure I.2).



5. **The government announced in the FY2002 Budget its intention to return to a balanced budget by FY2006.** In the FY2003 budget, the government reaffirmed this objective, and proposed to achieve fiscal consolidation through a three-pronged approach based on cutting expenditures, increasing tax rates and boosting economic growth.

³ The portion of fiscal reserves in foreign currencies are included in the official foreign exchange reserves in Hong Kong SAR.

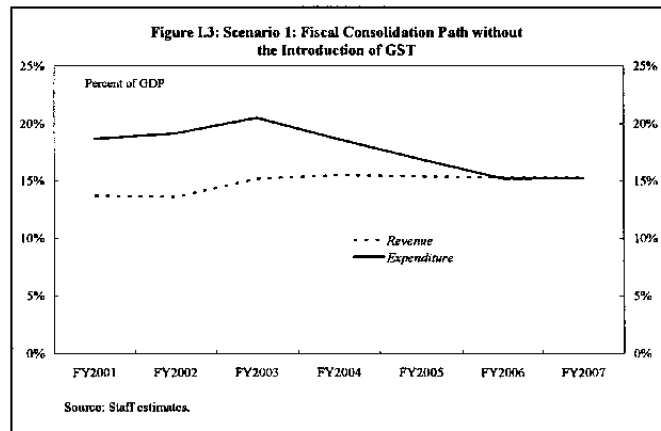
6. Two scenarios are developed by the staff to illustrate the implications of a different expenditure and revenue mix to achieve the targeted fiscal consolidation in the medium-term.

Basic Assumptions⁴

- In both scenarios, real GDP growth is assumed at 2.2 percent in 2003, gradually returning to its potential of 3.5 percent in the medium term. Deflation is projected to continue at 2 percent in 2003, and gradually dissipate by FY2006.
- On the revenue side, all recurrent revenue items (except investment income) are assumed to grow at the same rate as nominal GDP, and capital revenues (including land premium) are assumed to be 2.8 percent of nominal GDP annually, in line with their historical averages before the mid-1990s. A nominal rate of return of 5 percent is assumed for investment income on fiscal reserves.
- On the expenditure side, the government expenditure deflator is assumed to grow at the same rate as nominal GDP after FY2006 when a balance budget is achieved, and social security expenditure is projected to grow in line with the long term population projections.⁵

Path of Fiscal Consolidation

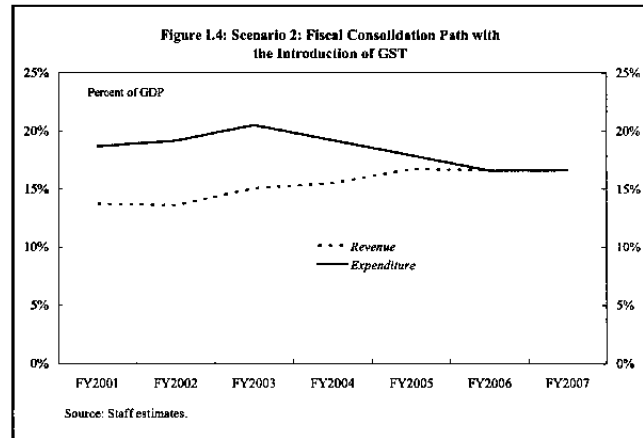
- In both scenarios, a modest fiscal consolidation of 0.2 percent of GDP is projected in FY2003 as envisaged in the FY2003 budget. In addition, the proposed revenue measures, mainly increases in rates of profits and salaries taxes, are expected to yield a total of HK\$14 billion additional revenues implemented over the period of FY2003 and FY2005.



⁴ The details for the key parameters of staff's projections are set out in Annex. It should be noted that the medium-term projections are based on a partial equilibrium and should be viewed more as illustrations of the plausible future fiscal path rather than as firm results.

⁵ The revenue and expenditure parameters are largely drawn from the assumptions in the budget model in the Final Report of the Task Force on Review of Public Finances, Hong Kong SAR, February 2002.

- In Scenario 1, no further revenue measures are introduced after FY2003. As a result, an expenditure cut (other than social security expenditure) of 9 percent per annum for three years will be needed in order to reach a balanced budget by FY2006. This implies a revenue/expenditure to GDP ratio of 15 percent in the long run. In this scenario, revenue efforts provide about 20 percent of the required fiscal adjustment of 5–6 percent of GDP.
- In Scenario 2, a Goods and Services Tax (GST) of 3 percent is assumed to be introduced in FY2005, with a projected revenue yield of 1.4 percent of GDP. Consequently, expenditure (other than social security expenditure) will only need to be cut by 5.7 percent per annum between FY2004 and FY2006, resulting in an expenditure to GDP ratio of 16.5 percent in the long run. In this scenario, revenue efforts contribute about 45 percent of the required fiscal adjustment.



7. **The two fiscal consolidation scenarios illustrate that government expenditures as a percent of GDP are in need of significant adjustment if Hong Kong SAR intends to maintain its tradition of having low taxes.** In the absence of significant new revenue measures besides the GST, and assuming property and stock-related revenues as a percent of GDP returning to their pre-1990 levels, total government expenditure to GDP ratio would need to be cut from its current level of near 20 percent to 16–17 percent by FY2006 to balance the budget. If a GST were not introduced, the expenditure to GDP ratio would need to fall to around 15 percent.

C. Revenue Structure

8. **Notable features of Hong Kong SAR's revenue structure are:** (1) the tax burden is low (9 percent of GDP) and the tax system is simple; (2) the tax base is narrow, with no general consumption taxes nor any duty on imports, and a majority of the working population is outside the tax net; (3) nontax revenues account for half of total revenue, mainly from proceeds of land sales and investment income.

Table I.2. Revenue Structure							
(as percent of total government revenue unless otherwise indicated)							
	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001
Taxes	67.0	67.1	56.3	53.3	47.9	56.1	71.2
<i>of which: Stamp duties</i>	6.2	9.8	10.3	4.7	5.2	4.8	4.9
Non-tax revenue	18.1	16.4	22.0	25.5	19.5	20.7	17.9
Investment income	3.3	2.7	5.3	14.6	15.8	8.7	0.2
Land premium	10.8	13.0	22.6	8.9	14.9	13.1	5.9
<i>Memo:</i>							
Total revenue as percent of GDP	16.4	17.2	20.9	16.9	18.7	17.5	13.7

Sources: Data provided by the authorities, and staff estimates.

9. **The heavy reliance on asset-related revenue makes Hong Kong SAR's revenue system highly volatile and procyclical.** Total fiscal revenues averaged 17 percent of GDP between FY1990 and FY2002, with a standard deviation of 2 percent. Land revenue and stamp duties are the most volatile revenue components, and are closely correlated with movements in property and stock prices. Moreover, investment income on the government's asset holdings with the Exchange Fund has become another major contributor to the volatility of fiscal revenues in recent years. Without the investment income, the fiscal deficits since FY1998 would have been much larger.

10. **The Advisory Committee on New Broad-Based Taxes concluded in its report in 2002 that a low-rated GST is the best option for Hong Kong SAR to broaden its tax base among different tax measures.** A 3 percent GST is estimated to yield around \$18 billion (1.4 percent of GDP in 2001) additional revenue annually. However, implementation of a GST in Hong Kong SAR may take two to three years of preparatory work. Administrative preparation will need to cover a wide range of tasks, such as the drafting of legislation; carrying out consultation, publicity, and education; determining and securing staffing needs; undertaking training of staff; developing systems, procedures, and forms for collection; and preparation of manuals and guidelines.⁶

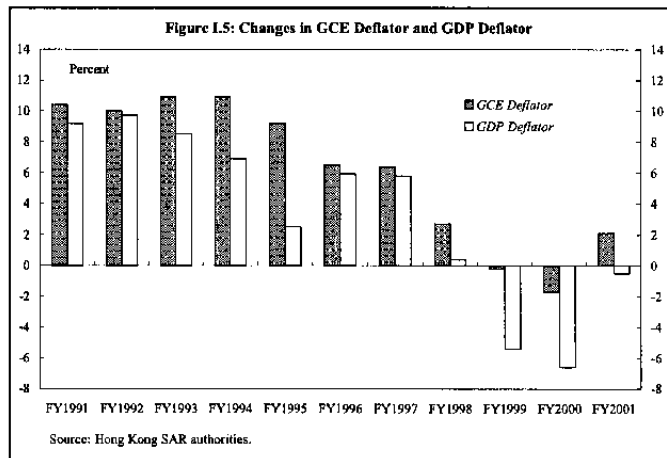
11. **To fill revenue shortfalls pending the implementation of GST, higher rates, lower personal income tax deductions and a land and sea departure tax are cited as interim options by the Advisory Committee.** The FY2003 budget set a target of raising revenue by HK\$20 billion by FY2006. Measures for raising HK\$14 billion additional revenues, mainly through increases in rates of profits and salaries taxes, have been proposed. The government

⁶ See the 2001 FAD Technical Report on Policy and Administrative Issues in Introducing a Goods and Services Tax, published with the final Report of the Advisory Committee.

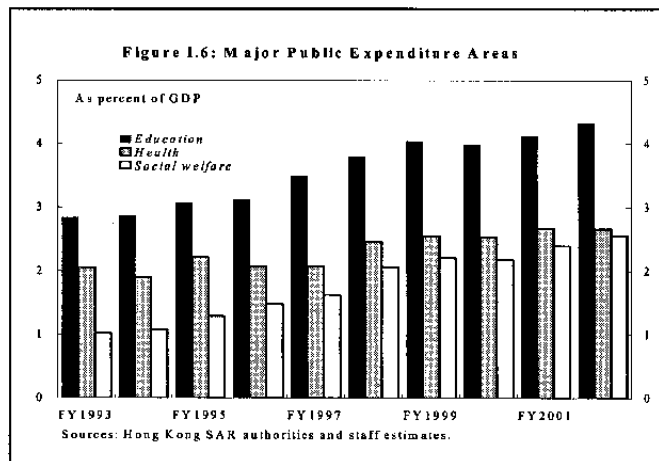
indicated that other revenue measures would be introduced in the next few years to bring an additional HK\$6 billion needed to achieve the revenue target by FY2006. They have also declared that a GST is essential for broadening the tax base and stabilizing public revenues in the long term. In view of the long lead time required for its implementation, technical preparations for a GST will have to get underway in the near future if it is to make a significant contribution to the medium term fiscal consolidation objective.

D. Government Expenditures

12. **Nominal government expenditures have persistently grown faster than nominal GDP, as prices pertaining to government spending have risen faster than the general price level in the economy.** This has resulted in an increase in the government expenditure to GDP ratio from below 15 percent in FY1990 to close to 20 percent in FY2002.⁷ One of the key factors behind the price rigidity of government expenditure is that salaries (of civil servants and employees of government funded organizations), pensions, and social security payments have not been adjusted downward in nominal terms to account for deflation.



13. **Education (21 percent of total public expenditures), health (12 percent), and welfare (12 percent) are the major areas of public expenditures.** Expenditures in all three areas have grown faster in real terms than GDP in the last few years. In particular, welfare spending has more than doubled over the past decade.



⁷ Although the Basic Law of Hong Kong SAR stipulates that the government should keep expenditure growth commensurate with the growth rate of GDP, it does not specify explicitly whether such growth should be measured in nominal or real terms.

14. **Given the heavy wage content of government expenditure, this section will first examine issues relating to civil service pay, and then discuss developments in the three major expenditure areas.** The analysis will incorporate some comparative perspectives with available data. Two indicators are frequently used to compare subcategory government expenditures internationally: these subcategory expenditures as a percentage of GDP and as a percentage of total public expenditure. It should be noted that total government expenditure as a percentage of GDP in Hong Kong SAR, currently at 20 percent, is very low by international standards. This reflects the deliberate policy of maintaining a small government in Hong Kong SAR. On average, government expenditures were more than 40 percent of GDP in OECD countries in 2001. Therefore, the notion of affordability of a particular public service in Hong Kong SAR should be analyzed within the institutional setting of a small government, not of a welfare state.

Civil Service

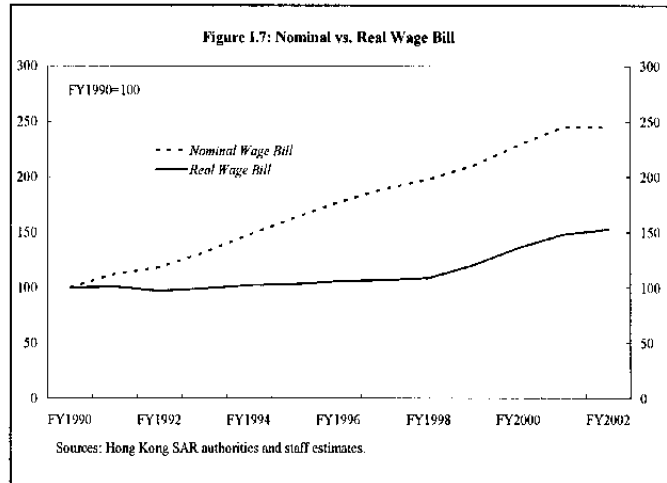
15. **The civil service in Hong Kong SAR employs about 5 percent of the labor force, with an associated wage bill of 5.5 percent of GDP in FY2001,** compared with 4.2 percent of GDP on average for high income countries, as estimated by the World Bank.⁸ However, as a percent of total government expenditure, the civil service wage bill at 30 percent is almost twice as high in Hong Kong SAR as the corresponding ratio in high income countries. In addition, personnel-related expenses account for 70 percent of government operating expenditure. Civil servants account for about half of these expenses, and the rest comprise payroll expenses to employees of government funded organizations (“subvented employees”) whose wages are linked to those of civil servants. Aside from salary payments, various benefits and allowances make up a significant portion of the remuneration package for civil servants.

16. **The civil service pay adjustment system has relied heavily on a formula-based mechanism premised upon broad comparability with the private sector in Hong Kong SAR.** However, comparability is often difficult to establish, as there is no comparable activity in the private sector for some government activities, such as the police. The last pay level survey was done in 1986, and pay trend surveys are conducted annually as a basis for annual

⁸ See World Bank’s Administrative and Civil Service Reform website (<http://www1.worldbank.org/publicsector/civilservice/>) for cross country data on government employment and wages.

civil service pay adjustment. Nominal wages continue to be adjusted upwards even with the overall economy experiencing persistent deflation.⁹ As a result, the wage bill has grown by 11 percent per annum in real terms since FY1998.¹⁰

17. **Generally, civil service remuneration packages compare favorably with those in the private sector.** The average government to private sector wage ratio stood at 3.3 in 2002, compared with an East Asia average of 2.9.¹¹ However, the economic downturn since 1997 has brought to the forefront the issue of perceived pay disparities between the civil service and the private sector.¹² While the median earnings (including bonus) for all industries grew at an average rate of 0.8 percent in nominal terms between FY1997 and FY2001, the annual nominal increase in the civil service wage bill was 6.9 percent during the same period. A pay level survey conducted in 1999 on starting salaries resulted in the downward adjustment of starting pay, in the range of 6–31 percent, for the majority grades of civil service.



18. **To address the concerns on the current annual pay adjustment mechanism, a task force was set up in early 2002 to conduct a comprehensive review of the pay policy and system for the civil service.** An analytical study was carried out on the latest developments in civil service pay administration in five countries (namely Australia, Canada,

⁹ The assumption of a 4.75 percent cut in civil service pay in the FY2002 budget met with strong opposition and was only implemented half-way.

¹⁰ The government wage bill in this chapter refers to total government personnel-related expenses. The composite CPI series is used to derive the real growth rates of various public expenditures in this study to estimate the extent to which public expenditures have grown faster than the overall economy.

¹¹ This ratio is estimated using the median earnings (including bonus) for all industries and the average salary of a civil servant, derived by dividing the total civil service wage bill by the size of the civil service establishment.

¹² A study commissioned by the Hong Kong SAR General Chamber of Commerce found in February 2003 that pay for government employees is 17 percent higher than average pay for employees in the business sector. When the cost of benefits are added (even excluding housing and education), the gap widens to 40 percent.

New Zealand, Singapore, and the United Kingdom).¹³ Among its findings on common trends in pay policy in the five surveyed countries, the study points out that affordability within budget constraints has become a dominant consideration with correspondingly less importance given to formal pay comparability with the private sector. In addition, a clean wage policy that consolidates various benefits and allowances with base salaries has been a common feature in the surveyed countries, as it provides administrative cost savings, reduced opportunities for abuse, and greater spending flexibility for staff.

19. **The task force in its Phase One Final Report recommended that:** (1) in the short run, priority be given to conduct a pay-level survey, and appropriate interim measures be adopted for the annual civil service pay adjustment pending the outcome of the pay level review; and (2) performance pay and flexible pay ranges, decentralization of pay administration, and a clean wage policy should be introduced in the medium- to long-term. In February 2003, the government announced its decision to reduce the salary of civil servants to the level in cash terms as at end-June 1997. In addition, the government intends to implement a number of improvements to the pay adjustment system for the civil service, including completing a new pay level survey by 2004.

Education, Health and Welfare Spending

Education

20. **Education spending, the largest expenditure component in the budget, has grown by more than 7 percent annually in real terms since FY1996,** compared to average real GDP growth of about 2.7 percent. The entire education system in Hong Kong SAR from primary school to university is basically financed by the government, but each school has considerable flexibility and autonomy in managing its own operations and resources. There is universal attendance from age six to 15 (dropout is minimal by international standards), and upper secondary and tertiary education are highly subsidized.

21. **As to the distribution of resources among different levels of education, Hong Kong SAR's pattern differs considerably from that in other countries.** In developed countries, resources tend to be more evenly distributed among students at all levels. Although the spending on higher education students is usually more than on primary or secondary school children, the gap is relatively small. The disparity between government spending on higher education and on basic education is significant in Hong Kong SAR. The low level of funding for primary schools is particularly noticeable. Per pupil spending by the government for primary education in Hong Kong SAR is about 60 percent of the OECD average.

¹³ The study was to cover the following five areas: (1) the pay policies, pay system, and pay structure; (2) the experience of replacing fixed pay scales with pay ranges, or other pay systems; (3) the pay adjustment system and mechanism; (4) the experience of introducing performance-based rewards to better motivate staff; and (5) the experience on simplification and decentralization of pay administration.

22. **Hong Kong SAR spends one third of its education expenditure at tertiary level.** Apart from some post-secondary and vocational programs, the enrollment rate for government funded universities was only 17 percent of the relevant age group in 2001, compared with over 50 percent in most OECD countries. Some residents have chosen to study abroad, in part owing to the intense competition for places in local tertiary education institutions. The low enrolment rate for higher education has permitted the government to maintain high-cost institutions and charge low fees. Per student expenditure in government-funded universities was about US\$26,000 in 1999, almost two times higher than the OECD average. Students on average contribute another US\$4,000 a year in fees and charges.

Table I.3. Expenditures by Level of Education Per Student (1999, in equivalent U.S. dollars converted using PPPs)					
	Hong Kong SAR	OECD average	U.S.	Korea	Japan
Primary Education					
spending per student (US\$)	2,502	4,148	6,982	2,838	5,240
spending per student to GDP per capita ratio (in percent)	10.3	19.0	20.0	21.0	21.0
Secondary Education					
spending per student (US\$)	4,307	5,465	8,157	3,208	5,612
spending per student to GDP per capita ratio (in percent)	17.7	23.0	24.0	24.0	23.0
Tertiary Education					
spending per student (US\$)	26,161	9,210	19,220	5,356	10,278
spending per student to GDP per capita ratio (in percent)	107.6	44.0	57.0	39.0	41.0
Sources: OECD (2002) and staff estimates.					

23. **Salaries constitute the largest part of recurrent expenditures on education.** More than 80 percent of expenditure at schools went to recurrent expenditure, which is basically teachers' salaries. Again, the disparity between higher education and primary education is significant.¹⁴ The average remuneration package for college professors in Hong Kong SAR is one of the most expensive in the world. It is about 11 times per capita GDP and five times as high as those for secondary school teachers. In addition, remuneration packages are equalized across different academic fields.

24. **The need for Hong Kong SAR to upgrade the skill level of its labor force will pose new demands on educational spending in the near term.** For example, if the current unit cost for higher education is maintained, doubling the current university enrollment rate to 34 percent would imply additional educational spending of HK\$13 billion (1.1 percent of

¹⁴ Less than 50 percent of teachers in government and aided primary schools and 80 percent in secondary schools were university graduates with a degree in FY2001.

GDP). Furthermore, to increase the percentage of college-degree holders among primary and secondary teachers, as set out by the government, would also have significant budgetary implications.

Health Care

25. **Health care expenditures, the third largest spending item in the government budget, have grown by more than 6 percent annually in real terms since FY1996**, partly because of the ageing of the population.¹⁵ As a percent of GDP and as a percent of total government expenditure, health care spending in Hong Kong SAR is not high by OECD standards. However, based on current population trends, public health spending is projected to double by 2015 and may account for up to 20–22 percent of total government expenditure.¹⁶

26. **Fees in public hospitals and clinics are heavily subsidized in Hong Kong SAR, and have not risen in line with costs.** The fee structure is uniform irrespective of the ability to pay by individual patient, but fees may be reduced or waived in cases of financial hardship. The government finances 97 percent of inpatient costs and 93 percent of outpatient expenses in public health care facilities. In total, user fees paid by patients finance less than 5 percent of public health expenditures.

Welfare Spending

27. **Welfare spending has grown rapidly in the last decade**, reflecting rising cash and housing assistance to the elderly, immigrants from the Mainland of China, and the unemployed. The number of recipients of the Comprehensive Social Security Assistance (CSSA) has grown progressively since the program's introduction in 1993, and nominal payments have not been adjusted in line with deflation over the past four years. There are concerns that the benefit levels have become increasingly attractive vis-à-vis the relatively slow growth in wages.

¹⁵ Traditionally, housing has been an important public spending item, but is not included in social spending in this paper.

¹⁶ See "Improving Hong Kong SAR's Health Care System: Why and For Whom?" Harvard Consultancy Report, 1999, Health and Welfare Bureau, Hong Kong SAR.

Table I.4. Estimated CSSA Expenditure by Type of Case (HK\$m): FY1995–FY2000							
	Old Age	Disability/Ill Health	Single Parent Family	Low Earnings	Unemployment	Others	Total
FY1995	2,705	952	609	97	237	232	4,831
FY1996	3,592	1,376	1,041	207	535	378	7,128
FY1997	4,570	1,784	1,482	340	784	482	9,441
FY1998	6,124	2,280	2,345	573	1,537	169	13,029
FY1999	7,030	1,957	2,317	624	1,495	200	13,623
FY2000	7,211	1,975	2,274	649	1,250	201	13,560
FY2001	7,538	2,104	2,476	671	1,420	195	14,405
FY2002	7,868	2,286	2,839	754	2,178	205	16,131

Sources: Data provided by the Hong Kong SAR authorities.

Options for Controlling Expenditures

28. **Affordability to pay within the budget constraint has become a dominant consideration for many governments in industrial countries when allocating public resources among different policy areas.** Although there are no available economic theories that can lay out optimal public resource allocations, experiences in other industrial countries can be helpful in identifying potential areas for expenditure cuts and rationalizations.

29. **The FY2003 budget has set the target for expenditure reductions by FY2006 at HK\$20 billion,** which would amount to a 10 percent reduction in total expenditures. In the FY2003 budget, the government has identified a number of areas for expenditure reductions. Further efforts may be required in these and other areas to achieve the targeted expenditure cuts.

- **Recent developments in civil service pay, in particular compared with the private sector, and the changing economic situation in Hong Kong SAR highlight the need for reform.** It is generally acknowledged that a good civil service pay system helps attract and retain talent and reduce corruption. However, the public sector wage bill, which accounts for a substantial share of operating expenditures, may have to be reduced significantly to achieve the targeted fiscal consolidation. The FY2003 budget has proposed a 6 percent cut in the public sector wage bill, and a 10 percent cut in the size of the civil service workforce. These measures are expected to yield HK\$12 billion savings. The government should also consider de-linking the pay system for the employees in the government funded organizations from that of the

civil service to reduce wage rigidity in the public sector. Moreover, completing the pay level survey expeditiously would help facilitate the process of further rationalizing civil servants' compensation.

- **Given the weak fiscal position, a major change in the structure of educational finance is called for in order to improve the quality of basic education and expand higher education.** Areas of improvement could include: (1) adjusting the distribution of spending among different levels of education with more resources allocated towards basic education; (2) promoting private provision of education service; (3) experimenting with a voucher system; (4) increasing fee charges substantially for tertiary education; and (5) recruiting more tuition students from the Mainland of China at the university level (i.e., export of education services). Further, although the quality of education is difficult to assess, especially at the university level, the high per student spending warrants further review of the pay system for university professors. Teacher salaries should be de-linked from civil service pay, and be aligned more closely with international norms.
- **Greater burden sharing with the private sector is needed to keep the government's share of health expenditure steady at its current level of 2½ percent of GDP.** This could be achieved through higher user fees, introducing means-testing, and encouraging more private insurance. Also, given the relative higher quality of health care services in Hong Kong SAR, the newly rich from the Mainland of China could be attracted to come and use the health care services (i.e., export of health care services). The government has already taken a number of steps in these areas. They have also commissioned a comprehensive review of the existing fee structure in the public health care sector with the objective of better targeting and prioritizing finite public subsidies to the most needy.
- **Some adjustments in the CSSA program appear warranted if the spiraling welfare budget is to be controlled.** The FY2003 budget proposed a 11.1 percent reduction in welfare benefits. The government has also taken initiatives to encourage capable CSSA recipients to become self-reliant. However, some restructuring of this program, such as reducing the length and replacement ratio of benefits for able-bodied individuals, may be needed to mitigate disincentive effects that could dissuade them from actively seeking re-employment and that may have contributed to rising long-term unemployment.

E. Conclusions

30. **During the last decade, Hong Kong SAR has undergone a tremendous change in its public finances.** On the one hand, the scale, expenditure, and outcome of its provision of social services have improved significantly. Housing, medical, educational, and social welfare

services have gradually become a vital part of the social fabric. On the other hand, Hong Kong SAR's narrow tax base and its heavy reliance on asset-related revenues have constrained the government's ability to finance its recurrent expenditures, especially during an economic downturn.

31. **Fiscal policy in Hong Kong SAR has reached a critical stage.** The mounting deficits have already raised concerns in international and local markets. Therefore, concrete and credible measures to rein in the deficits are crucial for the long-term sustainability of the public finances, and for the stability of the linked exchange rate system. The medium-term fiscal consolidation program in Hong Kong SAR has to strike a balance between the need to provide comprehensive social services to its citizens and its tradition of limiting the size and role of the government in economic and social affairs. If Hong Kong SAR wants to maintain a small government by keeping its current revenue system, major reforms are needed in the areas of civil service and social services (education, health, and welfare) to bring the government expenditure to GDP ratio back to the 16–17 percent range. On the other hand, taxes would have to be raised significantly if the current level and coverage of social services were to be maintained, or even expanded.

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Table I.5. Assumptions for Medium-Term Projections

Basic Assumptions:					
	FY2003	FY2004	FY2005	FY2006	FY2007
	(in percent)				
Real GDP Growth	2.2	3.1	3.4	3.8	3.5
CPI inflation	-2.0	-1.4	-0.7	-0.1	0.0
GDP deflator	-1.9	-1.0	-0.7	-0.2	-0.2
Demographic Parameters	Based on <i>Hong Kong SAR Population Projections 2000–2029 and the 2001 Population Census</i>				
	<u>FY2004–FY2007</u>				
Recurrent revenue items	Growth rate= growth rate of nominal GDP				
Land premium 1/	2 percent of annual GDP				
Investment income	5 percent nominal return on fiscal reserves				
Other capital revenue 1/	0.8 percent of annual GDP				
Social security expenditure 1/	Growth rate=0.44*CPI*portion of population aged 65+				
No Policy Action Scenario					
	<u>FY2003–FY2007</u>				
Revenue	No revenue efforts				
Government expenditure excluding social security expenditure 1/	Growth rate=growth rate of nominal GDP+0.8 percent				
Scenario 1					
	<u>FY2003</u>	<u>FY2004</u>	<u>FY2005</u>		
Additional revenue from proposed measures in FY2003 Budget (HK\$bn)	6	13	14		
	<u>FY2004–FY2006</u>	<u>FY2007 onward</u>			
Government expenditure excluding social security expenditure (in percent)	-9.0	Growth rate=growth rate of nominal GDP			
Scenario 2					
	<u>FY2003</u>	<u>FY2004</u>	<u>FY2005</u>		
Additional revenue from proposed measures in FY2003 Budget (HK\$bn)	6	13	14		
GST (HK\$bn)			18		
	<u>FY2004–FY2006</u>	<u>FY2007 onward</u>			
Government expenditure excluding social security expenditure (in percent)	-5.7	Growth rate=growth rate of nominal GDP			

1/ Parameters are drawn from the budget model in the Final Report by the Task Force on Review of Public Finances.

II. DETERMINANTS AND PROSPECTS FOR PROPERTY PRICES IN HONG KONG SAR¹

A. Introduction

1. **The evolution of property prices has important implications for macroeconomic outcomes in Hong Kong SAR.** Property price declines, as those experienced during the past five years, have been amplified through balance-sheet effects depressing consumption and investment. On the fiscal front, government revenues from land leases have declined substantially as developers have lowered their reservation price. Finally, the decline in property prices has also contributed to the continued deflation in the region. Policy measures and discussions, then, need to build upon an assessment of the outlook for property prices in Hong Kong SAR. This paper attempts to provide such an assessment.

2. **Recovery in the property sector will depend upon both domestic and global economic conditions, as well as successful integration with the Mainland of China.** While the inventory of unsold units and vacant office and commercial space remains relatively high by Hong Kong SAR's historical standards, a strong economic recovery and the associated boost in aggregate demand could go a long way towards correcting the imbalances. On the other hand, excess property inventory could continue to pose a major problem for price recovery in a weak economy.

3. **In the near term, supply factors could contribute to reduce excess inventory in the residential market and relieve some of the downward price pressure.** Starting 2003, the supply of government subsidized housing will be scaled down drastically. Also, private construction will likely slow down. Although the possible effects of continued price convergence with the Mainland of China remain a concern, most market analysts believe that the availability of low cost housing in Shenzhen does not contribute to increased effective supply in the housing market of Hong Kong SAR. In their view, the existence of a "Hong Kong SAR premium" is justified by the region's lower crime rates, and better medical care and education services.

4. **Econometric analysis suggests that current housing prices are approximately consistent with fundamental factors; however, future prospects remain uncertain.** Results obtained using different model specifications and a variety of scenarios suggest that current prices are approximately in line with demand-side fundamentals. However, continued weaknesses in housing prices can not be ruled out unless the economic recovery strengthens significantly.

5. The rest of the chapter is structured as follows. Section B describes the macroeconomic impact of property prices in Hong Kong SAR. Section C describes recent developments in the real estate sector, focusing particularly on recent government measures aimed at stabilizing the

¹ Prepared by Jorge A. Chan-Lau.

property market. Section D presents estimates of fundamental prices in the housing sector, compares them to current prices, and projects the evolution of fundamental prices forward under different scenarios. Section E concludes.

B. Macroeconomic Implications of Changes in Property Prices

6. The macroeconomic impacts of changes in property prices in Hong Kong SAR have been quantified recently by Peng et al. (2001), who analyzed the period 1984-2000. Their results indicate that a ten percent drop in property prices reduces private consumption growth by 1 percentage point and investment growth by $\frac{1}{4}$ percentage points, after controlling for the effects of other variables including changes in GDP and asset prices. Empirical evidence also suggests that total bank lending adjusts to changes in property prices (Gerlach and Peng, 2002), supporting the existence of a “balance-sheet” or “net worth” channel through which property prices play an important role as a determinant of the demand for credit.²

7. Government revenue in Hong Kong SAR is highly dependent on property-related income through both land sales and stamp duties. The dwindling demand for housing has in turn reduced the demand for land by developers and contributed to lower land prices. Revenues from stamp duties have fallen as a result of lower property prices and reduced transaction volumes. The recent suspension of land sales announced in November 2002, while intended to redress the imbalance in property market prices, has cut off one important source of fiscal revenues just when the government faces serious challenges on the fiscal front.³

8. The stock market has been affected by the decline in property prices as real estate firms account for over 20 percent of total market capitalization. Hence, developments in the property sector affect both households and banks’ investment portfolios. In addition, market

² The “balance-sheet” or “net worth” channel view explains the relationship between asset prices and economic activity through the value of collateral: in the presence of credit market frictions, access to credit depends on the ability of the borrower to collateralize the loan, which in turn depends on current asset prices. This channel gives rise to a “financial accelerator” mechanism: declines in asset prices reduce creditworthiness, and the contraction in credit causes a fall in consumption and investment as credit contracts. Future economic activity is negatively affected, which in turn increases downward pressure on asset prices. See Kiyotaki and Moore (1997), and Bernanke et al. (1999).

³ The Selected Issues paper on fiscal policy addresses this topic in detail.

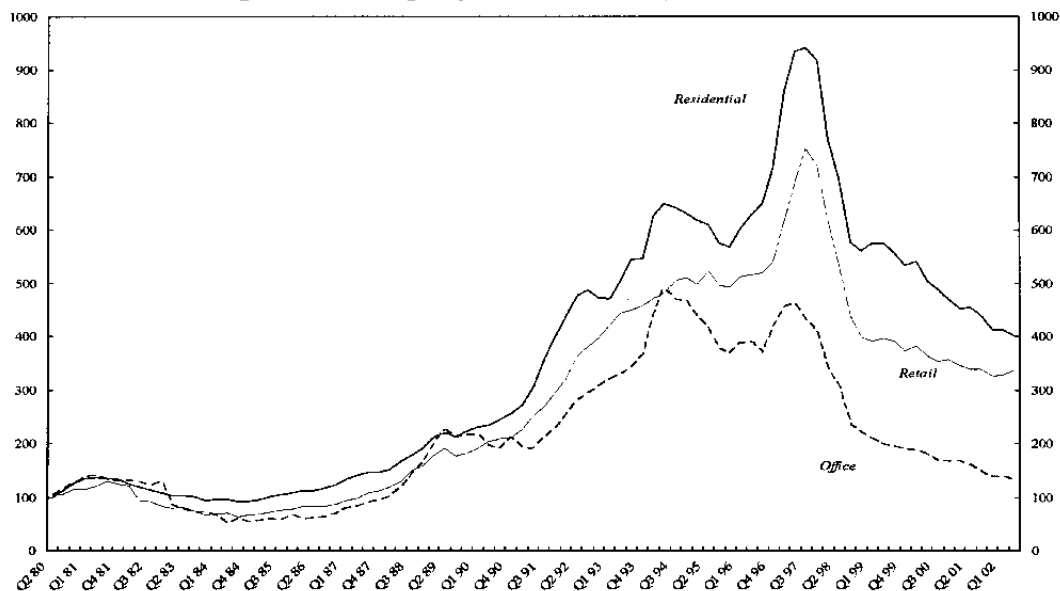
analysts have reported that the aggregate real estate exposure of the five largest Hong Kong SAR banks range from 20–40 percent of their equity base. However, it is believed that banks' earnings and equity base could withstand further property price declines in the range of 10–15 percent without a significant increase in vulnerability.⁴

9. On the other hand, the decline of property prices in Hong Kong SAR has helped to improve competitiveness. However, office occupancy costs are still high relative to other financial centers in the region. A recent survey indicates that, by end-2002, occupancy costs of US\$59 per square feet per annum placed Hong Kong SAR as the second most expensive city in the East Asia region. In contrast, office occupancy costs in Beijing, Singapore, and Shenzhen amounted to US\$41, US\$34, and US\$29 per square feet per annum, respectively.

C. Recent Developments in the Property Market

10. Prices in the property market, regardless of sector and geographic distribution, have experienced a sustained price decline since 1997 (Figure II.1).⁵ The main factors responsible for this decline are widely regarded as being the weak economic performance of Hong Kong SAR's economy following the financial turbulence in 1997–98, overbuilding, and, possibly, increased integration with the Mainland of China.

Figure II.1. Property Price Indices (1980 Q1=100)



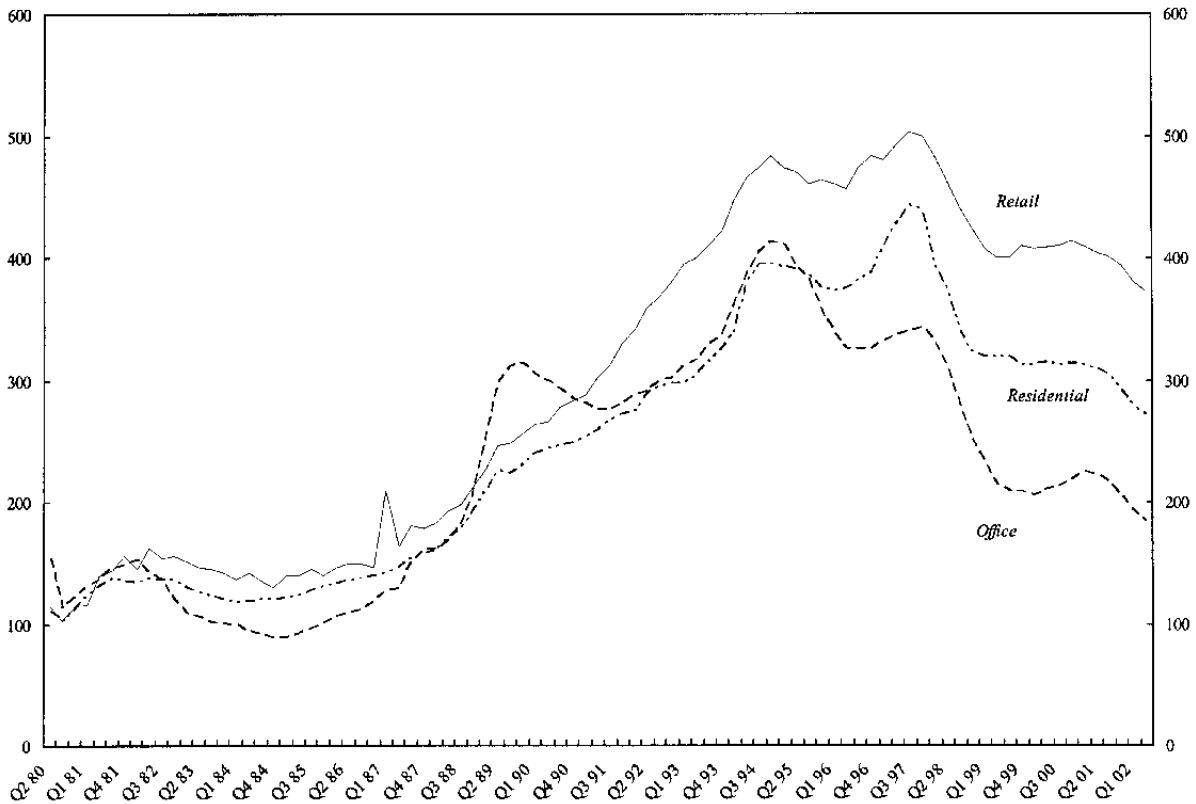
⁴ Morgan Stanley, "Where Are the Risks?," *Hong Kong Financial Services* (October 8, 2002).

⁵ HSBC, "Hong Kong Property: Things can only get better..." (August 30, 2002).

11. The year 2002 witnessed a significant pickup in the volume of primary market transactions in the residential sector, owing to the low interest rate environment. High affordability ratios and mortgage rates at sub-prime rate levels helped primary market sales to reach a four-year high of 27,000 units in 2002, well above the average of 19,000 units in 1999–2001. However, prices continue to decline because of aggressive sales tactics including price cuts, cash rebates, and developer-provided subsidies. Increased sales in the primary market came at the expense of reduced transactions in the secondary market, where transactions declined by 5 percent in the past year.

12. Excess vacant office space and weak demand have caused rental rates for office space to fall steadily by more than 50 percent since their 1997 peaks (Figure II.2). Weak global economic conditions have depressed the business prospects of the financial services, insurance, and trading industries, and reduced demand for office space. As a result, vacancy rates reached 10 percent by the third quarter of 2002, well above the 4 percent average vacancy rate during the pre-Asian crisis period. In the next two years, the completion of new office buildings would increase the inventory of available office space and contribute to keep rental rates down.

Figure II.2. Rental Indices (1980Q1=100)



13. In the past year, rental rates in the retail sector have been less affected than in the office sector thanks to increased tourism spending, especially by tourists from the Mainland of China, which helped to offset faltering domestic consumption. Properties located close to major transportation hubs and enjoying high foot-traffic benefited the most. Excess inventory is less of a problem in this sector.

Government Measures

14. In the past, the government has played an active role in the property market by supplying subsidized housing and controlling the land supply. Table II.1 chronicles the major measures targeting the housing sector since 1997. Since 1998, the government has reduced its role as a provider of subsidized public housing while encouraging private house ownership. On November 13, 2002, the Hong Kong SAR government unveiled a property policy package focused on the supply side of the property market.

15. Two important measures included in the November 2002 policy package were the temporary halt in land sales, through the suspension of the scheduled land auctions and the Application List and tenders from the Mass Transit Railway Corporation (MTRC) and the Kowloon-Canton Railway Corporation (KCRC), until end-2003; and ending the construction and sale of flats under the Home Ownership Scheme (HOS) from 2003 onwards. In the short term, these measures are believed to have only a negligible impact on housing prices, as most residential construction for the next three years has already been started.

16. In January 2, 2003, the government implemented the new Home Assistance Loan Scheme (HALS). This new scheme provides no-interest loans to low-income families for purchasing private residential units and replaces two similar schemes, the Home Purchase Loan Scheme (HPLS) and the Home Starter Loan Scheme (HSLs). The main differences relative to the previous schemes are the lowering of the maximum income ceiling for families not living in public housing units, and a general reduction of the loan amount to account for the decline in property prices. The initial quota is 10,000 cases per year, though it is difficult to project whether the quota will be fully used. While the new scheme provides incentives for purchasing private units, past experience with the HPLS suggest that the HALS quota may not be fully used.

17. With respect to the land sale process, starting in 2004 land sales will only be triggered through the Application List system. Under this system, the government announces in advance what lots will be available for sale (by auction or tender) in the coming year. An interested party can trigger the auction by submitting a price bid acceptable to the government. The land is then auctioned or tendered publicly to the highest bidder. In the absence of other interested parties, the party that triggers the auction is awarded the land for the price bid submitted and accepted by the government.

Table II.1: Major Housing Measures, 1997–2003

October 1997	Housing Policy Plan aimed at increasing home ownership. Key measures include increasing land supply, increased supply of subsidized housing, non-interest loans through the Home Starter Loan Scheme, and shortening of waiting time for public rental housing.
May 1998	Relaxation of anti-speculative administrative measures on the sale and pre-sale of flats.
June 1998	Suspension of land sales for nine months.
September 1998	Further relaxation of anti-speculative measures by removing restrictions on deposits and payments on the purchase of flats.
April 1999	Resumption of land sale. Introduction of the Application List system.
June 2000	Reduction in supply of subsidized flats; increase of subsidized loans.
February 2001	Tightening of eligibility requirements for subsidized flats; further relaxation of anti-speculative measures.
September 2001	Nine month moratorium on HOS/PSPS sales replaced by additional homeownership loans; administrative freeze on allocation of new sites for HOS/PSPS development.
June 2002	Resumption of HOS sales but supply reduced.
November 2002	Moratorium on land sales until after 2003; phase out of HOS after end-2003; land sales conducted only through the application list starting 2004.
January 2003	Replacement of HPLS and HSLS with HALS: tightening of maximum income eligibility for those not living in public rental housing; lowering of maximum loan amount.

Sources: Hong Kong SAR government publications, and Morgan Stanley Dean Witter.

D. Fundamental Housing Prices

18. Fundamental prices in the residential sector are estimated using the methodology first proposed by Abraham and Hendershott (1986) and used subsequently by Kalra et al. (2000), and Peng (2002). In this methodology, the growth rate of property prices can be decomposed into a fundamental component, which is a linear function of variables determining demand and supply, and a bubble component, which is a function of lagged prices and the gap between fundamental and past price levels.

19. Following the econometric specification of Kalra et al. (2002), it is assumed that the growth rate in residential property prices, p , can be decomposed into the growth rate of the fundamental or equilibrium price, p^* , and an adjustment term, θ :

$$p_t = p_t^* + \theta_t. \quad (1)$$

The fundamental price growth rate is a linear function of changes in disposable real income or some appropriate proxy, dpi , contemporaneous and lagged values of changes of the real rental rate, rr , and the level of the real best lending rate, blr , which is a proxy for mortgage rates:

$$p_t^* = \alpha_0 + \alpha_1 dpi_t + \alpha_2 rr_t + \alpha_3 rr_{t-1} + \alpha_4 rr_{t-2} + \alpha_5 blr_t. \quad (2)$$

The adjustment term, θ , is given by the following equation:

$$\theta_t = \lambda_0 + \lambda_1 p_{t-1} + \lambda_2 (\log P_{t-1} - \log P_{t-1}^*) + \varepsilon_t, \quad (3)$$

where P and P^* are the market and fundamental price respectively, and ε is an i.i.d. error term. The log difference of the market price and the fundamental price is defined as the *fundamental price gap*. If λ_1 is positive, the second term in equation (3) can be interpreted as a bubble component, as higher prices in the previous period are carried over to the next period. If λ_2 is negative, the third term in equation (3) can be interpreted as a mean reverting term or “bubble-buster”, which causes prices to revert to their fundamental value.

20. The choice of explanatory variables in equation (2) is guided by their role in determining housing demand. Equations (2) and (3) were estimated for three different specifications differing in the choice of proxy for disposable income: real household disposable income, real GDP, and the unemployment rate. The estimation results for the three specifications are presented in Table II.2, and the corresponding paths for fundamental prices are presented in Figure II.3. It should be noted, though, that these results have been obtained from model specifications that do not include supply factors such as the provision of public housing in the future, nor current excess inventory of unsold units.⁶ In addition, the availability of cheaper housing across the border in Shenzhen has not been modeled explicitly in the model because of a lack of historical data.

⁶ This shortcoming is addressed in the study by Peng (2002). However, the results reported here are similar to those reported in the above mentioned study. Furthermore, the use of the best lending rate rather than the mortgage series used by Peng (2002) did not alter the results substantially.

Table II.2. Speculative Bubble Model of Real Property Prices

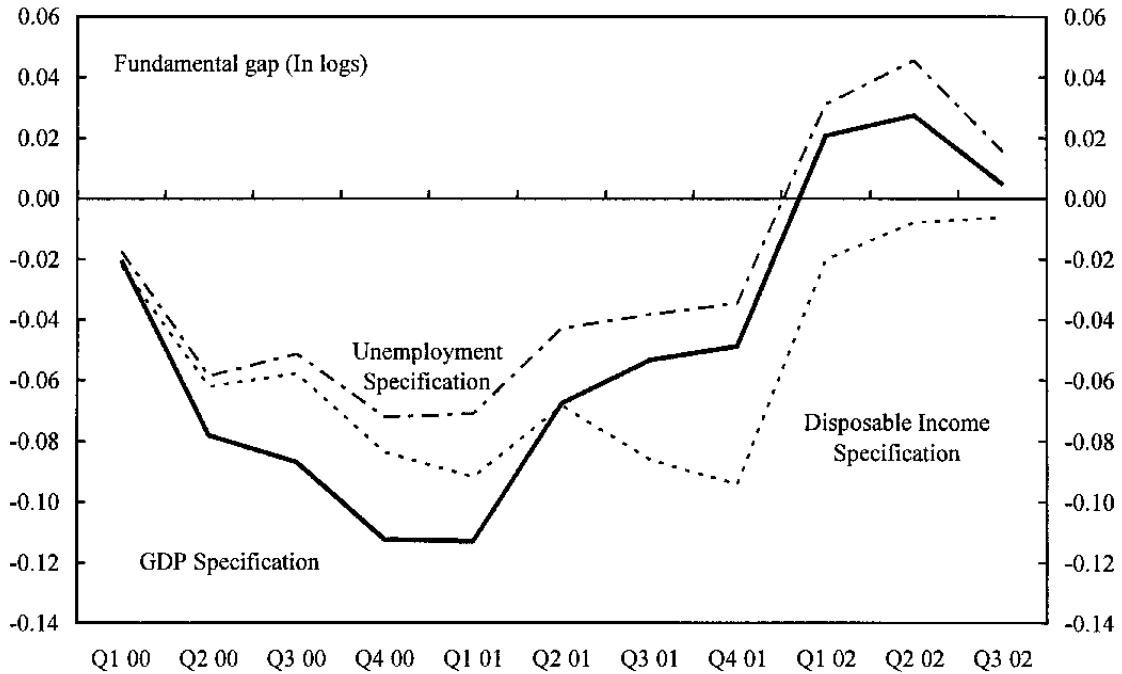
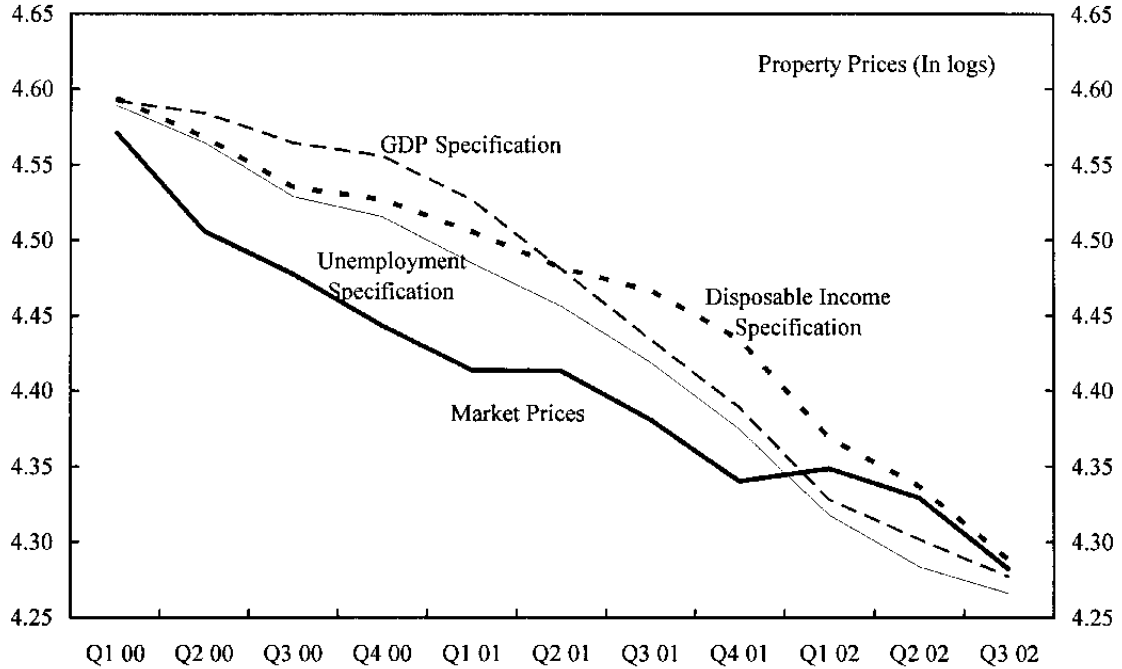
Variable	(1)	(2)	(3)
Constant	0.017 * (0.009)	0.006 (0.008)	0.024 * (0.007)
Real disposable income	0.264 ** (0.160)	--	--
Real GDP growth rate	--	0.434 * (0.138)	--
Changes in unemployment rate	--	--	-0.023 ** (0.013)
Change in real rental rate	1.115 * (0.222)	0.848 * (0.230)	1.028 * (0.216)
Change in real rental rate (-1)	-0.820 * (0.260)	-0.847 * (0.245)	-0.691 * (0.239)
Change in real rental rate (-2)	0.023 (0.214)	-0.002 (0.207)	0.071 (0.207)
Best lending rate	-0.454 * (0.132)	-0.408 * (0.121)	-0.480 * (0.127)
Change in real housing price (-1)	0.381 * (0.129)	0.378 * (0.134)	0.382 * (0.130)
Fundamental price gap	-0.182 * (0.064)	-0.213 * (0.068)	-0.204 * (0.067)
Adjusted R-squared	0.611	0.614	0.619
S.E. of regression	0.039	0.039	0.039
Durbin-Watson statistic	2.159	2.046	2.144
Number of observations	66	66	66

Note: The only difference among the three specifications shown in this table is the choice of proxy for disposable income.

* significant at 5 percent confidence level.

** significant at 10 percent confidence level.

Figure II.3. Residential Property Prices



Source: Primark Datastream and staff calculations.

21. Table II.2 shows that, for the three different model specifications analyzed, all explanatory variables enter with the expected sign and are statistically significant. Furthermore, the magnitudes of the coefficients on all explanatory variables, excluding the proxy for disposable income, are rather similar across different model specifications. The results suggest that bubbles in the housing market in Hong Kong SAR occurred in the past, as a one percent change in housing prices results in a 2½ percent increase in property prices in the long run *ceteris paribus*. However, the bubble-buster coefficient associated with the fundamental price gap is negative, and suggests the existence of price correction mechanisms in the housing market. These results are consistent with previous findings by Kalra et al. (2000) and Peng (2002).

22. Figure II.3 shows that from the first quarter of 2000 until the first quarter of 2002, housing prices in Hong Kong SAR were below levels consistent with fundamental demand factors (fundamental levels) for all model specifications. During 2002, different model specifications delivered different conclusions. On the one hand, housing prices are just ½ percent above fundamental levels according to the disposable income specification. On the other hand, the GDP and unemployment specifications suggest that housing prices are undervalued by ½ percent and 1½ percent relative to fundamental levels respectively. But note that the differences in results across these alternative specifications are quite small.⁷ Overall, given data measurement errors and uncertainty regarding the correct specification of the model, it seems reasonable to assert that by the third quarter of 2002, housing prices were approximately in line with fundamentals.

23. Uncertainty in the model parameter estimates as well as in the macroeconomic forecasts suggests that out-of-sample projections from these model specifications should be interpreted with considerable caution. Table II.3 provides some illustrative calculations to show how, using IMF staff projections of real GDP growth and unemployment rates, the GDP and unemployment specifications can be used to project how fundamental prices as well as market prices would evolve under different scenarios. These scenarios suggest that additional small declines in fundamental prices may occur in 2003 if the economy remains weak. However, fundamental prices are projected to increase, especially in 2004, if GDP growth and/or rental rates were to strengthen significantly. It is worth reemphasizing that the evolution of supply factors could substantially alter the price dynamics predicted by this model, which does not account explicitly for the impact of such factors. Further work integrating both demand factors and supply factors could be helpful, in particular, to analyze the impact of property prices in neighboring Shenzhen on property prices in Hong Kong SAR.

⁷ The standard deviation of the point estimates ranges between 0.60 and 0.70.

Table II.3: Scenarios for Housing Prices Projections 1/

	Scenario 1 (Benchmark)		Scenario 2		Scenario 3		Scenario 4	
	2003	2004	2003	2004	2003	2004	2003	2004
GDP specification								
Assumptions								
Real GDP growth	2.2	3.1	4.5	6.0	2.2	3.1	2.2	3.1
Best lending rate	7.0	7.0	7.0	7.0	7.0	5.0	7.0	7.0
Real rental rate growth	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	0.0	5.0
Implied price changes								
Market prices	-7.2	-3.5	-2.2	2.9	-5.9	0.0	-3.3	0.0
Fundamental prices	-5.3	-3.8	-1.3	1.3	-4.3	-1.1	-2.3	-0.7
Unemployment specification								
Assumptions								
Unemployment rate	7.4	7.0	7.0	6.8	7.4	7.0	7.4	7.0
Best lending rate	7.0	7.0	7.0	7.0	7.0	5.0	7.0	7.0
Real rental rate growth	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	0.0	5.0
Implied price changes								
Market prices	-11.6	-6.7	-10.4	-7.4	-10.1	-2.7	-4.5	7.5
Fundamental prices	-7.9	-6.5	-7.0	-7.0	-6.7	-3.4	-2.3	4.8

Source: Staff estimates.
1/ All numbers in percentage points.

E. Conclusions

24. The analysis undertaken in this paper suggests that, in the housing market, prices are roughly at levels consistent with those determined by demand factors such as personal disposable income, rental rates, and interest rates. This analysis has focused on demand-side factors since updated and historically consistent data on key supply-side variables were difficult to obtain. Nevertheless, the results are in line with those reported in an earlier study by Peng (2002), which were obtained using a similar model that included supply-related explanatory variables. While property prices now appear to be at levels consistent with demand-side fundamentals, further weaknesses in housing prices cannot be ruled out if the economy remains weak.

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III. DEFLATION IN HONG KONG SAR¹

A. Overview

1. **Hong Kong SAR has experienced continued deflation since the last quarter of 1998.** The composite CPI fell by almost 14 percent from the third quarter of 1998 until December 2002; about half of this is accounted for by the decline in housing costs, following the bursting of the bubble in property prices in the mid 1990s.² Other items that have also contributed significantly to the decline in prices include food, clothing and footwear, and durable goods (Table III.1). Falling prices have contributed to increased real debt burdens, depressed consumer confidence, tightened monetary conditions, and could have helped feed the contraction in aggregate demand (Table III.2).

	Weight	Cumulative Change Sep. 1998-Dec 2002 (percent) 1/	Contribution to Overall Deflation (percentage points)	Contribution to Overall Deflation (Share)
Composite CPI 2/	100.0	-13.7	-13.7	100.0
<i>Of which:</i>				
Food	26.7	-7.7	-2.1	15.0
Housing	29.9	-26.2	-7.8	57.3
Electricity, Gas and Water	3.0	-5.0	-0.2	1.1
Alcoholic Drinks and Tobacco	0.9	5.1	0.0	-0.4
Clothing and Footwear	4.1	-35.5	-1.5	10.7
Durable Goods	6.2	-27.2	-1.7	12.4
Miscellaneous Goods	5.7	3.7	0.2	-1.6
Transport	9.0	-0.2	0.0	0.1
Miscellaneous Services	14.4	-4.9	-0.7	5.2

Sources: CEIC database; and staff calculations.
 1/ Based on log-difference approximation.
 2/ Sum of the components using fix weights over the period September 1998 to December 2002.

2. **Previous research suggested that, although structural factors have played a role, deflation was mainly attributable to cyclical factors.** Staff analysis carried out during the 2002 Article IV Consultation showed that fluctuations in unemployment, nominal credit and the nominal effective exchange rate, which were considered as cyclical variables, were the main determinants of the decline in prices (IMF Country Report, No 02/99, Chapter III). This result implies that, as these cyclical factors turn around, deflation would end. Research by the HKMA arrived at similar conclusions (HKMA Research Memoranda, November 2001).

	Period Average 1993Q3-1997Q3	Period Average 1998Q3-2002Q4
Real GDP (year on year percent change)	5.03	3.00
Real Domestic Demand (year on year percent change)	7.03	-0.33
Consumption, real (year on year percent change)	4.96	0.49
Gross Fixed Capital Formation, real (year on year percent change)	11.17	-3.08
Real Interest Rates 1/	0.38	10.60
Real Interest Rates 2/	-2.71	6.95
Unemployment Rate 3/	2.20	7.20

Sources: CEIC Database; Authorities; and staff calculations.
 1/ Best lending rate minus actual yoy CPI inflation.
 2/ Interbank offered rate minus actual yoy CPI inflation.
 3/ level of unemployment rate prevailing in 1997Q3 and 2002Q4.

¹ Prepared by Papa N'Diaye.

² March 2003 figures indicate that deflation is still continuing as prices fell by 2.1 percent year on year.

3. **However, the persistence of deflation for such an extended period of time suggests that other factors may be at play.** In general, an economy's cyclical condition, as measured for instance by the output gap, can be affected by both transitory and permanent shocks, the relative importance of which determines the persistence of deflation. For example, as deflation increases the real debt burden, and becomes entrenched in expectations, private investment and consumption growth could decline, causing an even greater decline in economic activity.

4. **This paper presents a more comprehensive analysis, which provides a decomposition of the aggregate price level into transitory and permanent components, and identifies the nature and origin of the shocks that drive these two components.** The analysis is based on a methodology that has several features that are useful for analyzing deflation and its persistence. First, it provides a clear distinction between those driving forces of deflation that create trend movements in the variables (summarized in the permanent component) and those that generate temporary deviations from long-run equilibrium conditions (summarized in the transitory component). Second, it provides means for identifying the nature of those forces. The approach that is undertaken in this paper is a "structural" one as opposed to the commonly used "reduced form" approach. It helps, for example, to determine whether falling prices results from increased productivity, scarce money supply and/or temporary excess capacity. This is particularly relevant because the likely duration of deflation, its costs, and the policy actions that may need to be taken for combating it all depend upon the nature of its underlying causes.

5. **Empirical evidence suggests that the contribution of the permanent component has become relatively more important over time in explaining deflation.** The sustained fall in the aggregate price level is mostly accounted for by continuous declines in its permanent component which summarizes the cumulative effects of productivity shocks, scarce money supply, and price convergence with trading partners. These findings remain consistent with the staff's previous analysis since they indicate that, although the transitory component did contribute significantly to the initial phase of deflation, its effects are becoming progressively weaker.

6. The remainder of the chapter is organized as follows. Section B presents the model that has been used for analyzing deflation. It explains how the price level is decomposed into transitory and permanent components which reflect the effects of shocks that have an economic interpretation. These shocks are identified by imposing restrictions that are derived from economic theory. Section C presents the results. Section D provides an interpretation of the results. Section E concludes the paper.

B. The Framework

7. A structural vector error correction modeling approach à la King, Plosser, Stock and Watson (1991) is used to assess the nature and impact of shocks on prices to shed light on the main factors that are behind their sustained decline. The structural vector error correction model, also known as the common trends model (CTM), is well suited for analyzing the

interaction between variables that display trends and are determined simultaneously, uses general restrictions derived from economic theory to identify the main driving forces behind the trends observed in aggregate macroeconomic variables, and ensures consistency between the short-run and long-run dynamics of those variables.³

8. The CTM includes the following variables: real output, measured as nominal GDP deflated by the (composite) consumer price index; broad money; the consumer price index; real asset prices, measured by the Hang Seng stock index deflated by the consumer price index; foreign prices in Hong Kong dollars (HKD), measured as the trading partners consumer price index expressed in HKD.⁴

9. Box III.1 provides a diagrammatic representation of this framework. It shows how the outturn the price level can be decomposed into two components that reflect its short-run and trend movements, and what are their main driving forces.

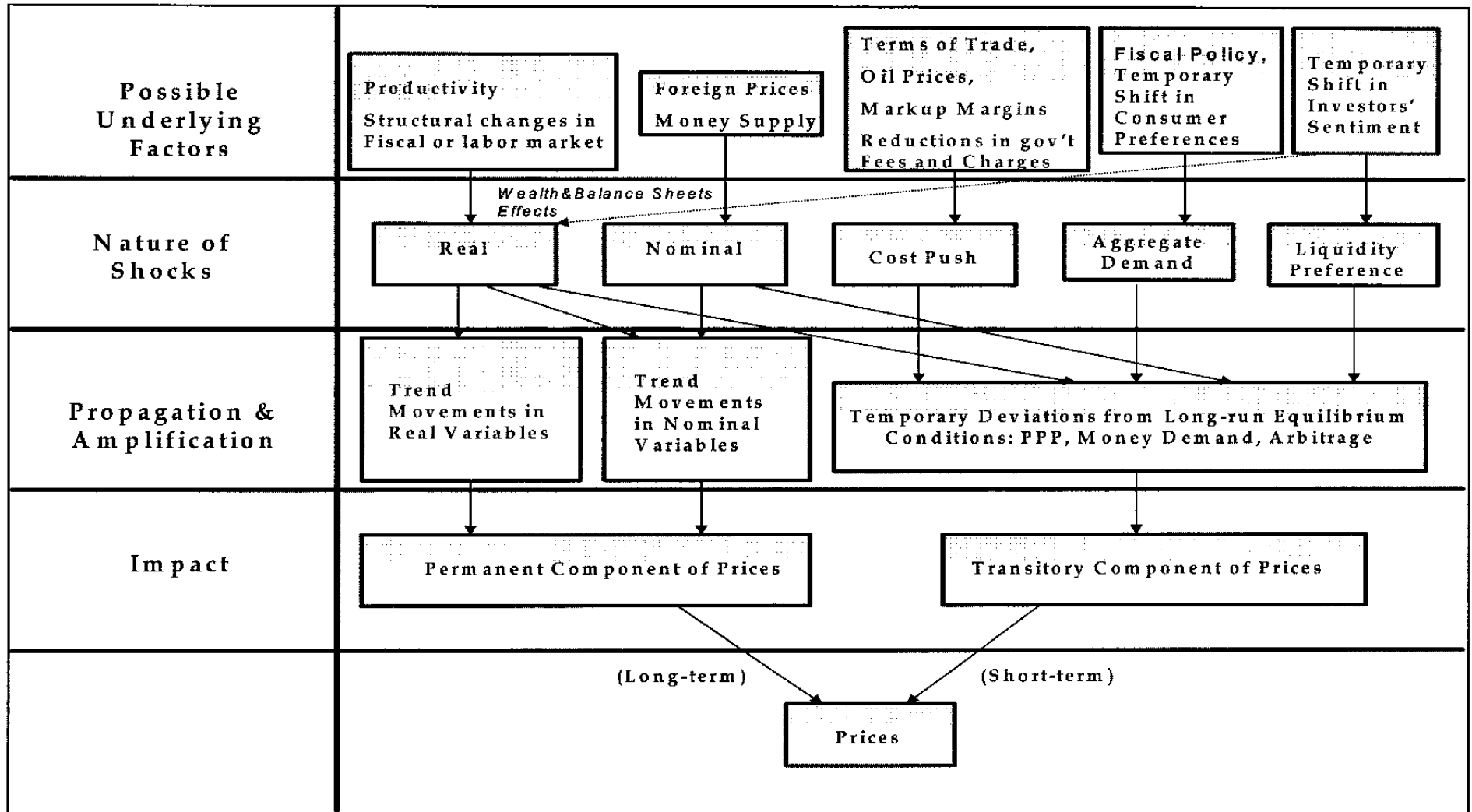
- The first panel displays several possible factors which could, at each point in time, influence different sides of the economy (e.g., supply vs. demand, nominal vs. real, etc.).
- The occurrence of an event related to these factors constitutes a “shock.” The nature of the shocks is determined according to which side of the economy they first have an impact on as well as the temporal nature of the shock (second panel). There are two types of shocks: **transitory shocks** that generate only short-run movements in the variables; and **permanent shocks** that generate both short-run and trend movements in the variables.⁵ The transitory shocks are: cost push shocks (e.g., changes in mark-

³ Technical details are presented in the Annex.

⁴ There are three main reasons why stock prices have been used in lieu of property prices. First, the former ensures consistency with the predictions of economic theories that suggest the existence of a stable long-run arbitrage relationship between output and real stock prices (e.g., Blanchard, 1981). Second, it provides a means for capturing, in a broad sense, the effects of changes in asset prices on both the corporate sector’s balance sheets and households’ wealth. Third, stock prices are highly correlated with property prices—the correlation between stock prices and property prices over the 1980Q4–2002Q3 period is 0.85, suggesting that this might not be too restrictive in any case.

⁵ Note that, even the transitory shocks could, through their effects on private sector balance sheets, have persistent effects on prices that last beyond the duration of the shocks themselves.

Box III.1. Effects of Shocks on Prices



- up margins), aggregate demand shocks (e.g., temporary shift in consumers' preferences), and liquidity preference shocks. The permanent shocks are: real (e.g., productivity) shocks, and changes in the money supply.⁶
- Each of these shocks generates particular movements in the variables of the system that distinguish it from the others, (third panel). For example, the so-called “real” shock, which is related to factors such as productivity changes or labor market reforms, generates short-run (e.g., deviation from long-run equilibrium conditions) and trend movements in all variables, whether the latter are of a real or a nominal nature. The “nominal” shock generates short-run movements in all the variables and trends in only those variables that are of a nominal nature. The cost-push shock generate short-run movements in all variables, but do not affect their trends.
 - The distinction between these two types of shocks constitutes the pillar of the decomposition of each variable into a **transitory component** and a **permanent component** (fourth panel). For each variable, the combination of the short-run movements generated by both types of shocks constitutes its transitory component; while that of the effects of the permanent shocks on its trend or long-run dynamics constitutes its permanent component.

10. The identification of the shocks that drive these two components is based on restrictions that are derived from economic theory. They include restrictions that stem from the long-run equilibrium relationships of a stable money demand, purchasing power parity, and arbitrage between output and real stock prices.⁷ The money demand equation embeds the monetarist view that, in the long run, inflation/deflation is a monetary phenomenon. Purchasing power parity captures the effects of price convergence with trading partners. The arbitrage relationship between output and real stock prices captures the idea that certain developments in the real (supply) side of the economy, such as improved productivity or labor market reforms, can engender trends in asset prices because of their impact on current and prospective levels of corporate profitability. Additional restrictions that include the concept of long-run neutrality of money (vertical Phillips Curve) and assumptions on stickiness in the adjustment process of certain variables to shocks are also used to obtain an exact identification of all shocks in the system.

⁶ The term “changes in the money supply” refers to increases (decreases) in the money supply beyond (below) what is required to finance long-run real GDP. It is also worth noting that real shocks could also include those changes in the supply of goods and services that are due to wealth/balance sheets effects resulting from, for example, shifts in investors' sentiment.

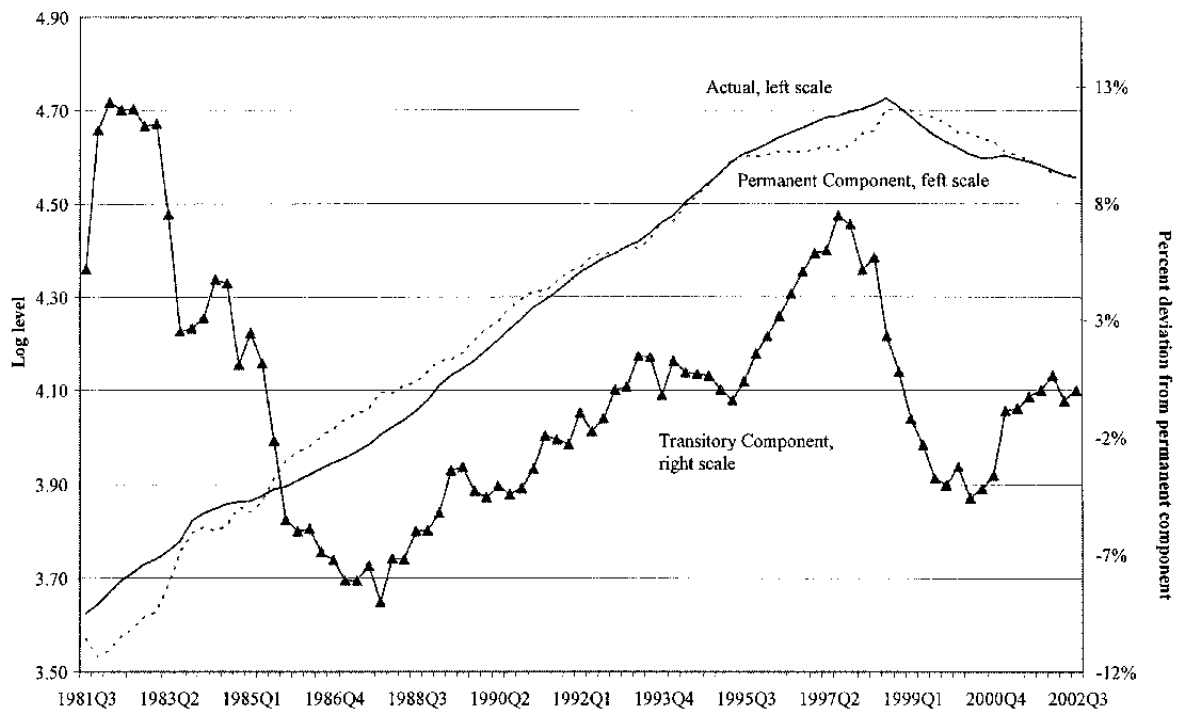
⁷ These restrictions were tested jointly since the Johansen Maximum Likelihood estimation procedure indicated the existence of 3 cointegrating relationships. The PPP restriction, when tested separately, was not rejected at the 5 percent level. See Becker (1999) and Cassola and Morana (2002) for examples of studies using similar restrictions.

11. The interpretation of the permanent and transitory components of each variable depends upon the effects of which shocks they include. For example, because the transitory component of output includes the short-run effects of productivity shocks, it can not be literally considered as a standard measure of output gap that would convey the notion of pressures arising only from the demand side of the economy.

C. Results

12. Over the 1998Q4–2002Q3 period, the decline in the price level has been associated with a decline in both its transitory and permanent components.⁸ However, although downward pressures on the price level resulting from the decline in the transitory component have been very pronounced during the initial phase of deflation, they have become progressively weaker. Consequently, most of the fall in the price level between 2001Q3 and 2002Q3 is accounted for by the decline in its permanent component (Figure III.1).

Figure III.1. Prices: Actual and Permanent & Transitory Components

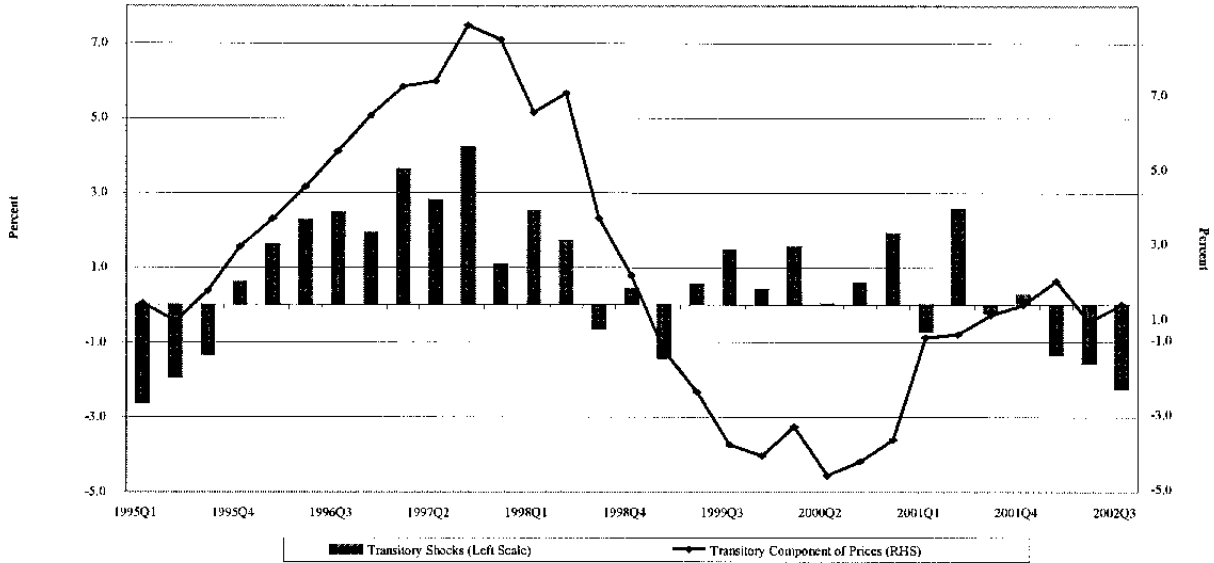


13. The sustained fall in prices results mostly from the effects of permanent *shocks* that determine entirely the path of the permanent component of prices, and have a substantial impact on the transitory component. The effects of transitory *shocks* on the transitory component of prices have been outweighed by those of permanent shocks over the deflation

⁸ The shocks that drive these two components are orthogonal by construction. But there is no restriction that the temporary and permanent components themselves be uncorrelated.

period (Figure III.2).⁹ Shocks such as productivity shocks, changes in money supply, and price equalization with trading partners have had a significant negative impact on the transitory component of prices over the 1998Q4–2002Q3 period.

Figure III.2. Transitory Component of Prices: Contributions of Transitory Shocks



14. In terms of the *rate of change* in prices (i.e. inflation or deflation), the estimates of the permanent component of prices show continued deflation due to permanent shocks such as productivity shocks, changes in money supply, and price equalization with trading partners over the last two years, (Figure III.3, permanent component).¹⁰

15. One approach to understanding the relative importance of different shocks is to examine their relative contributions to the variability of prices and output (Table III.3).

⁹ The transitory component represents the temporary dynamic effects of all random disturbances and exogenous variables on the variables of the system.

¹⁰ The permanent component of the *rate of change* in prices has been obtained from the estimates of the permanent component of the *price level* displayed in Figure III.1.

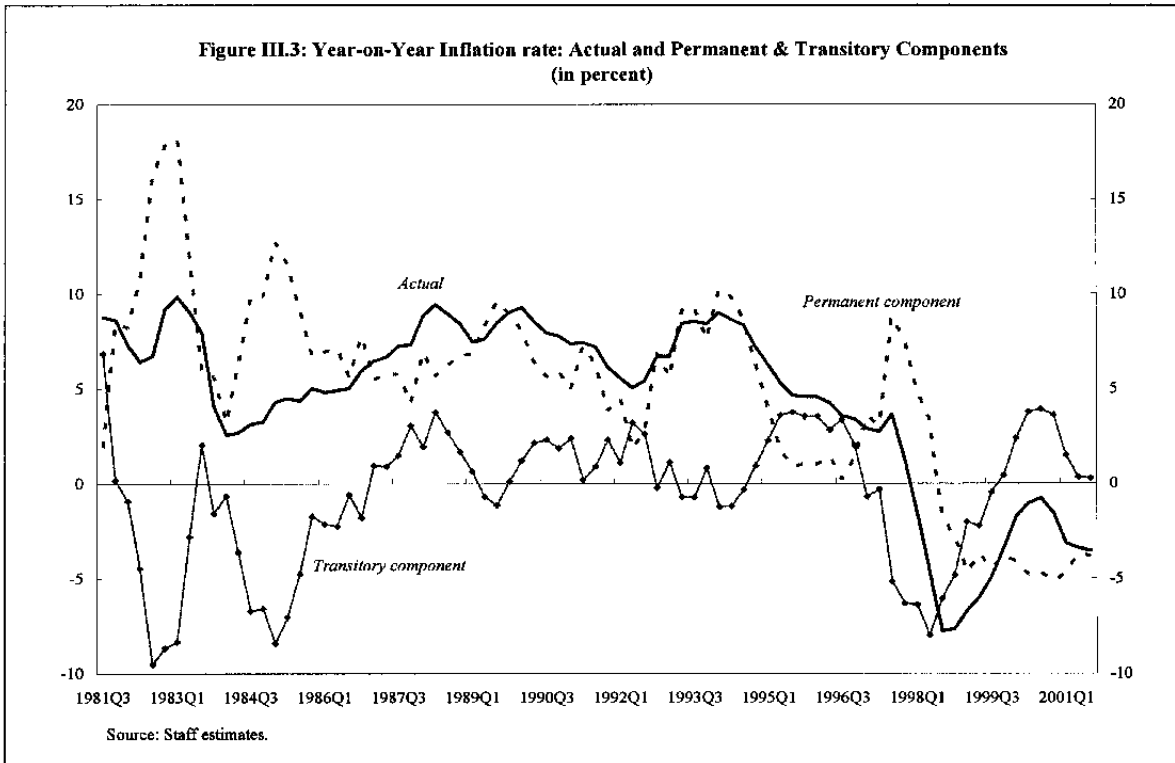


Table III.3. Forecast Error Variance Decomposition

	Permanent Shocks						Transitory Shocks								
	Real			Nominal			Liquidity Preference			Cost Push			Aggregate Demand		
	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Price Level	0.39	0.44	0.34	0.05	0.21	0.60	0.00	0.06	0.01	0.55	0.13	0.03	0.01	0.16	0.03
Output	0.44	0.66	0.88	0.09	0.12	0.05	0.00	0.03	0.01	0.00	0.08	0.02	0.48	0.11	0.04
Money	0.13	0.27	0.52	0.63	0.58	0.41	0.23	0.12	0.05	0.00	0.01	0.01	0.01	0.02	0.01
Foreign Price Level	0.43	0.19	0.20	0.13	0.63	0.68	0.11	0.06	0.04	0.17	0.08	0.05	0.17	0.04	0.04
Real Stock Prices	0.49	0.57	0.67	0.09	0.06	0.08	0.42	0.27	0.17	0.00	0.07	0.05	0.00	0.03	0.03

S=short-term (1 quarter)
M=medium-term (12 quarters)
L=long-term (40 quarters)

Prices

- Permanent shocks contribute to 44 percent of the fluctuations in prices over the short-term (one quarter) and 94 percent over the long term (40 quarters). The relative contribution of each of these shocks is as follows.
 - Productivity shocks and shocks related to changes in the aggregate money supply and price equalization with trading partners account for 34 percent and 60 percent of the long-term fluctuations in prices, respectively.

- However in the short and medium-term (12 quarters), productivity shocks are the main sources of variability in prices, accounting for 40 percent and 44 percent, respectively.
- The contributions of transitory shocks represent about 56 percent of fluctuations in prices in the short-term, and decline to about 35 percent in the medium-term. They can be decomposed as follows.
 - Cost push shocks, that could reflect temporary changes in firms' mark-up margins or rates concessions and waiver of water and sewage charges granted by the government, contribute the most to the variability of prices. They explain about 55 percent of fluctuations in prices in the short-term, and about 13 percent in the medium-term.
 - Aggregate demand shocks, such as discretionary fiscal policies or temporary changes in consumers' confidence, do not have an immediate effect on prices, but explain about 16 percent of their fluctuations in the medium-term.
 - The effects of liquidity preference shocks on the aggregate level of prices are limited. Liquidity preference shocks explain only about 6 percent of the fluctuations in prices in the medium-term.¹¹

Results (not reported here) of the historical decomposition of the price level into the components attributable to different shocks tell a similar story. Movements in the price level are largely determined by productivity shocks and shocks to the money supply and price equalization with trading partners.

Output

- Permanent shocks contribute to 55 percent of output fluctuations in the short-term and about 93 percent in the long-term, the details of which are as follows:
 - Productivity shocks, changes in the aggregate money supply and price equalization with trading partners explain 88 percent and 5 percent of output fluctuations in the long-term, respectively. These shocks still account for an important part of its fluctuations in the short-term, accounting for 44 percent and 9 percent, respectively.

¹¹ Because these transitory real asset prices shocks do not create changes in households' wealth and/or corporate balance sheets which lead to permanent changes in output, they could reflect swings in investors' sentiment that affect the stock market without affecting the bond market significantly. Such shocks would leave market interest rates unchanged.

- The contributions of the transitory shocks represent 48 percent of output fluctuations in the short-term, and decline to about 22 percent over the medium-term. The respective contribution of each transitory shock is as follows:
 - Cost push shocks account for 8 percent of the variability of output over the medium-term.
 - Aggregate demand shocks explain about 48 percent of the short-term variability of output. However, their relative contribution declines rapidly to about 11 percent over the medium-term.
 - Liquidity preference shocks explain about 3 percent of the variability of output over the medium-term.

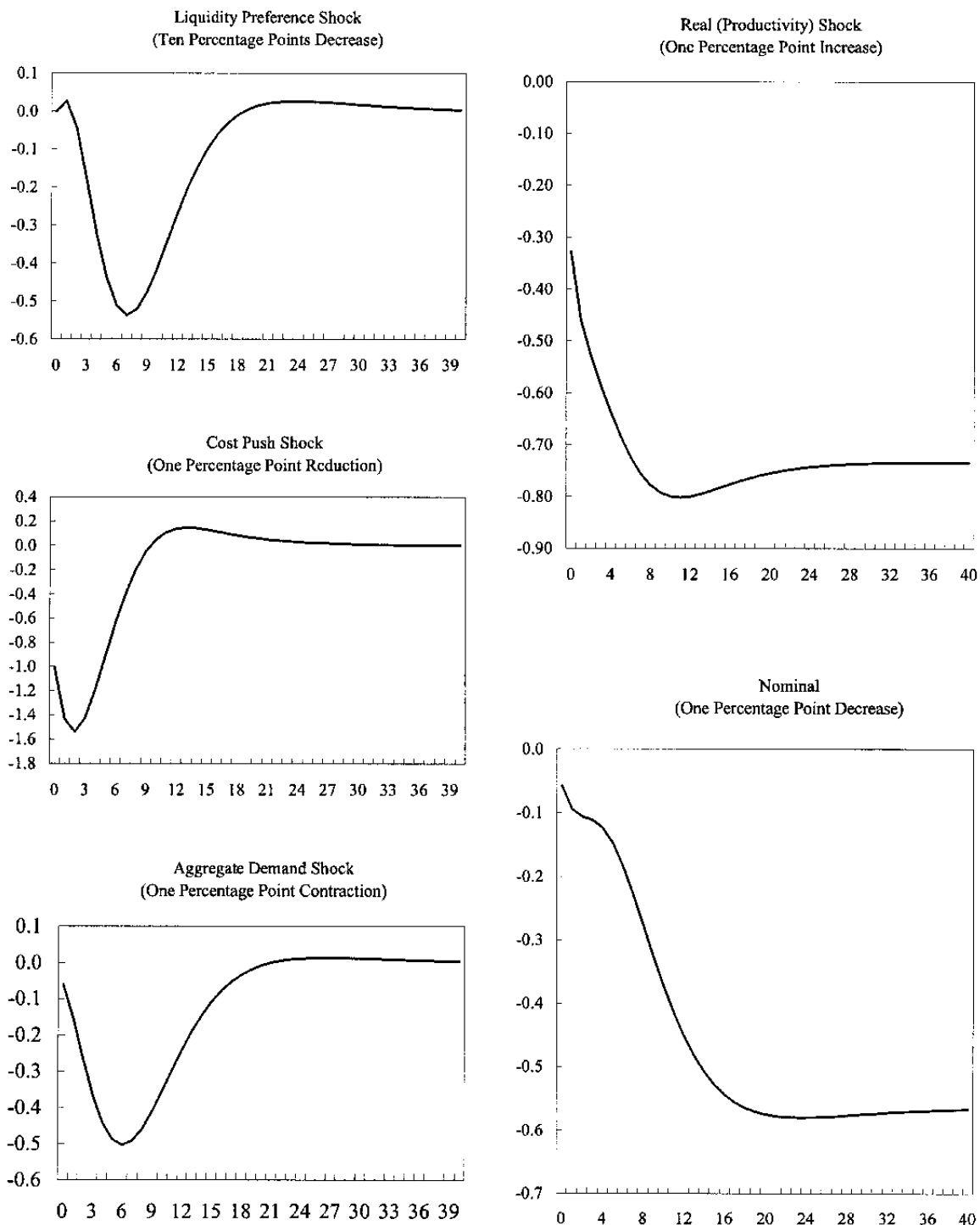
16. Another approach to understanding the relative importance of shocks is to analyze their dynamic effects on prices. Such an analysis has several uses. First, it provides a means to verify the consistency of the effects of shocks with standard predictions of economic theory and, therefore, an assessment of the validity of the identification restrictions used. Second, it provides information about how shocks are propagated and amplified throughout the economy. Looking at the dynamic effects on prices of **one-time** shocks of different types (Figure III.4), results suggest the following.

- The responses of prices to shocks are consistent with the predictions of standard economic theory. From an aggregate supply/aggregate demand perspective, a temporary real shock (e.g., one time increase due to higher productivity) that, say, corresponds to an outward shift of the long-run aggregate supply curve leads to a permanent decrease in prices (and increase in output). A temporary negative aggregate demand shock (of a Keynesian style), leads to an inward shift of the aggregate demand curve that induces a fall in prices in the short-run. With downward stickiness in wages, real wages increase leading to a decline in output and higher unemployment. In the long-run, as the aggregate supply curve flattens, prices go back to their initial level.¹²
- The adjustment of prices to transitory shocks is gradual, which suggests some degree of stickiness. The maximum effect is reached after seven quarters in response to an aggregate demand shock, four quarters in response to a cost push shock, and eight quarters after a liquidity preference shock.¹³

¹² While the magnitudes and duration of the transitory effects of these shocks are determined empirically, their zero long-run impact on the price level are imposed by the identification scheme.

¹³ Although the half-life of deviations from purchasing power parity appears not to be independent of the nature of the shocks that created it, estimates suggest a relatively fast speed of adjustment of the real exchange rate. It takes about eight quarters for half the effects of a cost-push shock to disappear, while those of an aggregate demand shock disappear only after 12 quarters.

Figure III.4: Movements in the Price Level in Response to Different One-Time Shocks



Source: Staff estimates.

D. Interpreting the Results

17. The high relative contribution of permanent shocks (productivity, money supply/price convergence shocks) to fluctuations in prices, compared to temporary shocks such as aggregate demand and cost push shocks, probably reflects the increased degree of integration between Hong Kong SAR and the Mainland of China and changes in the money supply.¹⁴ This implies that downward pressures could continue in the foreseeable future as (i) price differentials between Hong Kong SAR and the Mainland cities such as Shenzhen and Guangdong remain substantial and (ii) the stance of monetary policy in the United States could tighten when the economy recovers. Moreover, given that wage differentials between Hong Kong SAR and neighboring Mainland China cities have not narrowed substantially, the convergence process is very likely to continue in the near future.

18. The limited contribution and duration of the impact of aggregate demand shocks on prices, such as temporary fiscal measures, is consistent with evidence on the narrow tax structure and limited size of the fiscal multiplier in Hong Kong SAR. However, this result implies that macroeconomic policy actions oriented towards managing the demand side of the economy, in this case expansionary fiscal policies, may be unlikely to have a significant direct effect on price developments.

E. Conclusion

19. The analysis in this paper has shown that the effects of permanent shocks such as productivity shocks and shocks related to changes in the money supply and price convergence with trading partners have become more important over time in explaining deflation in Hong Kong SAR. These shocks originate partly from the real side of the economy (e.g., productivity), and partly from the monetary side, including the dynamic adjustment of prices for purchasing power parity purposes. In addition, the effects of temporary shifts in aggregate demand have been perpetuated by negative wealth and balance sheet effects in the corporate and household sectors arising from asset price declines over the past five years. The analysis has also shown that there is a prevalence of productivity and nominal shocks such as changes in the money supply and price convergence with trading partners in explaining price and output fluctuations.

¹⁴ Under the linked exchange rate regime, changes in the U.S. federal funds rate lead to comparable changes in Hong Kong SAR's interest rate (HIBOR). These changes imply adjustments in the monetary base to avoid capital flows that could put pressures on the exchange rate. The relative tightness of the monetary stance in the United States for Hong Kong SAR's economy can be inferred from the fact that the stock of broad money stood at or below its permanent level, i.e., the level of broad money that is required to finance long-run real output, over the period 1996Q1–2002Q3 (Figure III.7, third panel).

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COMMON TRENDS REPRESENTATION

This appendix provides technical details about the methodology that has been used for analyzing the persistence of deflation. The first section provides a brief overview of the structural vector error correction model (common trends model). The second section presents the results of the estimation of the model.

A. Methodology

The common trends model aims at analyzing the interaction between the following five variables: output, noted y_t , broad money, noted m_t ; the CPI, noted p_t ; trading partners' CPI in Hong Kong dollar (nominal effective exchange rate times foreign prices), noted ep_t^* ; and a measure of real stock prices (stock price deflated by CPI), noted f_t .¹ All variables are expressed in natural logarithm. These five variables are grouped into a vector x_t and decomposed into two components: a transitory component and a permanent component.

Representation

Formally, for this analysis, the common trends model (including exogenous variables) admits, after transformation, the following structural vector moving average representation.

$$x_t = x_0 + A\tau_t + \Phi(L)\psi_t + B\sum_{i=1}^l z_i + \Gamma(L)z_t \quad (1)$$

$$\text{where } x_t = \begin{bmatrix} y_t \\ f_t \\ m_t \\ p_t \\ ep_t^* \end{bmatrix},$$

$$\tau_t = \begin{bmatrix} \theta_t \\ \beta_t \end{bmatrix}, \quad \begin{bmatrix} \theta_t \\ \beta_t \end{bmatrix} = \begin{bmatrix} \theta_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \theta_{t-1} \\ \beta_{t-1} \end{bmatrix} + \begin{bmatrix} \vartheta_t \\ \zeta_t \end{bmatrix}, \quad (2)$$

¹ We used Hong Kong dollars Broad Money as a measure of the stock of money in the economy. The use of broad money in the system is to account for the existence of a long-run stable money demand relationship and provide a monetarist explanation to deflation—that is, deflation, like inflation, is in the long-run a monetary phenomenon. The stock of money supply is determined by the flows of funds in the different sectors of the economy and the stance of monetary policy in the U.S.

$$\omega_t = F\psi_t = F\begin{bmatrix} \psi_t^{perm} & \psi_t^{trans} \end{bmatrix},$$

$$\psi_t^{perm} = \begin{bmatrix} \theta_t & \zeta_t \end{bmatrix}, \quad \psi_t^{trans} = \begin{bmatrix} \varepsilon_t^{ad} & \varepsilon_t^{prices} & \varepsilon_t^{lf} \end{bmatrix}$$

τ_t is a vector of common stochastic trends. It includes a real stochastic trend, θ_t , and a nominal stochastic trend, β_t , which are driven by \mathcal{G}_t and ζ_t , the structural (uncorrelated) real and nominal disturbances, respectively. ψ_t is the vector of all structural disturbances, and $\Phi(L)$ is a polynomial matrix, with L the lag operator. z_t is a vector of exogenous variables, and $\Gamma(L)$ is a polynomial matrix. ε_t^{ad} , ε_t^{prices} and ε_t^{lf} are disturbances (uncorrelated with the other disturbances), identified as an aggregate demand shock, a cost push shock, and a liquidity preference shock (the identification restrictions are discussed later).

Shocks

There are two types of disturbances: those that have permanent and transitory effects on each variable of the system, called permanent shocks, and those that have only transitory effects, called transitory shocks. The former type of shocks, ψ_t^{perm} , is constituted of the real and nominal shocks, while the latter is constituted of the aggregate demand shock, the cost push shock, and the liquidity preference shock. The number of shocks of each type is determined by the number of variables in the system and the number of cointegration (i.e. long-run equilibrium) relationships that exist between them.

Transitory and Permanent Components

The transitory component of x_t represents the temporary dynamic effects of all random disturbances of the system and exogenous variables, $x_t^{trans} = \Phi(L)\psi_t + \Gamma(L)z_t$. The permanent component is the sum of the stochastic trends and the cumulative effects of the exogenous variables, $x_t^p = A\tau_t + B\sum_{i=1}^t z_i$. There are two common stochastic trends, of which generating processes are assumed to be random walk with drift.

The estimation and analysis of the CTM involves (i) the determination of the degree of integration of the series, (ii) the determination of the number and estimation of the cointegration relationships, (iii) imposing economic theory-based restrictions to identify the structural shocks, (iv) performing an impulse response analysis, and (v) variance decomposition analysis. The CTM has been estimated over the sample period 1980Q4–2002Q3. All data are from the CEIC database.

B. Results

Unit Root Tests and Cointegration Analysis

The standard Augmented Dickey-Fuller test could not reject the presence of a unit root in all variables. Tests of cointegration have been carried out using the Johansen (1988) maximum likelihood procedure. As shown in Table III.4, results indicate the existence of 3 cointegration relationships. However, for the 3 (normalized) cointegrating vectors to have any economic interpretation, one needs to impose restrictions that are provided by economic theory.

Null Hypothesis Number of Cointegrating Vectors	LR Max		LR Trace	
	Statistics	5 Percent Critical Value	Statistics	5 Percent Critical Value
No constant in cointegrating vector, no deterministic trend in data				
None	42.52	30.04	103.63	59.46
At most 1	35.75	23.80	61.11	39.89
At most 2	<u>17.53</u>	17.89	25.36	24.31
At most 3	5.63	11.44	<u>7.83</u>	12.53
At most 4	2.20	3.84	2.20	3.84
constant in cointegrating vector, no deterministic trend in data				
None	44.05	76.07	128.51	34.40
At most 1	38.11	53.12	84.45	28.14
At most 2	28.73	34.91	46.34	22.00
At most 3	<u>13.02</u>	19.96	<u>17.62</u>	15.67
At most 4	4.59	9.24	4.59	9.24

Notes: In bold indicates the rejection of the null hypothesis.

Because the study aims at analyzing deflation in a highly open economy with well developed financial markets, theories such the Quantity Theory of Money (QTM), Purchasing Power Parity (PPP), and Arbitrage Relationship between output and real stock prices provide restrictions that are useful for understanding the long-run determinants of the variables of the system, especially the price level. The QTM implies a cointegrating vector that includes output, money and the price level (and a measure of opportunity cost of holding money), with an income elasticity that has to be estimated and opposite unitary coefficients on money and the price level. The PPP implies a cointegrating vector which includes the domestic and foreign price levels, with associated coefficients equal to one and minus one, respectively. Although the cointegrating vector implied by the arbitrage relationship does not assign a specific value to the coefficient associated to output and real stock prices, it does suggest a positive relationship between them.

As shown in Table III.5, the null hypothesis of binding theoretical restrictions can not be rejected at any standard level, and the estimated coefficients are consistent with the predictions of the theories mentioned above.

	Money Demand	PPP	Arbitrage
y_t	-1.7 (0.05)		1
f_t			-0.49 (0.03)
m_t	1		
p_t	-1	1	
ep_t^*		-1	
Likelihood Ratio Test, $\chi^2(3)$		4.98	

Note: Standard errors in parenthesis.

Identification of Shocks

The model is identified using the restrictions implied by the long-run equilibrium relationships, and long-run and short run restrictions à la Blanchard-Quah. The existence of 3 cointegration relationships implies that the system of five variables has two common stochastic trends that are driven by two structural shocks, which have a permanent effect on these variables.

The two permanent shocks are considered as a real (productivity/supply) and a nominal (change in average money supply/price convergence). The permanent real shock could possibly include productivity shocks, tax reforms, changes in labor market conditions, and more generally measures/events that affect the supply side of the economy. The permanent nominal shock could include all shocks that lead to (unanticipated) changes in the money stock relative to what is required to finance long-run real output, changes in the trend in inflation expectations, and permanent changes due to price convergence. In order to separately identify these two permanent shocks, one restriction needs to be imposed. The long-run neutrality of money, which implies that the permanent nominal shock does not affect real GDP has been imposed. This is sufficient to ensure a zero-effect of the permanent nominal shock on all real variables in the long-run.

The remaining 3 stochastic processes of the 5-variable system are driven by transitory shocks, of which identification requires the imposition of two restrictions. The restrictions on the effects of the transitory shocks on the short-run dynamics of the variables exploit information about lags in the propagation mechanism, sources of rigidities (e.g., contracts length), and other stylized facts. The following two restrictions have been imposed: (i) cost push shocks do not have an immediate impact on output, and (ii) liquidity preference shocks do not have an immediate impact on output and domestic prices.

Although these restrictions can not be tested since the model is exactly identified, their accuracy can be assessed through the analysis of the impulse response functions.

Impulse Response Analysis

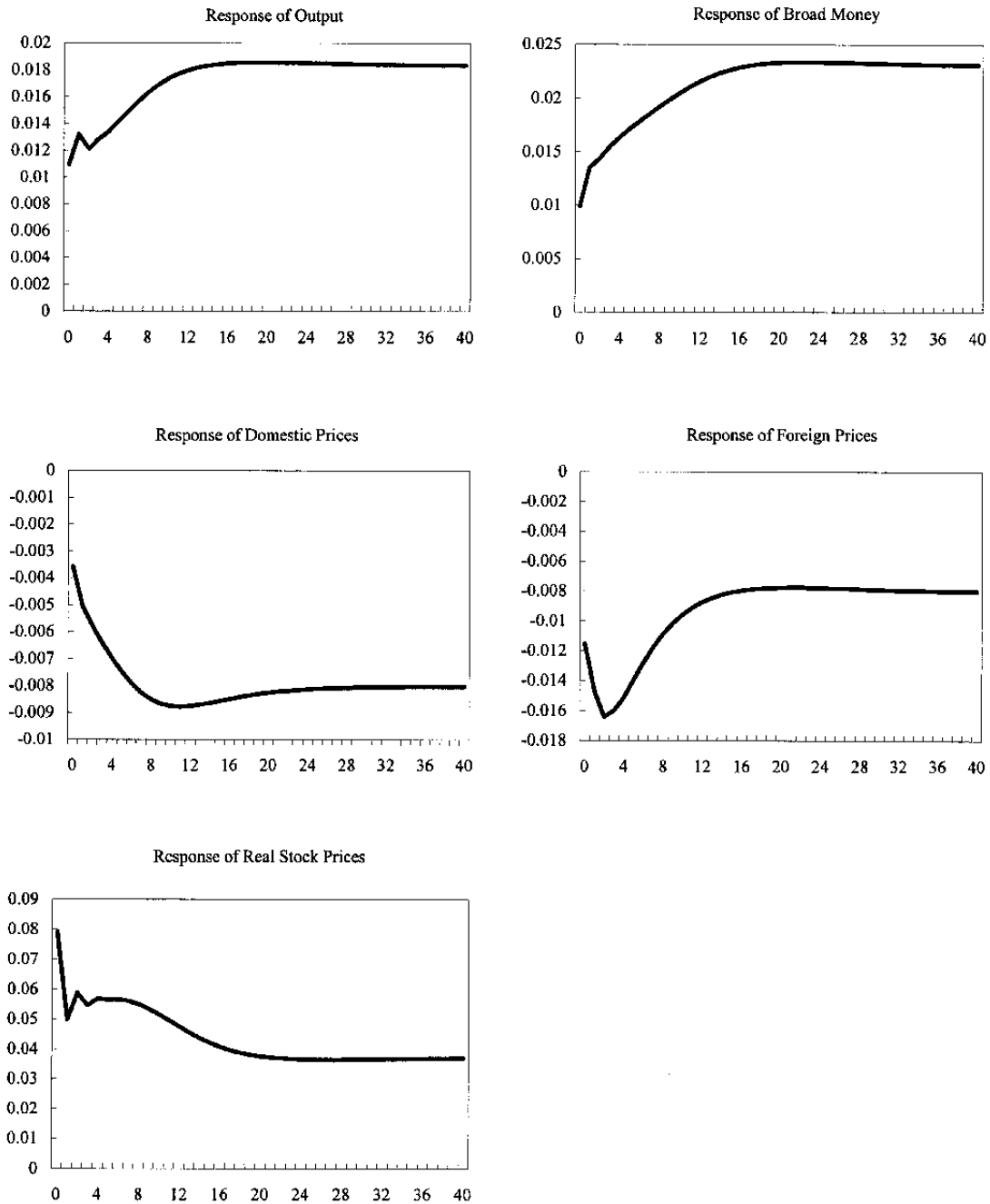
Figures III.5–III.9 present the responses of the variables to the five shocks. Overall, all responses corroborate the predictions of standard economic theory, which provide support to the identifying restrictions that have been imposed.

A productivity shock leads to a permanent increase in output, real stock prices, money supply, and a permanent decline of the price level. Note that the responses of money and the price level imply a permanent increase in real cash balances. A nominal shock (permanent change in the money supply/price convergence) has transitory but persistent effects on real variables and permanent effects on all nominal variables. Output increases temporarily above its permanent level (after a temporary fall for two quarters). Real stock prices rise for about eight quarters and then fall following an increase in the price level and decline in broad money. The positive effects of the liquidity preference shock on output are short-lived and reversed after six quarters. This shock leads to a temporary gradual increase in the price level and a decline in broad money. A cost push shock reduces temporarily output, real stock prices and broad money. After an aggregate demand shock, output and the price level increase, while real stock prices and broad money decline.

Permanent and transitory components

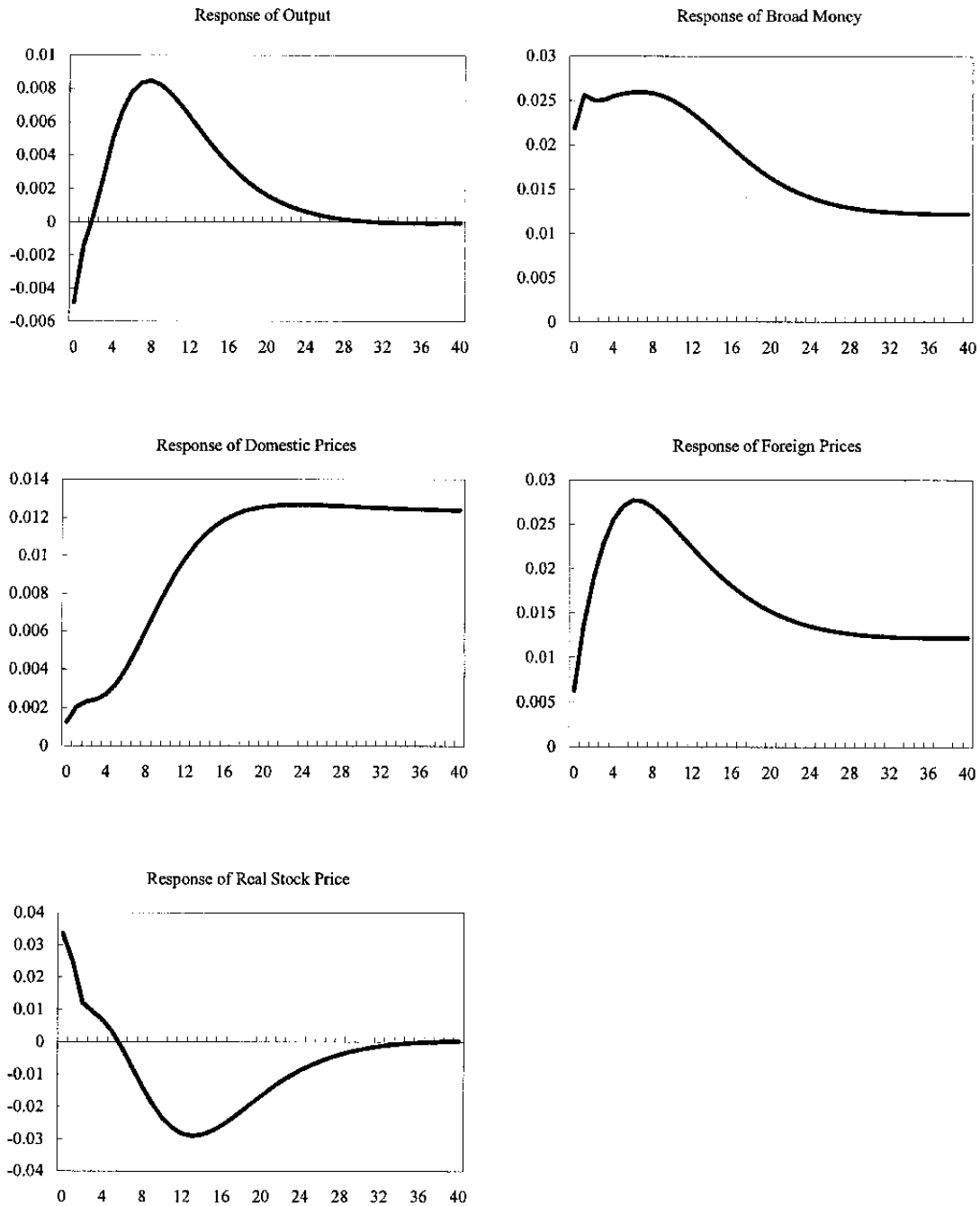
20. Figures III.10–III.11 present the actual levels of the variables of the system and estimates of their permanent and transitory components. The estimates help for example to identify periods during which deflation has been accompanied with increased productivity (permanent component of output), insufficient amount of money chasing real goods and services (transitory component of broad money), or negative swings in investors' sentiment.

Figure III.5. Responses to Productivity Shock



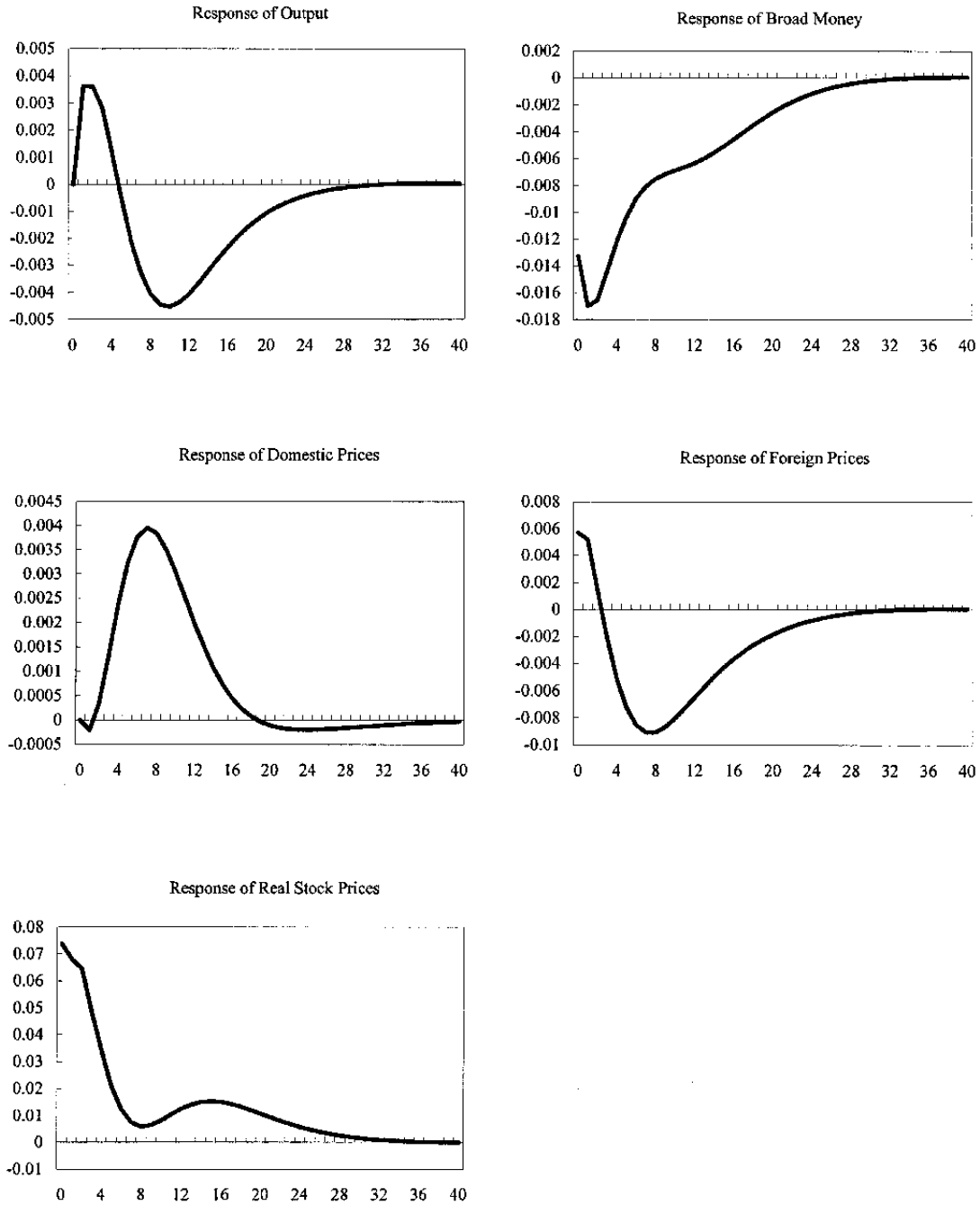
Source: Staff estimates.

Figure III.6. Responses to Permanent Nominal Shock



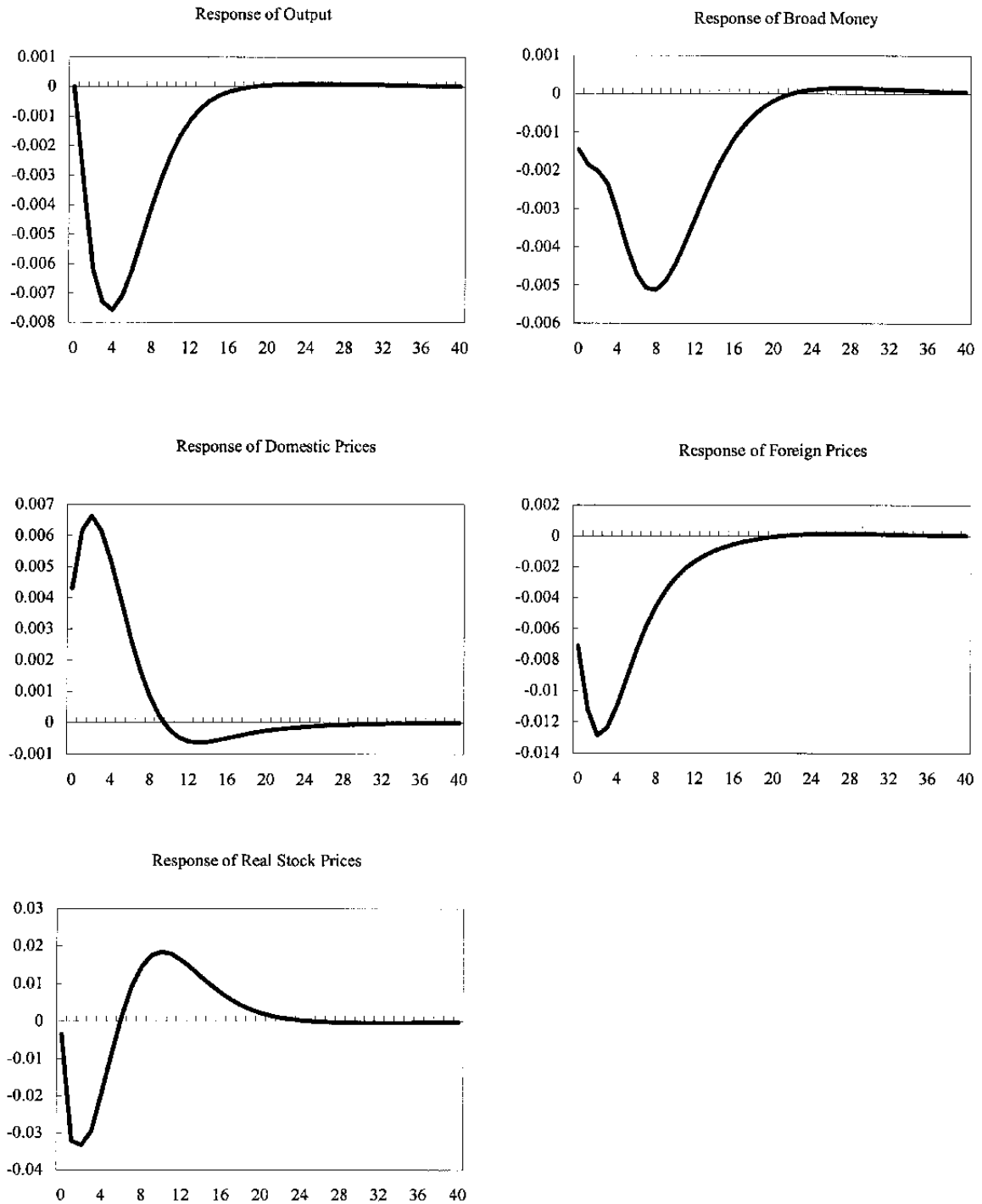
Source: Staff estimates.

Figure III.7. Responses to Liquidity Preference Shock



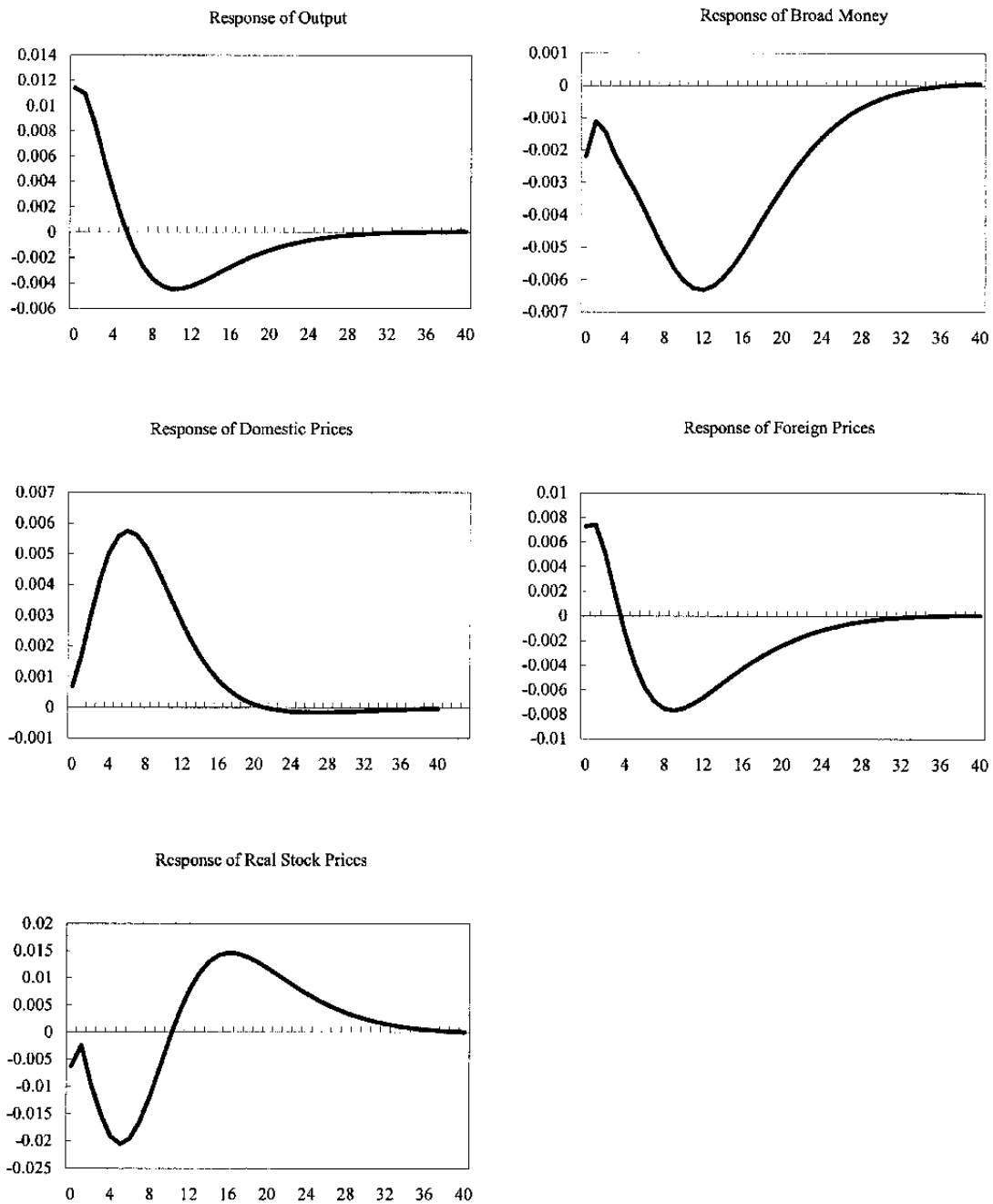
Source: Staff estimates.

Figure III.8. Responses to Cost Push Shock



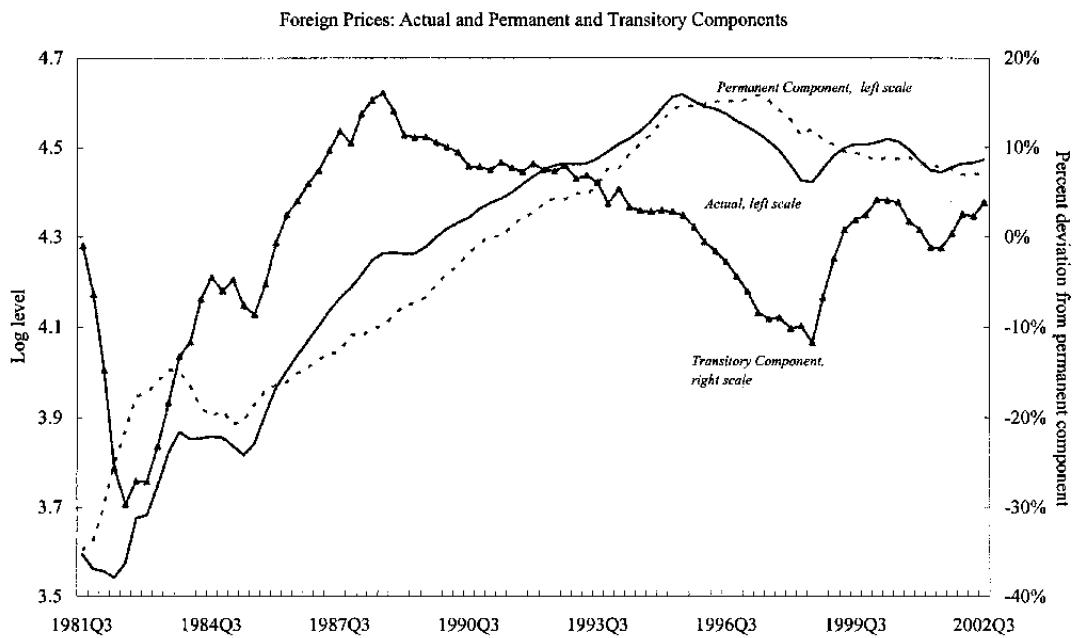
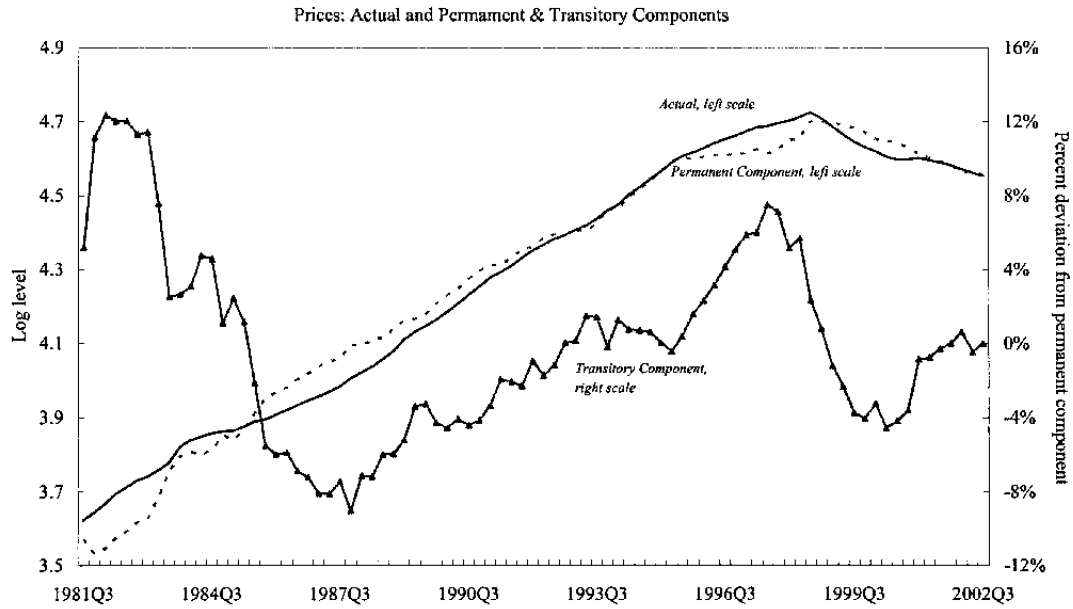
Source: Staff estimates.

Figure III.9. Responses to Aggregate Demand Shock



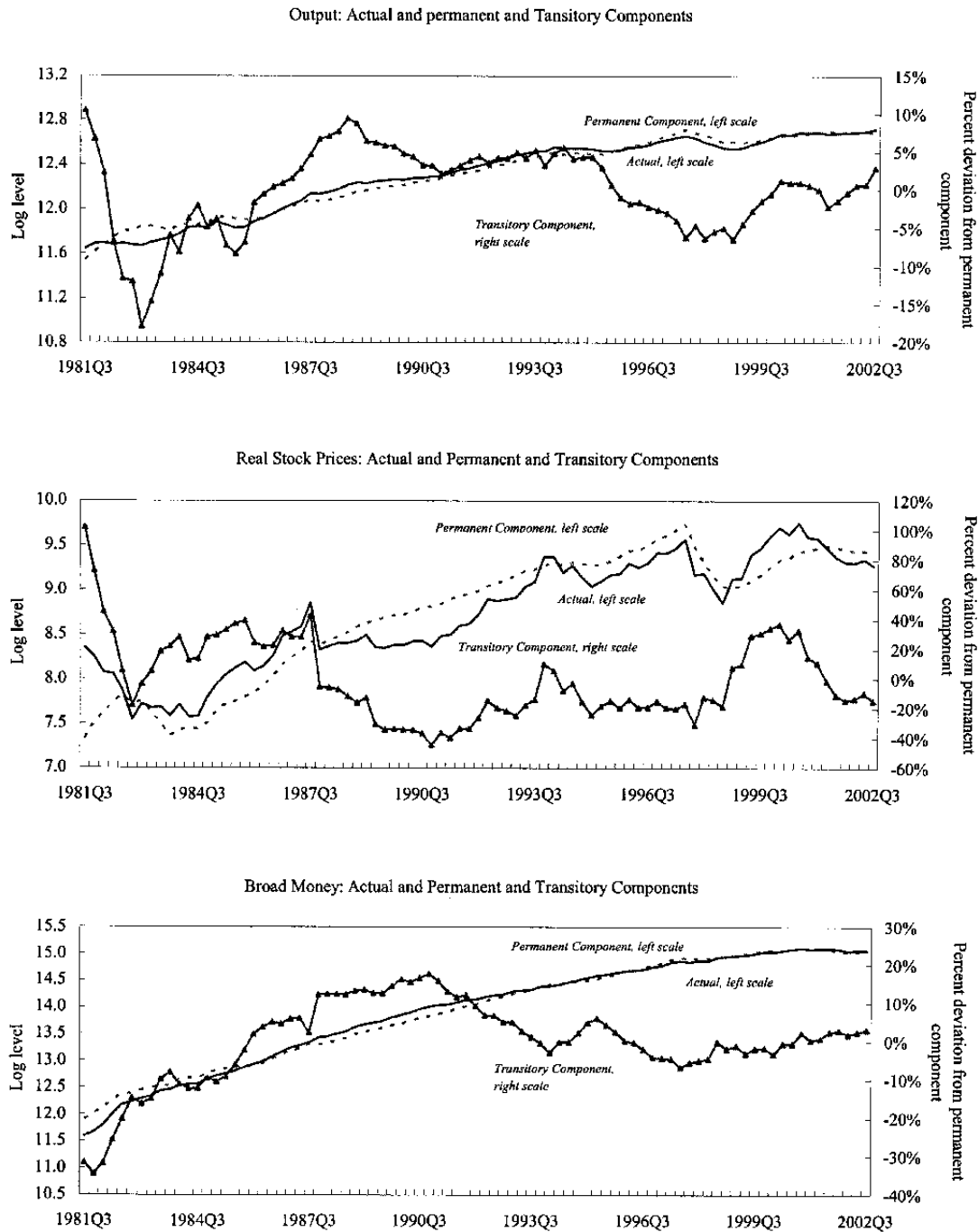
Source: Staff estimates.

Figure III.10. Permanent and Transitory Components of Prices



Source: Staff estimates.

Figure III.11. Permanent and Transitory Components of Other Variables



Source: Staff estimates.