

INTERNATIONAL MONETARY FUND

**Deflation: Determinants, Risks, and Policy Options—
Findings of an Interdepartmental Task Force¹**

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I. INTRODUCTION AND SUMMARY

1. There has recently been a marked increase in concerns of a generalized decline in prices in both industrial and emerging market economies. With Japan, China, and several other Asian economies already experiencing declining prices, the worry has been that deflationary pressures could deepen, and even spread more widely. This is against a background of massive declines in global equity markets; significant excess capacity and widening output gaps; repeated disappointments over the pace of global recovery; geopolitical uncertainties; and the impact on activity of higher oil prices.
2. This is the second time in the past five years that widespread concerns about deflation have come to the fore—the first being during and in the aftermath of the Asian crisis. Public discussion in many countries, including the United States and Germany, has centered on risks of the onset of deflation, with increasing attention levied to such risks by policymakers. These developments are notable given that for over four decades markets and policy makers have been more concerned about inflation than deflation.
3. In light of the above, an interdepartmental task force investigated issues related to the causes and consequences of deflation, the conjunctural risks in individual economies and globally, and policy options. This paper presents the findings of the task force and focuses on four areas:
 - Analytical Framework (Section II): This section discusses issues related to the measurement, determinants and costs of deflation.
 - Historical Experiences (Section III): An evaluation is undertaken of deflation in the 19th Century and during the Great Depression, along with the recent experience of Japan and China.
 - Risk Assessment (Section IV): A central part of the paper focuses on developing and implementing a framework for assessing deflation risks using three complementary approaches. First, it computes an *index of deflation vulnerability* based on a set of indicators for each of thirty-five of the largest industrial and emerging market economies—accounting for over 90 percent of global GDP. The index reflects developments in aggregate prices, outputs gaps, asset markets, and credit and financial markets. Second, an *expectations-augmented Phillips curve* provides an estimate of the size of the deflationary shock (increase in output gap and unemployment gap) that would be required for the onset of deflation, or persistent deflation. Third, a *case study* examines China's role in transmitting deflationary impulse.
 - Policy Response (Section V): The section reviews options available to policymakers both before and after the onset of deflation.

Task Force Conclusions

Analytical Framework and Historical Experience

4. Both demand and supply shocks can lead to deflation. However, in the former case declining prices are likely to accompany falling demand for goods and services, while in the latter, declining prices might be accompanied by increases in output. Nonetheless, deflation is seldom benign. Regardless of the source of the shock, it leads to a redistribution of income from debtors to creditors. In addition, credit intermediation can be distorted as collateral loses value. Given the zero interest-rate floor, the effectiveness of conventional monetary policy is curtailed—of particular concern when output is weakening. Persistent deflation risks turning into a deflationary spiral of falling prices, output, profits, and employment.

5. Deflation can be costly, and is difficult to anticipate. Deflation was not uncommon in the 19th Century, but even then its duration was often unanticipated. In the late 1920s and early 1930s, U.S. policy makers exacerbated deflation by underestimating its consequences and by failing to take aggressive action. In contrast, countries that exited the Gold Standard earlier—such as Sweden and Japan—recovered from deflation relatively quickly. Historically, deflation generally muted growth prospects, although it was mainly during the Great Depression that the most severe effects of deflation were felt.

Risk Assessment

6. Based on the *Index of Deflation Vulnerability*, the risk of an onset of deflation in a number of economies is seen to be relatively high and has drifted upward over the past several years. The risk occurs against a background of post-war low inflation rates; large output gaps; bursting of the equity price bubble; rising banking sector stresses in some economies; and declining credit growth.

- Asian economies, Japan in particular—but also Hong Kong SAR and Taiwan Province of China—are at risk of worsening deflation. Deflationary expectations appear to be entrenched, and in Hong Kong SAR, policy is constrained. In China, the strong pace of activity and policy stimulus already in the pipeline are likely to contain deflation. However, strains may arise in China from the large pool of underutilized labor and excess capacity in many sectors.
- In the euro area, core inflation has been slow to decelerate, and except for Germany, risk of deflation remains low in the major countries. Germany suffers from a weak macroeconomic environment, large and increasing output gap, high unemployment, and banking-sector strains, with limited policy options. Outside the euro area, Switzerland appears to have a moderate risk but—unlike Germany—there is greater scope for policy measures.
- In the United States, despite the lingering effects of the bursting of the equity price bubble, risk of deflation appears relatively low. The lower risk reflects an expected narrowing in the output gap; relief provided by a recent depreciation of the U.S.

dollar; the resilience in the financial sector; the availability of policy stimulus; and the explicit willingness of policy makers to take preemptory action.

- The task force did not find evidence to support strong concerns of generalized global deflation.² It also did not see any compelling evidence of widespread international transmission of deflation. However, the high correlation of business cycles across countries creates a non-zero, but still low, probability of a simultaneous decline in prices.

Policy Response

- Policies can be effective in warding off deflation, but only if preemptive, forceful, and sometimes unconventional steps are taken. Correspondingly, deflation is more likely, or more likely to be persistent, when policy is constrained, or not sufficiently forward-looking, or when policymakers are too dismissive of their ability to act.
- It is better to prevent deflation than to try to cure it, and monetary policy must take the lead. Since the risks of deflation are asymmetric, policy must be attuned to deflationary impulses in a low inflation environment. Further, because these impulses can also impede the monetary transmission mechanism, aggressive action is required. At the zero bound on nominal interest rates, additional unorthodox measures may be needed. Stimulatory fiscal policies can play an important complementary role; their beneficial effects could be enhanced if measures are adopted to raise the rate of return to the economy, so as to spur investment and output. Structural reforms, particularly those improving credit intermediation, could also be beneficial.

II. MEASUREMENT, DETERMINANTS AND COSTS

A. Definition and Recent Experience

7. Deflation is defined as a sustained decline in an aggregate measure of prices such as the consumer price index or the GDP deflator. One or two quarters of price declines, while technically constituting deflation, would not be worrying. However, even mild but continuous deflation could be a cause for concern, as it may increase economic uncertainties, distort resource allocation, entail distributional consequences, and lead to subpar growth performance. This definition precludes characterizing deflation in terms of changes in relative prices. In any economy, there will always be sectors where prices are falling in relative, or even absolute, terms. This reflects the normal operation of the market

² The SARS epidemic could have substantial demand side effects with adverse consequences for the pace of activity and deflationary pressures in several countries. The analytical work in this report was completed before the extent of the fall out from SARS was recognized.

mechanism, whereby changes in sectoral prices play a central role in resource allocation.³

8. In a number of industrial and emerging market economies, broad indices of goods prices have recently been declining (Charts 1 and 2 and Roach, 2002a). But with the weight of goods in CPI falling over time (averaging around only 25 to 35 percent in the G-7 economies) and services playing an increasingly important role, it is not clear that deflation in tradable goods sectors per se ought to be a concern. It has been suggested that deflation in goods prices may be a harbinger of developments in the services sector, since many service activities which previously had been essentially domestic oriented or shielded from competitive pressures are no longer so (Roach 2002b). This has been particularly evident in the case of financial and telecommunications services, but it now applies to several others also. However, there is currently little convincing evidence of a broad-based decline in services prices.

9. The impact of large asset price declines on balance sheets and aggregate demand is sometimes associated with deflation. For example, the U.S. stock market crash in 1929 presaged a period of widespread bankruptcies, collapsing demand and prices, and ultimately the Great Depression. The decline in Japanese equity and land prices in the early 1990s has been associated with a prolonged slide in activity and deflation. As Kiyotaki and Moore (1997) show, asset price declines have a severe impact on credit-constrained firms: the declines can spill over from one sector of the economy to another, and their effects can persist over time and become magnified. Nonetheless, while sharp declines in asset prices may reflect a heightened vulnerability, such declines by themselves do not constitute deflation (Bordo, 2002).⁴

10. Although the CPI is used as the main indicator of deflation, it is subject to a variety of biases. In almost all countries, consumer price indices are “Laspeyres” base-weighted, and hence do not allow for substitution possibilities. A second source of bias can arise when shifts to lower price discount outlets are inadequately reflected. A third element relates to new or improved products, whereby prices included in the CPI inadequately reflect these products’ characteristics. The magnitude of the overall bias due to these three factors varies across countries, but is generally perceived to range between ½ to 1 percentage point.⁵

³ This definition would also exclude the impact on the general price level of terms of trade shocks, such as a decline in oil prices whose effects might be beneficial, but also temporary.

⁴ Falling house prices may be accompanied by falling rental costs, which may impact standard measures of inflation. However, even if the decline in rents, or the rental component, is large, this by itself would not be expected to result in deflation.

⁵ In the United States, the first two were estimated to overstate inflation by up to 0.4 percentage points, and the third added as much as another 0.7 percentage points. While recent changes to the methodology for computing the U.S. CPI have helped to reduce some of the bias, Hausman (2002) suggests that these improvements fix only secondary issues, and that substantial bias still continues. Ariga and Matsui (2003) suggest that Japanese CPI may have an upward bias of at least ½ percentage point.

11. In view of the measurement bias, it is likely that measured inflation of less than 1 percent may already be close to price stability, or even reflect declining prices. Table 1a provides an illustration of the incidence of declining prices and inflation below 1 percent for a large sample of industrial and emerging market countries. The estimates show a sharp increase in the proportion of country-months showing annual CPI inflation of less than 1 percent over the past five years. While the higher incidence first became apparent during—and in the aftermath of—the Asian crisis, it has continued over the past three years, especially in emerging markets. A similar picture holds with regard to the more cyclically volatile PPI inflation (Table 1b).

Table 1a. Incidence of Deflation and Low Inflation¹: Consumer Prices
(in percent)

Deflation and Inflation less than 1 percent

	1980-84	1985-90	1991-96	1997-02	1997-99	2000-02
All Countries	1.8	9.8	5.0	23.5	24.8	22.3
Industrial Countries	0.1	11.8	10.2	23.7	31.0	16.3
Emerging Countries	3.2	8.3	1.4	23.4	20.7	26.3

Deflation

	1980-84	1985-90	1991-96	1997-02	1997-99	2000-02
All Countries	0.9	3.2	1.2	11.4	9.7	13.1
Industrial Countries	0.0	3.7	2.5	7.4	6.5	8.3
Emerging Countries	1.6	2.8	0.3	14.1	11.9	16.3

Table 1b. Incidence of Deflation and Low Inflation¹: Producer Prices
(in percent)

Deflation and Inflation less than 1 percent

	1980-84	1985-90	1991-96	1997-02	1997-99	2000-02
All Countries	12.8	27.4	29.0	40.8	45.3	35.7
Industrial Countries	8.3	36.0	45.5	57.2	66.2	47.3
Emerging Countries	17.2	19.6	16.5	28.7	30.2	27.0

Deflation

	1980-84	1985-90	1991-96	1997-02	1997-99	2000-02
All Countries	8.0	21.7	19.1	29.1	34.0	23.6
Industrial Countries	2.6	27.4	30.0	37.9	45.1	29.9
Emerging Countries	13.3	16.5	10.9	22.7	26.0	18.9

¹ Number of country months with yoy inflation less than 1 percent or negative, as a percent of total.
Data based on 35 of the largest industrial and emerging market economies.

12. The incidence of an actual decline in prices has also increased markedly in recent years. The number of countries experiencing a decline in consumer prices rose from around 1 percent in the first half of the last decade, to over 10 percent in the last five years (Table 1a). The proportion has continued to increase in the most recent period for both the industrial and emerging market economies. Although less dramatic, there has also been a noticeable increase in incidence of PPI deflation, particularly in emerging markets, in the last five years (Table 1b).

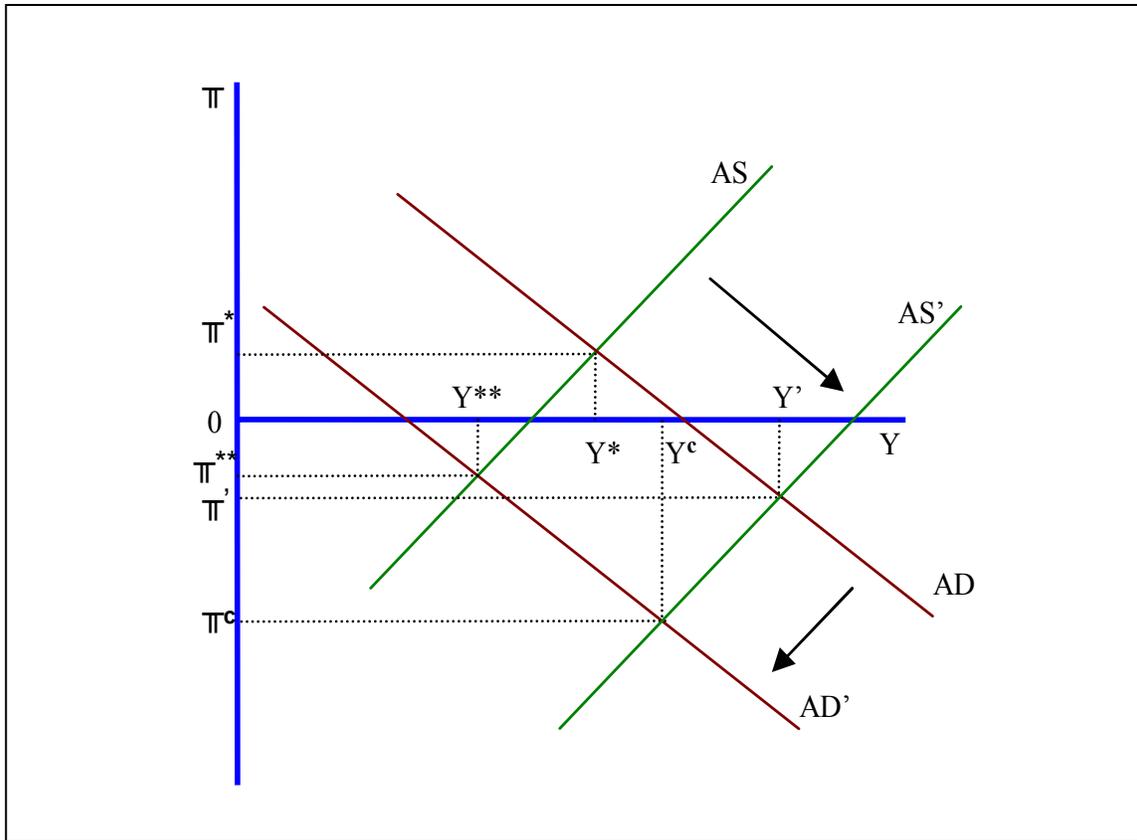
13. The background to the increased incidence of deflation is the decline in inflation rates over the past decade (Charts 1 and 2). Among industrial countries, CPI inflation has declined to an average of below 2 percent, a rate not seen since the 1950s (Chart 3). Even among emerging market economies, inflation rates are now at their lowest level since detailed data became available in the late 1960s. Low inflation confers significant economic benefits, but it also reduces the buffer against deflation and against hitting the zero bound on nominal interest rates. This raises a number of questions, discussed below, regarding factors that can lead an economy to move from disinflation to deflation, and the costs of deflation.

B. Determinants

14. The onset and persistence of deflation can reflect a variety of factors. Consider an economy initially at a full-employment equilibrium (π^*, Y^*) , given by the intersection of aggregate demand (AD) and aggregate supply (AS) (Figure 1). A sufficiently large negative demand shock that shifts the aggregate demand from AD to AD' can push the economy to a deflationary region (π^{**}, Y^{**}) with declining prices and lower output. Such a shock could reflect a severe cyclical downturn, the bursting of an asset price bubble, or excessively tight policies. The effects of the shock could be amplified through a deterioration in confidence and expectations of declining prices, exacerbating the initial deflationary impulse. The alternative to a demand shock is a positive supply shock that shifts the aggregate supply curve downwards to AS' where output is higher, even while prices are declining (π', Y') . Positive supply shocks can arise from a variety of factors including technological innovation and productivity growth, gains from trade liberalization, or heightened expectations of long-term political and economic stability. An economy may be subject to a combination of demand and supply shocks that could exacerbate the deflationary pressures but ameliorate the effects on output (π^c, Y^c) .

15. Once prices start declining, the risk of adverse dynamics is heightened, particularly in the case of a demand shock. Following such a shock and the onset of deflation, nominal interest rates will likely decline. However, given the zero bound on nominal rates, real interest rates will remain positive, and the greater the deflation, the higher the real rates. Monetary policy loses efficacy since demand for money is more or less infinitely elastic at interest rates close to or at zero. In terms of the standard IS-LM framework, this implies that if the IS curve intersects the LM curve at the latter's flat region, increases in money supply would shift the LM curve to the right to LM', but have no impact on the interest rate or output (Figure 2). This is the classic liquidity trap.

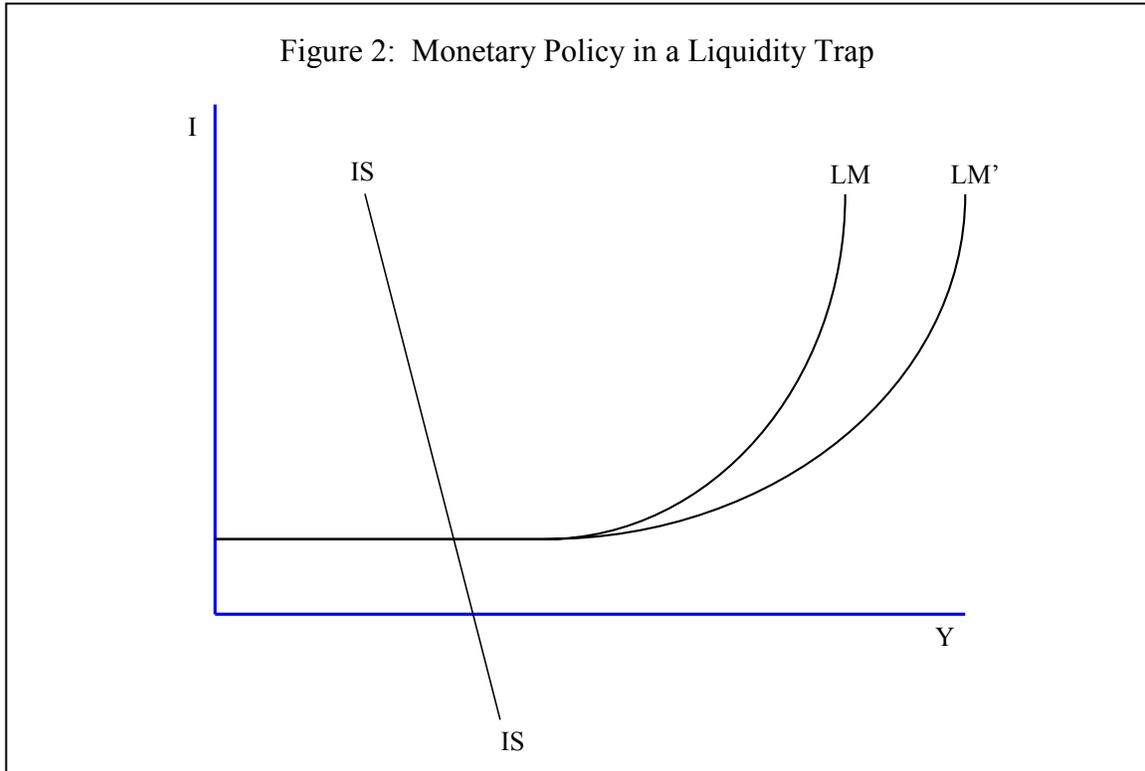
Figure 1: Aggregate Demand and Supply Shocks



16. From an inter-temporal perspective, the liquidity trap holds because of entrenched expectations in the presence of nominal rigidities (Krugman, 1998). As long as agents do not believe that the future path of money supply will be changed, they will not respond to current increases in money supply which they deem to be temporary. This can then become the fundamental challenge to policy in a deflationary environment—to *credibly promise to raise the price level not only in the present, but in the future as well* (Eggertsson and Woodford, 2003).

17. The role of expectations is crucial in the persistence of deflation. Suppose that as a result of an adverse demand shock, the price of current goods relative to the price of future goods (P/P^e) is too high, reducing expenditures today in favor of higher (expected) expenditures tomorrow. This means that the economy has an excess of saving over investment in the current period (Krugman, 2002). The equilibrium could be attained by lowering P or raising P^e . However, once the current price level begins to decline, the expected price level may also begin to decline, and activity slows further. As a result, the output-inflation dynamic itself can change. There is a possibility that the Phillips curve flattens, with the result that the aggregate demand shock leads to large declines in output and employment without initially having much impact on prices (Nishizaki and Watanabe, 2000).

But pronounced weakness in activity may be followed by an increasing downward pressure on prices. A deflationary spiral can thus form as declining prices reinforce expectations about future price developments.



International Transmission of Deflation

18. Deflationary impulses can be transmitted across countries. This was not an uncommon occurrence under the Gold Standard. However, in a global economy with generally flexible exchange rates and independent policy regimes, a generalized international propagation of deflation appears unlikely.

19. The scope for bilateral transmission of deflation may also be limited. Suppose an economy is witnessing rapid productivity growth, and has large excess capacity relative to its trade competitors. Its unit costs of production will be rising at a slower rate than the competitors', giving it an advantage in the tradable goods sectors. This would lead to an increase in its market share, and depending on the size of the tradable goods sectors could result in a large demand shock for the competitors. In response, the latter may need a depreciation of the real exchange rate, which would normally be achieved by a combination

of nominal exchange rate depreciation and lower domestic unit costs (and prices).⁶ If the nominal exchange rate does not adjust adequately, the burden of adjustment would be on prices. This may cause significant dislocation in these sectors, especially if there are structural rigidities that prevent a reallocation of resources. However, it is unlikely that this process could lead to generalized deflation, given the share of trade (actual and potential) accounted for by any single country, and the possibility of offsetting policy measures. Also, high growth in the large economy could boost demand for imports from the competing economies, partially mitigating the adverse shocks.

20. Another important impact of an economy undergoing rapid productivity growth experiencing a decline in unit costs and export prices will be significant terms of trade gains for its trading partners. This would be reflected in an increase in real incomes and demand growth, which could have substantial positive multiplier effects. These effects could mute the impact of deflationary pressures noted above, depending on the share of tradables in consumption in the importing countries.

C. Costs of Deflation

21. Assessing precisely the costs of deflation is challenging. First, the effects on output of falling prices per se have to be isolated from those of other factors, such as declining equity prices or rising risk premia. Second, it is necessary to quantify the cost of falling prices in terms of output losses. Nonetheless, there is considerable theoretical and empirical evidence to suggest that deflation can be a cause for concern.

22. The costs of deflation depend on its source as well as on its extent and duration. Deflation may not entail significant costs and be accompanied by growth in output under certain circumstances. These include temporary price declines due to a strong expansion in aggregate supply, as for instance, following a productivity spurt, falling import prices, aggressive trade liberalization, or other positive external shocks. Under such circumstances, deflation is the manifestation of an adjustment to a new equilibrium in the context of rising incomes. It is thus unlikely to become anchored in agents' expectations and have sustained deleterious effects on domestic demand and the pace of activity. Recently, the IT revolution, globalization, and deregulation have given a boost to productivity growth across a broad range of goods and services sectors, reducing inflationary pressures. Similar episodes of productivity spurts are believed to have played an important role in deflationary episodes during the 19th century (see below).

⁶ In the usual Balassa-Samuleson framework, a positive productivity shock in the tradeable goods sector is expected to lead to an appreciation of the real effective exchange rate as an equilibrating mechanism. This adjustment, however, happens over a period of time. Moreover, this mechanism could be impeded in certain circumstances because of the presence of large excess capacity and underutilized pool of labor, resulting in the persistence of the shock.

23. However, aggregate demand driven deflation is likely to entail significant costs, in part because of various nominal rigidities. These rigidities can be traced back to financial intermediation, including the zero-interest rate floor, as well as in the labor market. While the estimates due to the former are considered to be significant although difficult to quantify precisely, studies of the downward rigidity of nominal wages suggest that deflation could impose costs amounting to several percentage points of GDP (Akerlof et.al., 1996).

Collateral and Balance Sheet Effects

24. In a period of deflation, particularly if unanticipated, the losses of the debtors may not cancel out against the gains of the creditors because collateral loses value. The loss in collateral may be particularly severe when deflation is accompanied by sizable reductions in asset prices.⁷ The wholesale disposal of collateral could also intensify downward pressure on asset prices. As collateral loses value and bankruptcies ensue, banks need to reevaluate their loan portfolios but may find it hard to distinguish between good and bad risks. As a result, they either raise financing charges (the external finance premium rises) or they cut back on lending that they might otherwise have undertaken, resulting in a fall in aggregate demand.

25. By reducing collateral from firms' balance sheets, deflation also reduces the effectiveness of monetary policy in escaping from deflation. Near the zero bound, the policy-determined interest rate plays a less important role in determining the borrowing cost, since the external finance premium becomes increasingly important. In an extreme situation, the economy can end up in a debt-deflation trap. The balance sheet channel also explains why deflation from a positive supply shock may not be as deleterious as from a negative demand shock since rising output and incomes can help offset some of the effects of deflation on balance sheets.

Sticky Wages

26. Aggregate demand-induced deflation can reduce employment when nominal wages are rigid downwards. With sticky wages, price declines cause real wages to rise, profit margins to fall, and employment to be cut back. This may set off a deflationary cycle. Akerlof et al (op.cit.) calculate that with 1 percent annual rate of deflation and downward rigidities in nominal wages, unemployment in the United States could rise from a long-run equilibrium rate of 5.8 percent to 10.0 percent. Cumulative output losses could amount to a multiple of the roughly 4 percentage point loss in employment. Most other studies of nominal wage

⁷ As deflation raises the real value of outstanding debts contracted in nominal terms while it generally does not raise debtors' real capacity to service their debts, it can lead to bankruptcies which may entail real economic costs. This effect—based on Fisher's (1933) debt-deflation-theory— hinges on the assumption that deflation is not fully anticipated.

setting, while uncovering significant rigidities, estimate the costs to be less important but still far from insignificant.⁸

27. While sticky wages may be destabilizing in response to sustained aggregate demand shocks, they could stabilize output in response to temporary shocks (Keynes, 1936 and Tobin, 1975). DeLong and Summers (1986) show that by inhibiting expectations of sustained price declines from becoming anchored (because consumption is sustained and likelihood of increases in *ex-ante* real interest rates is forestalled), sticky wages may help prevent a deflationary cycle. This may also suggest why structural factors—such as the introduction of a legal minimum wage, unemployment benefits, and support for low income groups—have been associated with a decline in the cyclical volatility of output. However, the failure of wages to adjust in response to sustained declines in demand would eventually lead to rising unemployment and the costs noted above.

Deflation versus Inflation or Disinflation

28. Because of the imperfections in financial and labor markets, the costs of deflation and inflation—particularly if unanticipated—are not symmetric, regardless of the underlying economic shocks. The costs in terms of efficiency losses for resource allocation and an increase in uncertainty from moving from zero to very low inflation rates (below 2 percent, say) are likely to be negligible.⁹ In contrast, the adverse effects due to sustained mild deflation can be substantial.

29. Deflation and disinflation have some similar effects on activity but, because of market imperfections, deflation entails higher costs. The zero interest rate floor is more likely to become a binding constraint under deflation than disinflation; the same holds for wage rigidities at the zero bound. Furthermore, the “collateral” and “balance sheet” effects may well be stronger under unexpected deflation than disinflation. For example, assessments of creditworthiness typically place a disproportionate weight on the latest loan-to-asset values or loan-to-income/profit ratios. While the fundamental ability of a debtor to service a loan may deteriorate to the same degree under unexpected deflation as under unexpected

⁸ On the United States, see McLaughlin (1994), Akerlof et.al, (1996), Card and Hyslop (1997), Kahn (1997), and Altonji and Devereux (1999); for the United Kingdom, see Smith (2000) and Nickell and Quintini (2000); and for Germany, see Decressin and Decressin (2002). A caveat is that the behavior of nominal wages during periods of inflation—which is most of the available evidence—may be different from the behavior of nominal wages in periods of deflation: some of the available evidence suggests that wage rigidity may be reduced during deflation.

⁹ The arguments about the asymmetry in costs of deflation and inflation underscore the importance for policymakers to target an appropriate inflation rate. See Part V for a discussion of this issue.

disinflation, banks are more likely to cut credit lines under deflation for fear of not recovering the book value of the loan principal. Furthermore, the disintermediation that may follow the financial distress triggered by unexpected developments in prices may be larger under deflation than under disinflation (for historical evidence on the complementarity between price and financial stability, see, for example, Bordo et. al., 2001).

III. HISTORICAL EXPERIENCES OF DEFLATION AND POLICY LESSONS

30. In view of the above discussion of the determinants and costs of deflation, it is useful to examine the empirical evidence regarding persistent deflation. Prior to the onset of deflation in Japan from mid-1990s onward, there had been few sustained deflationary episodes in the post-Second World War period in the major economies. Among industrial countries Canada, Norway and Sweden had small and short-lived declines in consumer prices in the late 1980s; and the private consumption deflator fell in Germany in 1986 (mainly due to a supply shock) and in Japan in 1988. Several Scandinavian countries experienced a bursting of an asset price bubble, a sharp decline in output and severe banking sector distress in the late 1980s and early 1990s. However, these were not generally accompanied by falling aggregate prices. A number of emerging market and developing countries also experienced declines in prices up to the mid 1990s. But the declines were generally short-lived reflecting natural disasters or severe declines in terms of trade of commodity exporters (IMF, 1999; the CFA Franc Zone countries have experienced similar price shocks). Nonetheless, as noted earlier, the frequency of price declines in both industrial and emerging market countries has been clearly increasing over time.

31. For an assessment of periods of pronounced and sustained declines in prices, it is therefore necessary to consider the pre-Second World War period. The discussion below focuses on two periods: the experience of industrial countries during the last quarter of the nineteenth century when mild but persistent deflation in the first half of the period was followed by inflation in the second half; and second, the experience of the United States, Japan, and Sweden in the 1930s when severe deflation lasted for a shorter period, but was accompanied by far severe consequences.¹⁰

32. A review of the historical episodes yields three main conclusions: *first*, deflation and deflationary expectations can take root surprisingly quickly; *second*, deflation can impose severe economic costs, unless it reflects primarily positive supply shocks; and *third*,

¹⁰ The recent experience of Japan, where mild deflation has been accompanied by near stagnation in output, and a very different experience of China where less persistent deflation has been accompanied by strong productivity gains and output growth are examined in Section IV below.

determined and vigorous policies can make a critical difference to ending deflation effectively and relatively quickly.¹¹

Deflation in the Nineteenth Century

33. From a broader historical perspective, secular increases in the aggregate price level are very much a phenomenon of the second half of the twentieth century.¹² For much of recorded history, prices rose because of supply shocks, including military conflicts or harvest failures, but abstracting from these factors, prices were as likely to increase as decline: there were few episodes of sustained inflation. Over the nineteenth century as a whole, there was a marked decline in the aggregate CPI in several major economies (Chart 4). In the United States, the CPI index in 1900 was around half its value in 1800; in the United Kingdom, it was a third lower.¹³

34. Prices declined in large part because of the constraints imposed by the Gold Standard in an environment in which there was a significant excess demand for gold. Increasing demand for money was being driven by technological change and population growth. At the same time, the supply of gold was largely fixed. The constraints imposed by the limited supply of gold manifested in part in the deflationary episodes and relatively weak growth: despite the extraordinary technological revolution, annual U.S. real GDP growth per capita was just above 1½ percent over the entire century; in the U. K. it was just under 1 percent.

35. Although there is some debate on the precise effects of deflation specifically during the last quarter of the nineteenth century, there is a broad consensus on the following: (i) periods of deflation were generally associated with significant social and political unrest as producers (especially farmers) faced rising debt burdens and bankruptcies; (ii) there was significant volatility in output growth, with deflationary periods marked by frequent financial crises; and (iii) periods of inflation, such as the last decade of the nineteenth century, had generally higher growth than periods of sustained deflation during the decade of the 1870s and early 1880s (Lindert and Williamson 1985, Frieden 1993, and Bordo and Redish 2003).

36. Nonetheless, GDP growth was on average positive in periods of deflation. There are two main explanations for this: *First*, periods of declining prices occurred at times of relatively favorable supply shocks. These included major episodes of diffusion of new technologies including the spread of railways and electrification. *Second*, prices did not fall long, or far, enough to lead to expectations of a deflationary spiral becoming entrenched.

¹¹ The lessons from Japan's recent experience are consistent with these three conclusions and are discussed in Section V below; for details, see Bayoumi and Collins (1999).

¹² Why this is so is much debated. But one of the key reasons may well be the existence of discretionary monetary policy.

¹³ Taking an even longer period, the aggregate price level in the United Kingdom and the United States was virtually the same in 1900 as in 1700.

This hypothesis is supported by the behavior of long-term interest rates that did not fall during deflationary episodes. Furthermore, financial intermediation played a less crucial role in the nineteenth century, and nominal rigidities likely were less entrenched than today (Bordo et al, 2000).

Deflation in the Early 20th Century

37. Deflation in the late 1920s and early 1930s was qualitatively and quantitatively different than that during the 19th century. In the United States, the consumer price index (and the GDP deflator) declined by 24 percent from August 1929 to March 1933, after having been virtually flat from 1921 to 1929. This decline was accompanied by a fall in real GDP of almost 30 percent. Similar price declines occurred in other countries; from 1929 to 1933, prices fell by 25 percent in Japan and 20 percent in Sweden.

38. In contrast to the 19th century, a collapse in aggregate demand and credit channels, along with policy mistakes, drove deflation of the late 1920s and early 1930s. There is broad agreement that monetary factors played a crucial role both in the onset and prolongation of deflation and in the accompanying Great Depression. Friedman and Schwartz (1963) show that the initial downturn in August 1929 and the length and severity of the Great Depression were due to restrictive monetary policy that resulted in a drastic decline in money supply. Bernanke (1995) has emphasized disruptions to the bank intermediation channel—and Eichengreen (1995) the international financial channels. These factors are now generally reckoned to be more important than the stock market crash *per se*.¹⁴

39. Obstfeld and Rogoff (1996) emphasize that there is a broad consensus that the Depression was caused by an “*exogenous world-wide contraction, originating mainly in the United States and transmitted abroad by a combination of policy errors and technical flaws in the interwar gold standard*”. This conclusion is also supported by the clear divergence in economic performance between countries that abandoned the gold standard early in the Depression and others that stubbornly clung to gold.

40. In the United States, the Federal Reserve made two policy mistakes. *First*, it saw the initial collapse in prices and demand as “necessary” to correct excesses of the 1920s. It regarded the collapse as a result of nonmonetary forces— including creation of excess capacity in the late 1920s—and beyond the influence of monetary policy. The large number of bank failures in 1930 were according to its view the result of poor management and lending for speculative equity and land deals. *Second*, it tried to maintain the gold standard. While the Federal Reserve did ease, it paid no attention to the money supply. The discount

¹⁴ In addition to the latter two, the unequal distribution of income and wealth has also been noted to be a factor.

rate fell from 6 percent in early 1930 to ½ percent in the first part of 1931.¹⁵ However, bank lending had virtually stopped, and along with the high rate of deflation, real interest rates rose sharply. The gold standard was maintained until 1933.

41. Sweden and to some extent Japan provide examples of policymakers that were able to break deflationary forces through strong action.¹⁶ Sweden experienced similar, although somewhat less pronounced, deflation as the United States in the late 1920s. Consumer prices had been falling gradually, and wholesale prices sharply, since late 1928 as the gold standard transmitted deflationary pressures to Sweden. Industrial production declined by 21 percent during 1929-31, compared to a fall of 46 percent in the United States. In late 1931 Sweden left the gold standard, the Swedish central bank explicitly adopted a price level target, and implemented a policy including open market operations to achieve that target. The abandonment of gold standard itself was an immense boost to confidence and a signal that the government was not prepared to allow deflation to continue. This was supported by the price level targeting framework underlining the government's determination to end deflation. As Berg and Jonung (1999) show, there was a clear recognition that the Riksbank's commitment to price stability would anchor expectations.

42. Japan was also able to stop deflation by adopting strong measures. It had temporarily returned to the gold standard in 1929, but by 1930-31, there were sharp declines in Japanese exports, resulting in output declines and rapid deflation. Wholesale prices declined by about 30 percent in 1930-31. The gold standard was abandoned in December 1931, followed by exchange rate depreciation, a marked easing in monetary policy and large-scale government deficit spending. The Bank of Japan underwrote a substantial proportion of the government's bond issuance. These measures led to a sharp rebound in Japanese domestic demand and an end to deflation; wholesale prices rose substantially during 1932-33. However, in the absence of a clear commitment to price level targeting as in Sweden, and the rapid increase in government spending and monetization of deficits driven by war mobilization, inflation accelerated markedly in the second half of the 1930s.

IV. RISKS OF DEFLATION

43. This section provides an assessment of conjunctural deflation risks in the world economy. It shows that deflationary pressures have risen in several countries, and the

¹⁵ The discount rate was temporarily raised in response to Britain's abandonment of gold standard in September 1931.

¹⁶ It should be remembered that gold had anchored exchange rate and monetary policy for nearly two centuries. Policymakers thought it inconceivable that, aside from the occasional revaluation, the exchange rate could float freely. Bernanke (1995) notes that the gold standard and austere fiscal policies were central tenets of the French political establishment; so much so that even the Communist party in the 1930s accepted the need for them.

susceptibility to deflation is high in some of them. Moreover, the global economic environment continues to be highly uncertain not least owing to the significant declines in equity markets, large and possibly rising output gaps, and geopolitical concerns. These factors could increase vulnerabilities further. Nonetheless, it shows that the deflationary pressures are not strong enough to lead to generalized global deflation. The assessment is based on an index of deflation vulnerability computed from a set of economic and financial indicators for 35 countries. The index is complemented by an analysis based on expectations augmented Phillips curves for the G-7 economies, and a case study of China.

A. Global Deflationary Pressures

44. As Section II suggested, sustained deflation can be unanticipated even as inflation and interest rates fall close to zero. Spotting deflationary pressures is difficult since the aggregate demand shocks that push an economy into deflation may be confused with the “normal” business cycle.¹⁷ Moreover, the magnitude and effects of supply shocks may be unclear from an assessment of the price level alone. Thus a comprehensive set of indicators is required to identify deflationary pressures. The analysis in the previous sections also suggests that demand-driven deflation is more damaging than supply-driven deflation, so the indicators are primarily focused on demand shocks. Deflation driven by demand shocks may also be easier to detect. Demand-side variables are generally available at high frequencies, and they tend to move in the same direction as deflationary forces (falling prices are associated with falling output). In contrast, supply-driven deflation can be harder to discern, either because the economy appears to be improving (for example, output gaps may be closing or be positive, while prices are falling), or because supply-side data are available only with long lags and at relatively low frequencies (such as rates of return).¹⁸

45. The earlier analysis suggests four sets of indicators: (i) aggregate prices; (ii) measures of excess capacity, or output gap (iii) asset markets; and (iv) credit market and monetary indicators. In addition, structural characteristics, and the room for maneuver on the policy front play a role in the overall assessment.

46. For each of the four sets of indicators, several variables were used to assess deflation vulnerability. The variables, discussed below, were computed from the early 1990s to the present for thirty-five of the largest industrial and emerging market economies. For each variable, an examination was undertaken as to whether the variable exceeded a predetermined threshold; if it did, the economy was given a score of 1 on that count;

¹⁷ Ahearne, et. al. (2002) highlight optimistic growth forecasts for Japan that ultimately proved to be mistaken, but caused policymakers to forestall action. In the United States, the 2001 recession was not reflected in national accounts data until July 2002, a full 16 months after the recession had started.

¹⁸ Of course, a focus on demand-side indicators would make it difficult to take into account forces that predominantly reflect positive productivity shocks.

otherwise, 0 (see Appendix for details). The thresholds were determined on the basis of a variety of considerations and were cross-validated with Japan's experience in the mid-1990s.¹⁹ The scores were aggregated to compute the index. In order to account for the heterogeneity across countries in the importance of asset and credit markets, a weighted index was also computed. The discussion below first notes developments in each set of indicators, and then looks at the construction of the aggregate index.

Price Indicators

47. Consumer and producer price inflation is at post-war lows in many countries. However, inflationary expectations generally remain well anchored (Chart 5). According to both Consensus and IMF staff projections, very few countries are expected to register consumer price inflation of less than one percent: outside of the Asian region, these encompass only Germany and Switzerland. Although global oil prices have recently declined sharply, the lagged effects of the earlier higher prices could be reflected in an uptick in headline inflation rates in the near-term (Chart 6).²⁰ However, higher oil prices are also likely to have had adverse effects on activity which may increase deflationary expectations. Given the difficulty in predicting deflation and the measurement bias, price indicators with a low value (inflation of less than ½ percent) were taken as a worrying sign (see Appendix).

Excess Capacity and Output Gap Indicators

48. Excess capacity may be acting as a drag on growth in several G-7 and smaller industrial economies. GDP growth is below potential in several of these economies, and is expected to remain so (Chart 7a). From a long-term perspective, if overcapacity were a significant drag, the rate of return on capital should fall. However, in the largest economies, only Japan is showing a sustained decline in the return on capital (corporate profits as a share of the business capital stock).

49. In emerging market economies, particularly in Asia, evidence points to excess capacity in a number of economies, and in specific sectors. Staff calculations suggest that output is below potential in Hong Kong SAR, Singapore, Brazil, Poland, and Russia (Charts 7b-7c). Output gaps could be increasing in these countries, in particular in Singapore and Brazil. In

¹⁹ Given the limited number of recent deflationary episodes, it was not possible to estimate the thresholds using the usual econometric techniques. The thresholds were derived instead from the recent experience of Japan, an assessment of factors underlying deflation in Hong Kong SAR, and from other empirical evidence (for instance on the relationship between output gap and inflation). A number of simulations were undertaken by varying the size of the thresholds: the findings indicated a high degree of robustness of the results.

²⁰ There may also be some impact of increases in non-oil commodity prices, particularly grain and agricultural raw materials. With generally large inventories, metals prices have continued to be weak.

China, surveys suggest high excess capacity in several state dominated industries, which may be increasing given strong private and public investment.²¹

Asset Market Indicators

50. Since early 2000, equity markets have suffered exceptionally large corrections (Charts 8a-b). Price-earning ratios have returned to close to historical averages in several G-7 economies. However, earnings projections in many cases may still be overoptimistic—exposing downside risks (Chart 9). Over the same period, house prices have risen considerably across several countries, sustaining household balance sheets. Conversely, the decline in house prices in Japan, and to a lesser extent Germany, has aggravated the adverse effects of declining stock prices. Stock markets in emerging market economies have also declined significantly: the MSCI index of emerging market equities has fallen by over 50 percent (in U.S. dollar terms) since early 2000. The assessment of the deflationary impulse from an equity price shock to household and corporate balance sheets took into account the magnitude of price declines, and the importance of equity markets in the economy.²²

51. As in the case of asset price declines, an appreciation of the exchange rate has both income and balance sheet affects. An appreciated currency dampens activity and incomes in export and import competing sectors, and puts downward pressure on prices, both directly and through weaker activity.²³ Given the differences in the extent and speed of exchange rate pass-through, a variety of measures were considered to proxy the effect on deflation via the exchange rate channel (see Appendix). The measure utilized was based on the degree of appreciation of the effective exchange rate (Chart 10).

Credit and Money Indicators

52. Credit growth has slowed markedly in many industrial and emerging market economies, failing even to keep pace with nominal GDP growth (Chart 11). This may largely reflect weak demand, but in some cases could also be an indicator of elevated risk aversion by banks, or emerging stress in the financial sectors. For example, in Japan the ongoing contraction in credit reflects weak credit demand as firms seek to deleverage, as well as worsening credit quality of borrowers; it may also, however, reflect a restriction in lending

²¹ For the non-OECD countries, output gap measures were obtained using a Hodrick-Prescott filter to derive potential output series.

²² Given the lack of data on house prices in many countries, the formal analysis focused on equity prices, although changes in house prices were taken into account in individual country assessments discussed below.

²³ A striking exception may appear to be the U.S. dollar appreciation of the late 1990s, which occurred during rapid economic growth without raising concerns about deflation. But it was accompanied by a sharp increase in asset prices, reflecting higher expected rates of returns.

by creditors given the difficulty in determining creditworthiness. Several measures of financial intermediation, including growth in broad monetary aggregates and credit were utilized to assess the extent to which credit and money channels may be exerting deflationary pressures.²⁴

Aggregation and Weighting

53. Two sets of indices were computed based on the raw scores: (i) an unweighted index where the scores were aggregated and renormalized to one to yield the index; and (ii) a weighted index where the financial and credit indicators were weighted according to their relative importance in the economy. For the weighting procedure, data regarding market capitalization of the broader equity index as a share of GDP were obtained and countries were divided into three cohorts along the lines of relative importance of equity markets. In countries that have a relatively large equity market, changes in equity prices were given greater weight than where equity markets are smaller. A similar scheme was used to reflect the heterogeneity with regard to the financial sectors (see Appendix.)²⁵

B. Overall Assessment

54. The country rankings for both unweighted and weighted indices suggest the following (Tables 2-3):

- There has been a clear increase in the vulnerability to deflation for a number of industrial and emerging market economies. However, at this juncture, apart from the countries already beset with deflation, only a few additional countries appear to be significantly at risk.
- Japan ranks at the top of the list, and in Asia is followed by Hong Kong SAR and Taiwan Province of China. China, despite ongoing deflation, ranks rather low because, as noted above, the indicators used in the index have a demand-side focus. This underlines the largely supply-side nature of China's deflation which is fundamentally different from the mostly demand-contraction driven pressure on prices seen elsewhere.
- The score for the United States indicates a relatively low risk of deflation. Nevertheless, there are considerable uncertainties with regard to the effects of equity price declines still in the pipeline, excess capacity in several major sectors, and the impact of security and geopolitical concerns.

²⁴ Euro area countries were excluded in the application of money growth variable.

²⁵ An effort was also made to control for country heterogeneity in the degree of openness to trade, and exchange rate pass-through. Unlike for the equity and credit market variables, the weighting scheme based on these factors did not substantially change the results.

Table 2a. Index of Deflation Risk, with Latest Data (Weighted)¹

Risk/ Index	Minimal < 0.2	Low $0.2 \leq x \leq 0.3$	Moderate $0.3 \leq x \leq 0.5$	High > 0.5
	Australia	Austria	Belgium	Japan
	Chile	Brazil	Finland	Hong Kong SAR
	Denmark	Canada	Norway	Taiwan Province of China
	Malaysia	China	Portugal	Germany
	New Zealand	France	Singapore	
	Russia	Greece	Sweden	
	South Africa	India	Switzerland	
	Spain	Ireland		
		Italy		
		Korea		
		Mexico		
		Netherlands		
		Poland		
		Thailand		
		United Kingdom		
		United States		

¹Maximum index score is 1.

Table 2b. Index of Deflation Risk, with Latest Data (Equal Weight)¹

Risk/ Index	Minimal < 0.2	Low $0.2 \leq x \leq 0.3$	Moderate $0.3 \leq x \leq 0.5$	High > 0.5
	Australia	Austria	Belgium	Japan
	Canada	Brazil	Finland	Hong Kong SAR
	Chile	China	Germany	Taiwan Province of China
	Denmark	India	Norway	
	France	Italy	Poland	
	Greece	Korea	Portugal	
	Ireland	Malaysia	Singapore	
	New Zealand	Mexico	Sweden	
	Russia	Netherlands	Switzerland	
	Spain	South Africa	Thailand	
	United Kingdom			
	United States			

¹Maximum index score is 1.

Table 3a. Index of Deflation Risk (1995) (Weighted)¹

Risk/ Index	Minimal < 0.2	Low $0.2 \leq x \leq 0.3$	Moderate $0.3 \leq x \leq 0.5$	High > 0.5
	Australia	Canada	Finland	Japan
	Austria	Denmark	France	
	Belgium	Italy	Mexico	
	Chile	Norway	Netherlands	
	Germany	Singapore	Spain	
	Greece	United Kingdom	Sweden	
	Hong Kong SAR		Switzerland	
	India			
	Ireland			
	Korea			
	Malaysia			
	New Zealand			
	Portugal			
	South Africa			
	Taiwan Province of China			
	Thailand			
	United States			

¹Maximum index score is 1.

Table 3b. Index of Deflation Risks (1995) (Equal Weight)¹

Risk/ Index	Minimal < 0.2	Low $0.2 \leq x \leq 0.3$	Moderate $0.3 \leq x \leq 0.5$	High > 0.5
	Australia	Chile	Finland	Japan
	Austria	Germany	France	
	Belgium	Greece	Mexico	
	Canada	Italy	Spain	
	Denmark	Norway	Sweden	
	Hong Kong SAR	Singapore	Switzerland	
	India	United Kingdom		
	Ireland			
	Korea			
	Malaysia			
	Netherlands			
	New Zealand			
	Portugal			
	South Africa			
	Taiwan Province of China			
	Thailand			
	United States			

¹Maximum index score is 1.

- Some European economies have an increased vulnerability. In the euro area, risks remain low in all the major countries, except for Germany. Were deflation to start in Germany and become sustained, pressures could spill-over into other euro area countries fairly quickly, particularly through the financial system. However, considerable scope remains for easing monetary policy. Outside the euro area, Switzerland appears to have a moderate risk, but also has scope for policy response.

55. Although these indicators present a mixed picture, they do not support strong concerns of generalized global deflation. With flexible exchange rates, global deflation is likely only if there were to be a series of significant shocks. This conclusion is reinforced by developments in the major economies:

- Corporate sector imbalances may be unwinding. Large corporate restructurings over the past two years have also helped facilitate adjustment in balance sheets.
- Labor incomes have continued to grow, offsetting a fall in household wealth. Labor markets have so far been holding up better than during previous slowdowns, particularly in the United States and euro area.
- Policymakers still have some room to maneuver. There is substantial scope for lower rates in the euro area, and officials in most major economies have indicated an awareness of risks.

56. This is not to deny the significant downside risks in specific economies. It is far from clear that the full effects of the bursting of the equity price bubble have manifested themselves. There are also concerns about the effects of a possible correction in house prices. Furthermore, the expectations of a recovery, notably of investment, have been repeatedly disappointed. This suggests that excess capacity may be larger than suggested by the available data, and the profit outlook cloudier than previously thought. In addition, in several countries problems in the financial sector may be exacerbating risk aversion and provision of credit.²⁶

C. Deflationary Pressures in the Major Economies

57. This section assesses in more detail the risks of deflation in the largest industrial economies. It augments the preceding analysis by presenting Phillips curve estimates of the changes required in the output gap and the unemployment gap to set-off, or exacerbate, deflation. Taking the current estimates of the output gaps and the NAIRU as given, a

²⁶ For issues relating to investor risk appetite, see Kumar and Presaud (2002).

modified form of the Phillips curve was estimated for each of the G-7 economies.²⁷ The parameter estimates were then utilized to assess the likely output and unemployment gaps that could lead to declines in the aggregate price levels, defined as either (i) mild deflation, which would entail a modest decline in consumer prices for two to four quarters; or (ii) persistent deflation, which would involve at least four quarters of declines in consumer prices by more than 1 percent. Detailed assessment of conjunctural developments and risks for the United States, Germany and Japan are provided in the attached Boxes.

United States

58. As suggested by the *Indicators* analysis, current risks of deflation in the United States are low, but downside concerns remain because of weak activity. The underlying consumer price inflation has slowed considerably in the past several years, with an increasing number of industrial and service sectors experiencing price declines. Demand has been held back by the effects of a sharp decline in equity prices, a rise in unemployment, and excess capacity in many industries (see Box 4.1). The decline in equity markets to-date is similar to the decline in Japan in the three years after the bursting of its asset price bubble (Chart 12a). Nonetheless, strong productivity growth and tax cuts have helped support personal incomes, and combined with mortgage refinancings have underpinned consumption. In addition, the underlying rate of return in the economy appears to have held up fairly well, owing to aggressive corporate restructuring over the past two decades. Accordingly, inflation expectations have been relatively stable, with the largest downside risks associated with the possibility that consumption will slow before investment has a chance to rebound.

59. The Phillips curve estimates suggest that for mild deflation to take hold, the output gap would need to increase by around 3 percentage points, to over 5 percent (Table 4). GDP growth would have to remain around $\frac{3}{4}$ percent for the next five to six quarters, and the unemployment rate would need to increase from 6 percent (in 2002Q4), to 8 percent, within 4 quarters. For persistent deflation, the output gap would have to increase by over 5 percentage points, and the unemployment rate would have to move to 10 percent.

60. While there is a small risk that mild deflation could occur—the staff’s central projection is for the output gap to widen in the first half of 2003—the expected policy

²⁷ The estimated functional form was as follows:

$$\pi_t = \alpha_1 * \pi_{t-1} + \alpha_2 * \pi_{t-2} + \alpha_3 * \pi_{t-3} + \alpha_4 * \pi_{t-4} + \beta * U_{gap,t} + \varphi * (U_{gap,t} - U_{gap,t-1})$$

where π denotes inflation and U_{gap} denotes the unemployment gap; equations for each of the G-7 economies were estimated over the period 1990 to 2001 using quarterly data; robustness analysis was undertaken by estimating equations with varying sample size. A complementary formulation utilized output gaps with the following specification:

$$\pi_t = \alpha_1 * \pi_{t-1} + \alpha_2 * \pi_{t-2} + \alpha_3 * \pi_{t-3} + \alpha_4 * \pi_{t-4} + \beta * Y_{gap,t} + \varphi * (Y_{gap,t} - Y_{gap,t-1})$$

where Y_{gap} denotes the output gap. Both the output and employment gap data were obtained from the OECD database and staff estimates.

response makes the likelihood of persistent deflation remote. Policymakers appear both willing and able to respond preemptively to the risk of renewed weakness and of deflation, even though the Fed Funds rate is at a very low level. For instance, Greenspan (2002) has emphasized that it is crucial to “ensure that any latent deflationary pressures are appropriately addressed well before they become a problem” (see also, Bernanke, 2002 and Reinhart, 2003a). Federal Reserve officials have also made public statements on the measures they would consider to forestall deflation, including purchase of long dated securities; and there is considerable fiscal stimulus in the pipeline and more on the horizon. Moreover, should activity fail to rebound, the U.S. dollar could depreciate further, providing a fillip to prices, exports and corporate profits.

Germany

61. With broadly stable prices over the past six months, the German economy faces substantial demand driven drag to growth (Box 4.2).²⁸ Credit growth, production, and incomes weakened considerably during 2001 and 2002, and the labor market has been coming under pressure. House prices have been falling; equity markets have adjusted more than in the other advanced economies (Charts 12a and 12b); and corporate balance sheet adjustments still have some way to go. Furthermore, banks and insurance companies are, by their own admission, undergoing the most challenging period since World War II. Thus the near-term outlook for a recovery in investment remains more clouded than in the other advanced economies.

62. The Phillips curve analysis for Germany suggests that for mild deflation to take hold, the output gap would need to rise 1 to 2 percentage points (Table 4). At the same time, the unemployment gap would have to increase by 2 percentage points. For persistent deflation, the output and employment gaps would have to increase by 2½ to 3½ percentage points. The staff’s central projection sees a widening of the output gap on the order of 1 percentage point this year because real GDP growth would remain around ½ percent. However, the unemployment rate would increase relatively modestly.

63. Accordingly, the probability of mild deflation taking hold over the next year is considerable. Of course, as prices in Germany decline relative to its trading partners, particularly in the euro area, the improvement in its competitiveness will stimulate exports and investment. This may prevent expectations of falling prices from becoming entrenched. However, this mechanism is likely to operate only slowly, and can do little to remedy difficulties in financial intermediation that could develop rapidly in a deflationary environment. Unlike in other economies, the room for policy maneuver is constrained, if not absent altogether. Fiscal policy is set to become restrictive (cutting the cyclically adjusted deficit by ¾ percent of GDP this year)—in support of Germany’s commitments under the Maastricht Treaty. While monetary conditions have tightened given the euro appreciation,

²⁸ Prices have been broadly stable abstracting from one-off changes due to indirect taxes.

monetary policy may not ease significantly because of greater price pressures in Germany's euro-area partners.²⁹

Japan

64. In Japan, core CPI deflation continued for forty-one consecutive months through March 2003, and there are only marginal signs of deflationary pressures waning. Unless policies play a more supporting role and the economy's long-standing structural problems are resolved, the risk of continued deflation remains high. In the near-term, with growth below potential, the output gap is expected to widen further, potentially increasing downward pressure on prices (Box 4.3). The Phillips curve analysis suggests that if the unemployment gap were to increase by 1 percentage point, or the output gap by 2 percent the pace of deflation would accelerate, which could heighten the risk of a deflationary spiral (Table 4).

65. An important issue relates to why deflation is not already worse given the continued large output gap, high unemployment, and record business sector bankruptcies.³⁰ This could reflect in part sticky expectations. Both market and survey evidence suggests that deflation is expected to remain around $-\frac{1}{2}$ to -1 percent. In the Consensus forecast, market participants attach a 70 percent probability to deflation of around 0.8 percent in 2003. This expectation may reflect a relatively flat Phillips curve; that is, the decline in activity and output gap would have to be significantly greater than witnessed to-date for there to be a substantial further increase in deflationary pressures. It is also possible that the monetary easing in recent years has played a helpful role. The *cumulative* growth in base money has not been aggressive enough to improve expectations, but it may well have played a role in preventing deflationary expectations from worsening.

66. Nonetheless, despite the recent uptick, the economy is vulnerable to further adverse shocks that could markedly worsen deflation. In particular, asset prices could come under further pressure if banking sector difficulties mount, and corporate de-leveraging continues. In addition, investment could decline further in an uncertain environment.

67. Because of the risk that deflation could worsen, a more vigorous monetary-policy response is needed even if structural impediments remain in place. Such an approach could include a more rapid expansion of the monetary base in tandem with a commitment to end deflation within a given time period. Backed up by a clear communications strategy, these measures could reduce deflationary expectations (see Section V below).

²⁹ Higher inflation in other euro area countries may of course help somewhat in restraining deflationary pressures in Germany.

³⁰ There is evidence that CPI understates deflation for reasons noted earlier. However, that would only mean that deflation is somewhat higher than currently measured, and not that it is getting worse.

Other G-7 Countries

68. The pace of activity in France and Italy has slowed markedly in recent months, but the risk of deflation appears to be appreciably lower than in Germany. Despite the recent downward revisions to projections, growth is projected to pick up in the second half of the year in both France and Italy, confidence is somewhat better, house prices are continuing to increase, and consumer prices are better sustained, with core inflation close to or higher than 2 percent.

69. In the United Kingdom and Canada, economic conditions do not raise immediate concerns about deflation. Robust household demand growth has continued in the United Kingdom—supported by a housing price boom, and GDP growth is expected to pick-up in the second half of 2003 on the strength of public spending. Inflation and inflationary expectations seem well supported. However, there may well be a risk of an abrupt correction in house prices which could have a substantial adverse effect on domestic demand growth. In Canada, although some recent indicators have been mixed, the underlying pace of growth remains robust. For the second year in a row the economy is expected to attain the highest growth rate among the G-7, and is the only one in the group to have virtually no output gap. Inflation is well above the 2 percent target range.

70. The Phillips curve estimates for the above four countries suggest that the output and employment gaps would need to increase substantially to move them into mild deflation. These results complement the findings from the deflation vulnerability index, and suggest that in these economies deflation risks are very small.

Table 4. Deflation Risk: Incremental Changes in Output and Unemployment Gaps¹
(in percent)

	Deflation Onset		Persistent Deflation	
	Unemployment Gap	Output Gap	Unemployment Gap	Output Gap
United States	2 - 2½	3 - 4	3½ - 4	5 - 6
Germany	1 - 1½	1 - 2	2½ - 3½	2 - 2½
France	> 3	4	> 5	> 6
United Kingdom	2 - 2½	2 - 3	2 - 3	4
Italy	5	5	> 6	> 5
Canada	5	> 5	6	> 5
Japan	---	---	1	2

1. Estimates of the increase in the output and unemployment gaps likely to lead to the onset or persistence of deflation.

D. China

71. In China, the mild deflation is linked mostly to *transitory* as well as *longer-term supply-related factors*. Transitory factors include lower commodity prices, WTO-related tariff cuts, and restraint in administrative price increases stemming from social concerns. Some of the longer-term factors include productivity gains from strong investment, state-owned enterprise (SOE) reform, and adoption of new technologies—supported by robust increase in foreign direct investment—and stronger market orientation. A less benign structural source of deflation is large excess capacity in some sectors, owing to the loss-making operations of some state-owned enterprises. Large surplus labor in rural areas is also acting to put downward pressure on costs and prices.

72. Risks of persistent deflation are small. Given the strong pace of activity, deflationary pressures should continue to ease over the course of this year as transitory factors fade (see Box 4.4). Policies are also supportive; the monetary stance is accommodative, with room left to maneuver, and fiscal policy has been expansionary. The recent depreciation of the U.S. dollar has also led to an effective depreciation of the yuan. Expectations of continued strong economic growth are reflected in buoyant private demand and increasing real estate prices. However, some longer-term factors, including continued expansion in capacity and excess labor could continue to press prices down and prevent Balassa-Samuelson effects from taking hold. Further deflationary pressures arising from excess capacity could build if loss-making operations of state-owned enterprises are not closed down in a timely manner. There is also a risk that if the SARS epidemic is not contained quickly, its adverse impact on private spending could create deflationary pressures from the demand side.

China's Trade Share and Transmission of Deflation

73. Supply-side factors in China are creating downward price pressures in a number of industrial sectors globally.³¹ Cheap and abundant labor and large production capacity have helped China in the last 10 years gain market share in the United States and Japan. By 2002, its share in total U.S. imports reached 11 percent, overtaking Japan as the largest exporter to the United States; its share in total Japanese imports reached 18 percent during the same period (Charts 13a-b). Although *actual* imports from China account for a small proportion of consumption in most countries (in the U.S. imports from China account for 1 percent of GDP), the *potential* imports appear to be a much larger. However, cheaper imports entail terms of trade gains which, through their positive effects on aggregate income and demand growth, could mute the direct deflationary effects in individual sectors.

³¹ In addition to light manufactures including clothing and textiles, and footwear, these include an increasing range of high technology products, such as, digital cameras and camcorders, televisions, electronic and personal computers.

74. Apart from the direct impact on prices, there may be an indirect impact through activity on some competitor economies. The magnitude of the impact is illustrated by the increase in China's share in the Asian region's total exports to the world from under 15 percent to close to 30 percent over the last ten years. However, this change in market share is not fully at the expense of other countries: there has been a sharp increase in intra-regional trade, with a significant increase in imports by China from many of the regional economies which is likely to help offset the adverse impact on activity and prices in these economies.³²

75. Despite the increase in trade shares, there is insufficient evidence that China is exporting deflation, although there are marked price pressures in particular sectors. A Vector Auto Regression (VAR) analysis on the linkage between prices in China and major trading partners suggests that price fluctuations in China have a moderate impact in a few Asian countries, and discernable but small impact on prices in the United States and Japan (Chart 14). In the region, prices in Taiwan Province of China and Hong Kong SAR are affected the most, owing to their strong links to mainland China, and the price changes appear to be passed through fully in about 2 years. There is some evidence of transmission to Singapore, but in a more limited way. Prices in other economies in the region—Malaysia, Thailand, India, and Indonesia—on the other hand, appear not to be affected at all by changes in prices in China.

76. Nonetheless, the transmission effects appear to be growing over time. When a similar VAR analysis is undertaken for the late 1970s, the impulse response functions imply weaker links than the ones identified over 1993–2002. This change is not surprising because Chinese external trade began to pick up around 1993, once the government initiatives to increase exports started to take hold. Nonetheless, it does suggest that with the expected continued integration of China into the global economy, the transmission effects could increase further.

V. POLICY RESPONSE

77. Given the costs of deflation, it is desirable to prevent it from taking root, rather than deal with it once it has become entrenched. This is a particular challenge for policy in a low inflation environment. A number of conceptual and practical issues related to both prevention and cure are examined below. Strictly speaking, monetary policy should, by itself, be able to stave-off deflationary expectations. However, the central bank may underestimate the risks of deflation, or be unable to—because of political economy reasons—undertake the necessary steps. When monetary response is insufficient or inadequate, fiscal policy and structural measures can play an important role.

78. Policymakers need to be attentive to four channels through which deflationary forces can be propelled and through which policy can act:

³² Indeed, over the past three years, the growth in total imports by China has outpaced the growth in its exports.

- Exchange-rate channel: An open trading system can serve as a buffer, while fixed exchange rate systems have, in the past, transmitted deflationary shocks.
- Asset price or portfolio rebalancing channel: Deflation affects the relative trade-off between assets, and cash generates a risk free rate of return (equal to the rate of deflation), discouraging risk taking.
- Expectations channel: Entrenched expectations help determine nominal wage demands and *ex ante* real interest rates. Once deflationary expectations set in, they help to drive up real wage costs and real interest rates.
- Credit channel: When deflation reduces the value of collateral, banks find it difficult to discriminate credit risks, and the external finance premium rises. Distressed banks may curtail lending, further driving down output and prices.

79. A vigorous policy response may be required if one or more of these channels are not available. For example, if deflation is setting in, banks are restricting credit, and labor markets are inflexible with sticky wages, the central bank may need to be particularly aggressive in easing policy and changing expectations—so as to compensate for its reduced ability to act through the other channels.

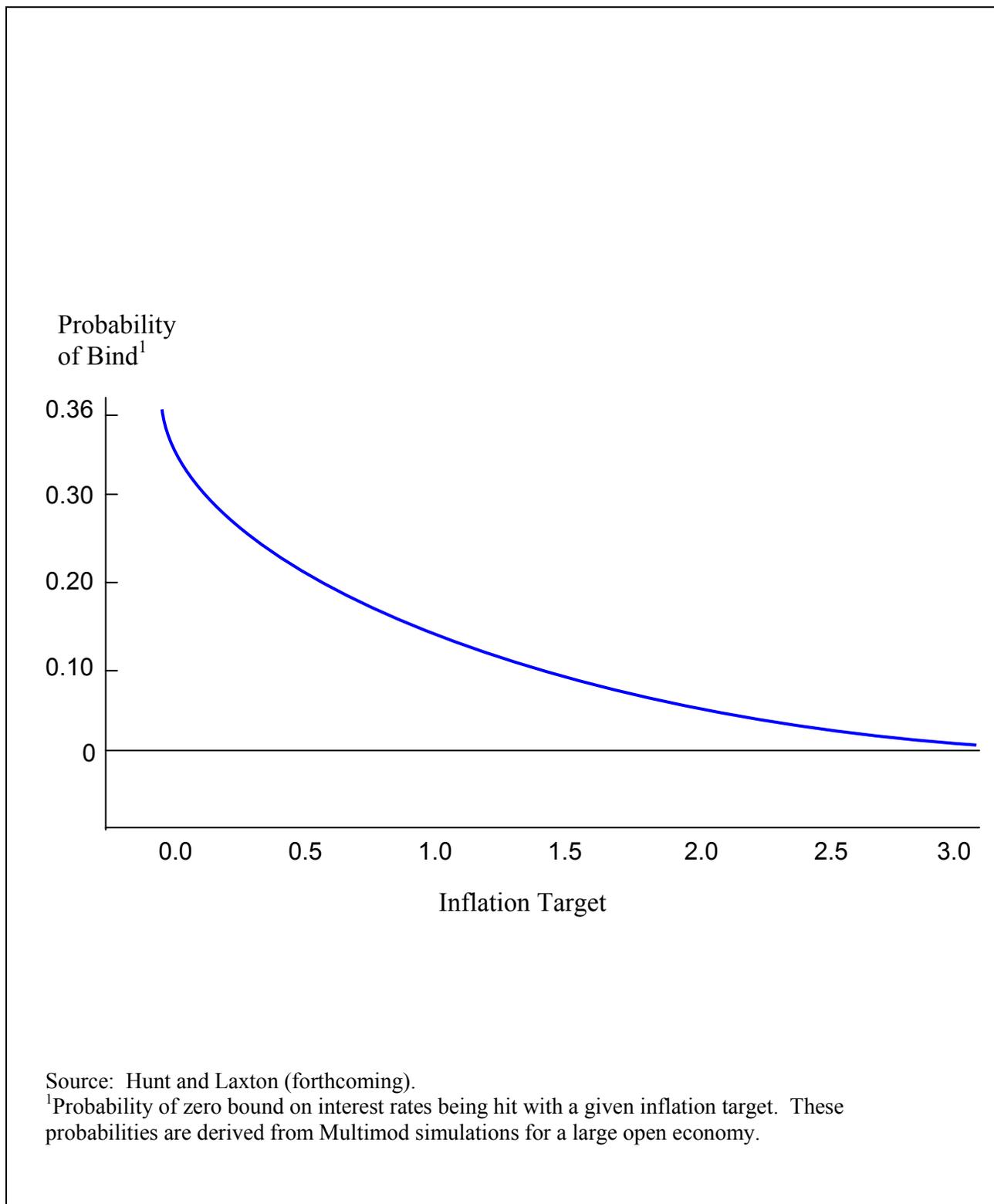
A. Policy Before the Onset of Deflation

80. Preventing deflation in a low inflation environment requires preemptive and possibly aggressive action. Past episodes suggest that sustained deflation can be unanticipated, even as inflation and nominal interest rates fall close to zero. The challenge is evident from the recent experience of Japan. In the mid 1990s, household and business surveys—along with government and corporate bond yields—showed that markets expected moderate inflation, right up to the onset of deflation. Furthermore, as Ahearne et. al (2002) show, *ex ante*, the monetary policy stance was appropriate or even loose (using Taylor-type monetary policy rule). But *ex post*, policy proved to be too tight, reflecting lower inflation than forecast. Given such circumstances, with baseline forecasts still projecting inflation, policy makers could be hard-pressed to justify implementing measures against deflation.

81. Monetary policy therefore needs to set targets to provide a buffer against the risks of deflation. Under inflation-targeting regimes, policymakers should not set an inflation target that is too low, but instead provide a “buffer zone” to obtain insurance.³³ As Figure 3 illustrates, the likelihood of hitting the zero bound on interest rates declines significantly as the inflation target increases (see Box 5.1). With flexible monetary policy regimes, clear communication with the markets is important, as is a willingness to act quickly,

³³ A buffer zone is appealing because, as noted, inflation statistics suffer from measurement issues and possible upward biases. The benefits of an inflation buffer zone must, of course, be weighed against the costs of higher inflation rate in normal times (Bernanke, 2002).

Figure 3: Inflation Target and Zero Bound



even though easing may appear unnecessary *ex ante*. Model simulations suggest that in Japan lowering short-term interest rates by another 200 basis points at any point between 1991 and early 1995 would have helped avoid deflation (Ahearne et al *op. cit.*). A proactive stance is particularly necessary if financial markets and institutions may be in risk of coming under stress, say following the bursting of an asset price bubble. Aggressive easing by the U.S. Federal Reserve in early 2001 can be seen in this light.

82. Fiscal policy can play an important role in supporting incomes, relieving pressure on firms' and households' balance sheets and underpinning confidence. In an environment of deflationary expectations taking hold, and with the economy in a liquidity trap, stimulating policy—beyond the automatic stabilizers—may be necessary. Measures to boost return on capital investment that would have efficiency gains while signaling authorities' commitment to prevent a generalized decline in prices have an added attraction (see Rogoff 1998). In the case of Japan, Ahearne, et al. (*op. cit.*) suggest that a moderate amount of additional fiscal loosening during the first half of 1990s could have assisted economic activity and lowered the risk of deflation.

83. An open trading system offers a measure of protection from deflation, although this protection is much greater under flexible rather than fixed exchange rates. Countries with deficient domestic demand face incipient downward pressure on tradable goods prices and interest rates. With flexible exchange rates, and a liberal trade and capital account regime, the downward pressure on interest rates would lead to currency depreciation and aid exports. Under such circumstances, expectations of deflation are less likely to take hold. But policy still needs to be alert to the risk of deflation spreading from imported deflationary impulses in particular sectors, especially if the sectors are large with relatively inflexible structures. Where exchange rates are fixed, including in a currency union, the adjustment to adverse demand shocks would be considerably more protracted, as it would operate through domestic prices rather than the exchange rate.³⁴ This makes it more likely that expectations of deflation develop, with further deleterious consequences for demand.

84. Lower barriers to trade can help in spreading the adjustment to demand shocks. Instead of a large adjustment by a single country, a small adjustment globally could help to redress country-specific imbalances.³⁵ However, globalization may also contribute to raising the symmetry of economic shocks across countries. The recent equity price bubble is an example of how increased financial linkages might contribute to spreading “irrational exuberance” and a subsequent correction (see Rogoff et. al., 2003 on the costs and benefits of financial globalization).

³⁴ Meltzer (1999) argues that failure to allow the nominal exchange rate to depreciate has forced deflation onto Japan.

³⁵ From a multilateral perspective it might not be efficient to rely on this mechanism to exit deflation, particularly for large countries. This issue is noted further below.

85. With flexible exchange rates, the threat of an internationally transmitted, global deflationary shock is small. This is because countries in risk of deflation could expand their money supply and create inflationary expectations. If the policy makers' anti-inflation credentials are high, there may be little risk that these expectations will be difficult to reverse. (This also underlines the case for the transparency in long-term objectives which provide broad guidelines for inflation over the medium-term (Rogoff, 2003)). In the case of a global demand shock, if every country expanded its money supply in response to a deflationary impulse, exchange parities would change to the extent that the impact of the shock and the monetary response differed across countries. But in general the stock of money would be higher, reducing the likelihood of deflationary expectations from gaining ground.

86. Nevertheless, the global effects of a depreciation in a large country can be significant. A depreciation in the U.S. dollar, for example, would lead to higher U.S. exports, offsetting foreign production, and put downward pressure on foreign prices. It would also have income and balance sheet effects, and if the dollar decline were severe enough, foreign balance sheets could come under significant pressure, aggravating deflationary pressures there with effects that can rebound on the United States.³⁶

B. Policy Once Deflation Has Set In

87. Policymakers face a difficult challenge under deflation, because the traditional relationships between policy instruments and economic variables, as well as the transmission mechanisms, may be impaired or altered. For example, when deflation has set in, even if nominal rates are low or zero, monetary policy may not be loose enough to spur activity. This may be especially constraining given that in a liquidity trap, the economy's equilibrium real interest rate may well be negative.

88. The problems may be compounded if the banking system is undergoing difficulties, say following a sharp slowdown in activity or the bursting of an asset price bubble. An increase in banks' bad debts is likely to reinforce their unwillingness to take risks, curtailing credit. In such a situation, efforts to boost base money may have limited effect if the additional liquidity largely ends up as banks' excess reserves.

89. In these circumstances, historical experiences suggest that policymakers may need to consider "unorthodox" policies. Monetary policy can generate inflation, independent of the structural impediments in the economy (Rogoff, 1998 and 2002). As Bernanke (1995) observes: "... if the price level were truly independent of money issuance, then the monetary authorities could use the money they create to acquire indefinite quantities of goods and assets. This is manifestly impossible in equilibrium."

³⁶ See Reinhart (2003b) for a discussion of the spill-over effects of policy measures implemented in a large economy. For some evidence on specific spill-over effects within the G-7 economies, see Kumar (2001).

90. For instance, the monetary authority, if credible, could lower interest rates along the yield curve by promising to hold short-term rates at zero for a specified period (along with an explicit inflation target) or by purchasing longer-term bonds. The bond purchase operation could be underpinned by announcing target yields and committing to purchase securities consistent with that target, thereby lowering rates along the entire term structure.³⁷ In addition, the range of assets eligible as collateral for bank borrowing from the central bank could be widened, reducing term and liquidity premiums and lowering the cost of capital. The central bank could also extend its range of purchases to equities (exchange traded funds), real estate (real estate investment trusts), or foreign assets (foreign currency or bonds).

91. Once deflationary expectations have taken hold, policies will be successful only to the extent that they manage to break expectations. Monetary policy helps to stimulate the economy because a lower policy rate helps to flatten the yield curve, lower long-term rates, and encourage contemporaneous consumption and investment. This role does not change under deflation; the central bank must choose steps that have the largest effect on expectations. For example, if the credit channel were not severely impaired, the central bank may be able to lower long-term interest rates by purchasing government bonds along the yield curve, which would help encourage bank lending. However, if the credit channel were impaired or the balance sheets of firms and households were distressed, the central bank may need to take more drastic steps, such as purchasing private assets.

92. The “unorthodox” policy prescriptions can pose operational challenges because the broader impact of these policies may be uncertain. Even during inflationary times, the lag structure and impact of changes in the monetary stance may be unclear. With unorthodox policies, there may be little guidance to the appropriate extent of easing. There is also a risk that the central bank’s balance sheet could incur sizeable capital losses if the value of the acquired assets falls. Nevertheless, these uncertainties and risks are small compared to the costs associated with entrenched and deepening deflationary expectations. The monetary policy response should also not be held hostage to structural reforms: one of the key lessons of the events that led to the Great Depression in the U.S. was the misplaced and ultimately catastrophic emphasis on reforms at the expense of monetary easing.³⁸

93. Fiscal policy financed by monetary expansion can play an important role in this situation. Indeed, for an economy in a liquidity trap, the use of unorthodox monetary

³⁷ For example, from 1942-51 the Federal Reserve successfully maintained a cap on Treasury bond yields.

³⁸ It is telling that in 1930 a key member of the U.S. Federal Reserve Board repeatedly argued against aggressive quantitative easing. The official claimed that it would be ineffective and most likely counterproductive; that the economy had to “pay” for the excesses of the 1920s, and that the monetary easing would only interfere with the natural process of restructuring (Goodfriend, 2001).

operations noted above could entail a significant fiscal element.³⁹ Stimulatory fiscal policy will boost activity, help address problems in the credit and asset channels, and result in an increase in prices of goods and assets. For liquidity constrained consumers, traditional fiscal multipliers may actually be higher under deflation than inflation because the credit channel is weakened. If deflation is due to an especially large demand shock, beyond the automatic stabilizers, discretionary fiscal policy can play a particularly useful role in supporting incomes and spending. A well-timed tax cut will increase disposable incomes, helping to encourage consumption. Higher government spending could also help boost production and relieve unemployment. When banks are distressed and the credit channel is impaired, the government may need to inject capital into the banking system, and under deflation, it may need to act faster than it would otherwise.

94. However, fiscal policy needs to be tailored to credibly boost *aggregate* demand. The stimulus should not be wasted on projects for political economy reasons that benefit too few to have an effect at the aggregate level. Furthermore, to limit Ricardian effects, spending programs and tax relief should target liquidity constrained consumers, and as noted above, projects that boost the return to private investment. It is also important to ensure that fiscal policies do not give rise to a permanent increase in the level of expenditures. This suggests that measures to reallocate demand inter-temporally, for instance, through temporary tax credits for investment or reductions in consumption taxes that automatically lapse after a period of time, would be most appropriate (see Feldstein, 2001 and 2002).

95. Structural reforms can also play an important role in combating deflation. By increasing flexibility in factor markets, they may facilitate reallocation of resources. They may also allow for a more rapid disposal of bad assets and promote enhanced intermediation in the economy, improving the effectiveness of the monetary transmission mechanism. In addition, measures aimed at promoting deeper and more liquid capital markets can help reduce frictions generated by deflationary shocks; with the banking sector under stress, corporate financing will be able to take place more readily if there is access to alternative markets. By helping raise the long-term return on capital and enhancing the economy's growth potential, structural reforms can thus be a key component of an anti-deflation strategy. Even in the short-run, a credible and well-articulated package of reforms can underpin confidence and by raising expectations of future growth mute deflationary pressures. Structural reforms should not, however, be regarded as a prerequisite for the monetary and fiscal response.

³⁹ See Buiter (2003) who also suggests that conventional monetary policy alone may cure deflation when used to monetize (in secondary markets if institutional constraints exist) expansionary fiscal policy.

Box 4.1: United States—Economic Outlook and Deflation Risks

With strong financial headwinds from a large accumulation of debt during the late 1990s and a sharp decline in the U.S. equity markets, some observers have wondered if the United States could experience deflation. A few months of negative headline CPI inflation cannot be ruled out, but the likelihood of sustained deflation appears remote.

Aggregate Demand and the Output Gap: While there is uncertainty about the degree of excess capacity, the acceleration in productivity after 1995 means that the potential growth rate is substantially above recent growth, leading to a widening output gap of just over 2½ percent in 2003q1, and disinflationary forces. Domestic demand in the past two years has been buffeted by a series of shocks, including continuing equity price declines, accounting scandals, September 11th attacks, the war in Iraq and broader geopolitical uncertainties. Consumption continued to grow, in part supported by house price increases, but the need to rebuild wealth could cause the saving rate to rise sharply, curtailing consumption. Weaker labor markets and the waning effects of tax cuts could exacerbate the effects on consumption. The recovery in investment has yet to become broad-based and firmly established. Nonetheless, with strong support from monetary and fiscal policies, and continuing impressive productivity performance, GDP growth is expected to begin strengthening in the latter half of 2003. The recent data on corporate earnings have been encouraging, and there are indications that consumer and business confidence may be recovering.

Prices: Corporate prices have fallen much more than consumer prices, cutting into corporate profits, but economy-wide aggregate price levels do not show signs of declining. Core CPI is down to 1¼ percent (y/y) in March 2003 (compared to 2¾ percent during 2001 and 2 percent during 2002), with headline inflation rising to around 3 percent. The GDP deflator is around 2 percent (yoy), and the deflator for the nonbusiness sector has fallen sharply (Figure 1). However, given the policy stimulus in the pipeline and the expected pick-up in activity, inflation expectations—as measured by surveys and spreads on inflation-indexed bonds—have been relatively stable.

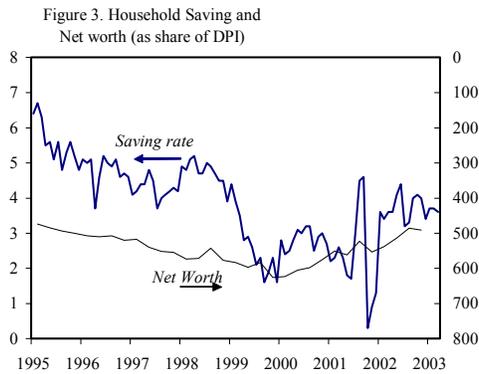
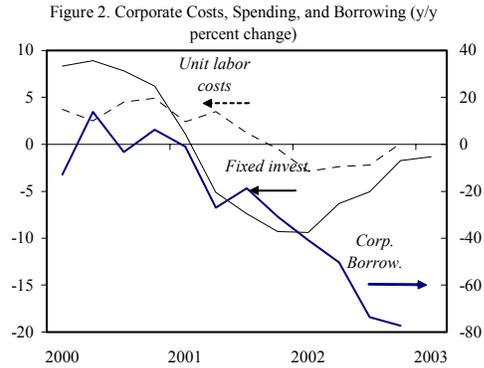
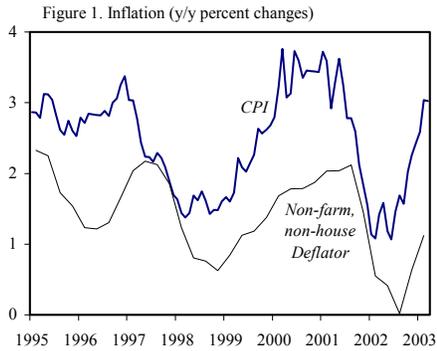
Corporate Sector: With a sharp fall in industrial output, the U.S. corporate sector led the economy into recession. Industrial production declined 6 percent during 2001; at the depth of the recession in 2001, GDP declined only ½ percent. When corporate profits came under pressure, firms embarked on an ambitious cost-cutting strategy, sharply reducing investment (Figure 2). While some have worried about overcapacity, rates of return on capital have held up, indicating that firms do not yet have difficulty using their capital stock efficiently.

Monetary and Credit Conditions: Bank lending ground to a halt in early 2002, but it did not contract (on a y/y basis), and banks remain relatively healthy. Credit growth has subsequently recovered, and by March 2003 was growing by around 7 ½ percent (yoy). Corporate credit spreads, after widening in late 2001 and early 2002 reflecting Enron and other corporate accounting concerns, have recently narrowed.

Asset Prices: U.S. equity markets peaked in March 2000, and at the height of the technology bubble, household wealth peaked near \$43½ trillion, or 6.3 times disposable income (Figure 3). Since then, net worth has fallen \$4 ¼ trillion to 4.9 times disposable income. Normally, such a large decline would have sparked a significant decline in consumption, but well-timed tax cuts in 2001 cushioned the blow by helping to support disposable incomes. The housing market has responded to aggressive interest rate cuts, and housing wealth rose \$1½ trillion during 2000-2002.

Box 4.1: United States—Economic Outlook and Deflation Risks (cont.)

Policies: U.S. policy makers have shown remarkable flexibility in responding to the economic shocks, and the central bank appears ready to use unorthodox policy measures to prevent deflation. Monetary policy remains accommodative, and recent indications by Federal Reserve governors seem to be preparing the markets for unorthodox monetary policy if the target federal funds is near zero (Bernanke, 2002 and Greenspan, 2002). Fiscal surpluses achieved during the late 1990s have turned into deficits, but the stock of government debt is forecast to remain stable at under 40 percent of GDP for the remainder of the decade, leaving room for stimulus, if necessary.



Box 4.2: Deflationary Pressures in Germany

Many indicators suggest that deflationary forces are at work in Germany: (i) underlying inflation is running under 1 percent per annum; (ii) unit labor costs (ULCs) for the entire economy have grown at an average rate of about $\frac{3}{4}$ percent in the past five years; (iii) equity prices have retreated by about 40 percent during 2002, to levels last seen since early 1997—the evidence on real estate prices is mixed, with some (BIS) indicators suggesting that prices have retreated over the past decade and others (CPI rent component) pointing to stability; (iv) real domestic demand is contracting and GDP growth will fall well short of potential for the third year running in 2003, causing a widening of the output gap to nearly $2\frac{3}{4}$ percent of potential GDP; (v) the number of bankruptcies is reaching record levels and (vi) domestic credit almost ground to halt in mid-2002, as German banks are struggling to maintain their regulatory capital, while suffering asset price declines and loan losses.

Although the near-term outlook for the German economy is fairly bleak, most forecasters do not foresee a significant decline in inflation for 2003: the consensus forecast for 2003 is for 1.2 percent, with one half of observers seeing a decline in inflation relative to 2002. However, the task force's analysis suggests that mild deflation is fairly likely to take hold even though the risks of pernicious deflation are low.

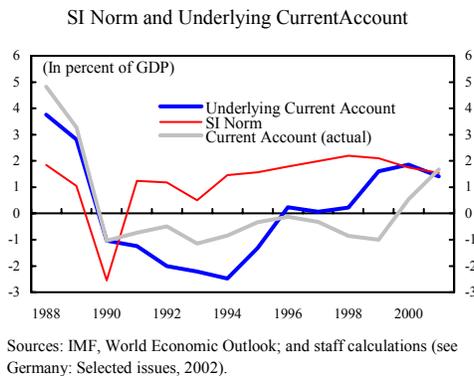
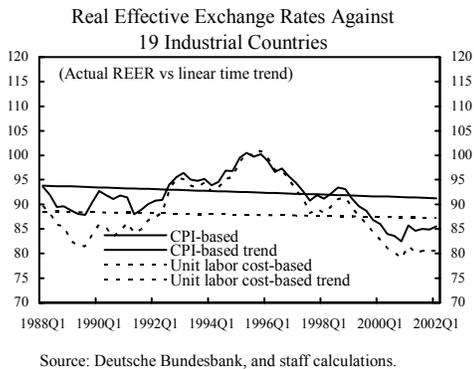
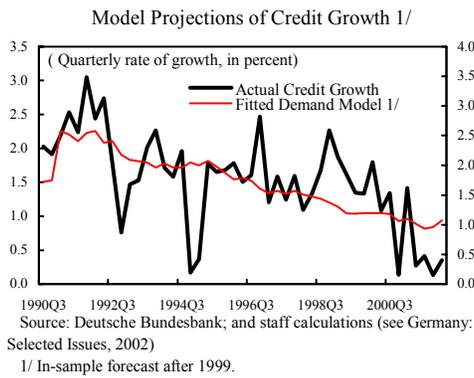
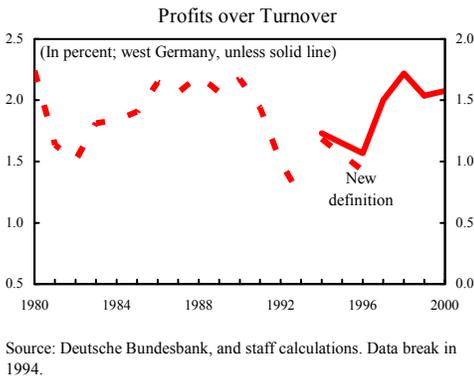
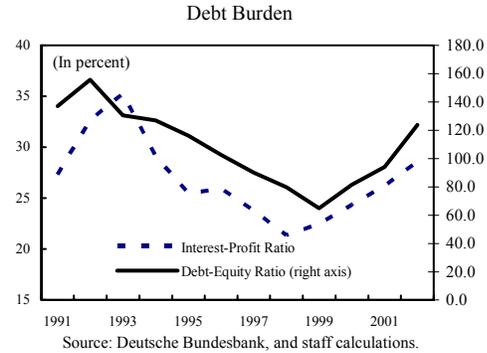
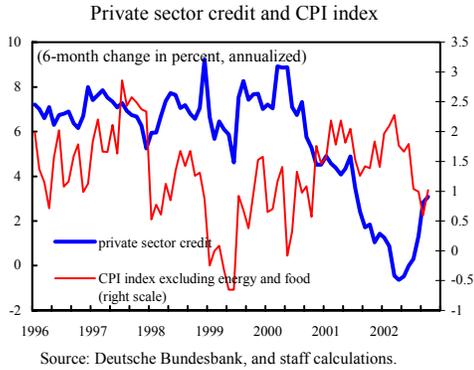
First, the estimated output gap is large and the (ILO) unemployment rate remains high—at some 7.7 percent in 2002Q4—even if it is down from a peak of 9.3 percent in 1997. Balance sheet indicators for the ratio of after-tax profits to turnover display no structural decline but are likely to have taken a blow over the past two years; and OECD data for the business sector suggest that the capital-output ratio in 2001 still exceeded the post-1980s average by 2 percent, down from a peak excess of 4.3 percent in 1996. Notice that the size of the output gap is not unprecedented: it compares to that of 1982-84. However, during the early 1980s the unemployment rate and the capital-output ratio were lower and inflationary pressures higher.

Second, credit growth is low and bank profitability weak—owing to deteriorating asset markets, high competition, and a cost structure that does not compare favorably even against those in other continental European countries.. Credit growth has fallen short of demand, as measured by a linear combination of GDP and interest rates, but the shortfall compares to that seen in earlier recessions. While a case for a credit crunch is hard to make at this stage, banks are facing, by their own admission, the most difficult business environment since World War II, suggesting that financial intermediation is unusually vulnerable to adverse shocks.

Third, although the external sector is serving as a floor on prices and output, that floor is unlikely to buffer the effects on GDP of a sudden, rapid deterioration in domestic demand. Germany has become more competitive, seeing its external current account balance improve from a deficit of about $\frac{1}{2}$ -1 percent of GDP during the 1990s, to an estimated surplus of $2\frac{1}{2}$ percent of GDP in 2002, a level last reached just before unification. According to some estimates, a 2 percent of GDP surplus is in line with equilibrium estimates of Germany's current account (Figure) and thus the potential for saving rates to rise has diminished. However, because the improvement in the external position was achieved largely through slow import and domestic demand growth—rather than higher productivity and export growth, as had been hoped following unification—downside risks remain.

Box 4.2: Deflationary Pressures in Germany (cont.)

Lastly, but perhaps most importantly, a major concern for Germany is the constraint on macroeconomic policies: monetary policy is geared to the euro area where price pressures are not considered to have subsided sufficiently. And Germany's fiscal policy is widely seen as turning highly contractionary in the near-term, to move the fiscal deficit back under the 3 percent Maastricht reference ratio. The automatic stabilizers, which—together with the ECB commitment to price stability—could offer some protection against sustained deflation, are thus not allowed to widen the fiscal deficit while growth continues to fall short of potential.



Box 4.3: Deflation in Japan

Japan's experience with low inflation is hardly recent. In the fifteen years prior to the onset of deflation in the mid-1990s, its annual core inflation (CPI excluding fresh food, and energy) averaged 2.1 percent. During the mid-1980s, core inflation fell close to zero, followed by several quarters of decline in the GDP deflator. As growth picked up sharply from late-1987 onward, coinciding with a tremendous run-up in land and equity prices, the economy overheated, operating at 2-3 percentage points over potential GDP in the late-1980s and early-1990s, but CPI rose only moderately. Core inflation peaked at slightly above 3 percent in early 1991, and then began trending down, with a tightening of monetary policy, and a collapse of asset prices. Bernanke and Gertler (2001) argue that the Bank of Japan (BoJ) was behind the curve during this boom-bust cycle—the central bank waited too long before tightening monetary policy during the bubble period, and delayed in easing once the economy headed downward.

The sharp fall in land and equity prices was followed by real GDP growth coming to a crawl. A widening output gap, reflected in the sizeable excess capacity in the manufacturing and construction sectors, exerted further downward pressure on prices. Banks, which had leant heavily to real estate and construction companies, struggled under a mountain of bad loans and rapidly declining profitability. They focused on consolidating their balance sheets and sharply curtailed further credit. Reflecting the loss of economic momentum, broad money (M2+CDs) growth declined rapidly, from over 11 percent in 1990, to 0.6 percent in 1992.

With declining activity, inflationary pressures virtually dissipated. Additionally, prices in the tradable sector were affected by the further opening of the economy and the resulting competitive pressures.¹ Prices in the non-tradable sector also faced some downward pressures owing to deregulation and innovations. In its efforts to stimulate demand and prices, the BoJ eased monetary policy, lowering the uncollateralized overnight call rate from 8.5 percent in early-1991 to 0.5 percent by late-1995, but that proved to be insufficient in the face of an unrelenting decline in asset prices and resulting problems.

The GDP deflator began its near-continuous decline in 1995 and Core-CPI deflation materialized fully in 1998 with the onset of a recession. A short-lived economic recovery around the Y2K-related investment boom in the late-1990s did little to arrest deflation. Initiatives to recover the economy fell short, and consumption and investment remained weak. As a result, asset prices continued to decline, with both land and equity prices near two-decade lows at end-2002. Inflation expectations, which remained positive until the beginning of actual price declines, subsequently turned negative and became entrenched as a sustainable economic recovery proved to be elusive. Surveys indicated that households and firms expected prices to continue to fall in the foreseeable future. The BoJ responded by gradually lowering the overnight call rate toward its floor in the late-1990s, but base money growth rates remained relatively muted until early-2001. A quantitative easing framework was then put in place, with banks' excess reserves held at the BoJ becoming the operating target. The BoJ incrementally raised its target of purchasing government bonds as part of the quantitative easing policy, but so far there is little evidence that its actions have been sufficiently aggressive to dent deflationary pressures.

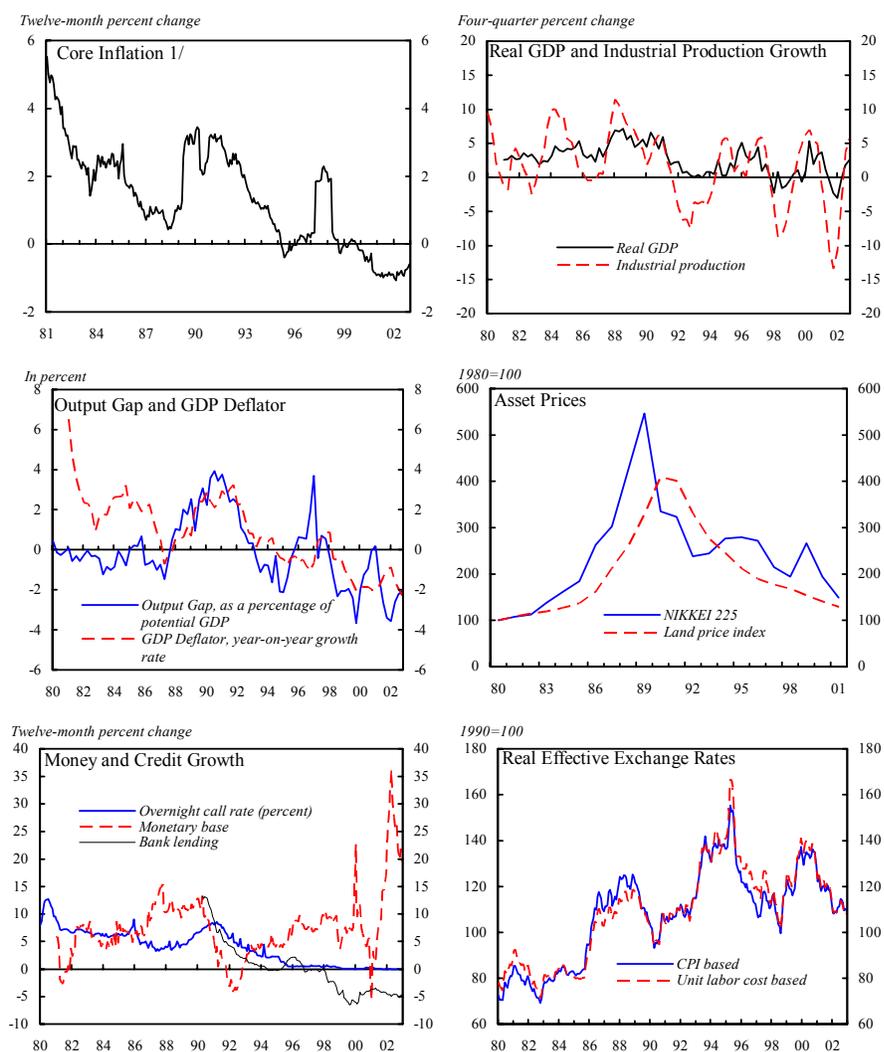
The ongoing deflationary episode has been strikingly broad-based in its nature. Very few items in the consumer price index have experienced increases or even price stability. Prices of major items such as food, clothing and footwear, furniture, transportation and communication, housing rent, and durable goods, have all registered gradual declines. The general decline in price levels cannot be explained a single factor, such as competitive pressure from abroad or excess capacity and deregulation at home. Rather, a combination of these and other factors, including banking sector difficulties, insufficiently loose monetary policy, and stagnant demand have been instrumental.

¹ Kamada and Hirakata (2002), estimating a comparative advantage model for Japan, show that some of the downward pressure faced by consumer prices in the mid- and late-1990s can be explained by the increase in international competition.

Box 4.3: Deflation in Japan (cont.)

On the policy front, clearly, an aggressive easing of monetary policy is essential in combating deflationary pressures. Studies of historical episodes of deflation have repeatedly shown that a large and sustained increase in liquidity is a prerequisite to generating inflationary expectations, and despite recent measures such as targeting banks' excess reserves held at the BoJ, Japan's monetary policy has not been sufficiently loose (Baig, 2003). Additionally, a comprehensive approach to tackle the bank and corporate sector problems is needed to stimulate demand and prices on a sustainable basis and bring the economy out of its protracted stagnation.

Figure 1. Japan: Selected Economic Indicators, 1980-2002



Sources: IMF, Information Notice System; CEIC database; and staff estimates.

1/ Excludes fresh food, fuel, water and light; seasonally adjusted. The two spikes around 1989 and 1997 are due the introduction and subsequent increase of consumption tax.

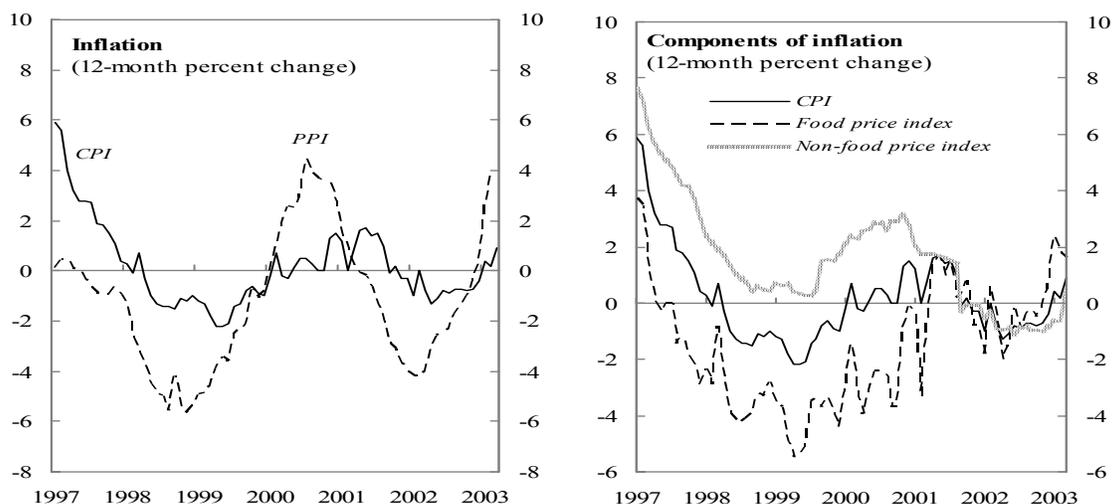
Box 4.4: China—Recent Deflation Episodes

Prices: The recent deflation episode is the second in the last four years. After peaking at over 25 percent in 1994, CPI inflation declined steadily as macroeconomic policies were tightened to cool the overheated economy. Prices began to fall in 1998 as the economy slowed further in the wake of the Asian crisis, and this lasted until 2000. Deflation resurfaced during late 2001– end-2002, peaking in April 2002 at 1.3 percent. Falling goods prices more than accounted for this decline, as most service prices continued to increase moderately. During the same period, PPI declined also, with PPI deflation exceeding 4 percent in early 2002, but this decline ended by December 2002.

Staff analysis suggests that in the second deflationary episode, both transitory and longer-term supply shocks were at play. In the short-run, lower commodity prices and WTO-related tariff cuts put downward pressure on prices, and led to a mild deflation. Longer-term factors include: productivity gains from reforms to State-Owned Enterprises (SOEs), adoption of new technologies, and greater competition from more open markets. Among the less benign factors is high excess capacity in some sectors owing to difficulties in closing some SOEs.

Monetary and Credit Conditions: Strong foreign exchange inflows pushed the M2 growth rate to 18 ½ percent (year-on-year) in the first quarter of 2003. While overall lending was strong, lending by large state commercial banks remained cautious.

Policy Impediments: Despite improvements, shortcomings remain in China’s institutional framework, which reduce the effectiveness of indirect monetary instruments, and China faces medium-term fiscal pressures. Monetary policy faces significant headwinds from an underdeveloped interbank market. Furthermore, while fiscal policy was geared to support domestic demand in 2002, fiscal consolidation is needed in the medium term, in view of the large quasi-fiscal liabilities in the banking system and future costs of pension reform, infrastructure, and other social needs.



Box 5.1: Inflation Targeting and Deflation Risks

The benefits of low inflation are well known. But given risks of deflation, is there a case for targeting a somewhat higher rate of inflation, say 2 to 3 percent, rather than a lower or zero rate? There are three relevant considerations:

First, a small positive rate would reduce the likelihood that countercyclical monetary policy becomes constrained by the zero floor on nominal interest rates. A number of studies suggest that the probability of the zero interest rate floor becoming binding is small for inflation targets down to around 2 percent, but then increases for lower targets, and especially below 1 percent (see Hunt and Laxton 2003, Kieler 2003, Reifschneider and Williams, 2000 and Yates 2002). It has been argued that these findings may underestimate the likelihood of the zero constraint becoming binding given the non-linearities in the system.

Second, the potential dispersion in trend inflation across members of a currency union may be large. Inflation in some countries may have to be compensated for with deflation in others, if the inflation target for the union is low. For the Balassa-Samuelson effects, a variety of studies suggest that the steady state inflation in Germany could be significantly below the euro area average, and perhaps below 1 percent if the ECB aims for 1.5 percent for the aggregate.¹

Third, inflation may facilitate relative price and wage adjustments in an economy where agents are averse to nominal wage or price cuts.² Downward rigidities may stem from elements of money illusion, and employer concerns about the impact of wage cuts on worker morale. Akerlof et al. (1996) argue that steady-state unemployment in the United States would be considerably higher at rates of inflation below 3 percent, and especially below 2 percent. However, the coexistence of low inflation and falling NAIRUs in a number of industrialized economies in the 1990s—including the United States and the United Kingdom, and several euro countries—suggests that the reduction in inflation to roughly 2 percent has not had any detrimental impact on the smooth functioning of labor markets.

¹ See for example, Canzonieri and others (2002), and De Grauwe (2000). The Balassa-Samuelson model has not received unequivocal backing in the empirical literature. For example, Rogoff (1996) concludes that across industrialized countries, there is long-run convergence to PPP, the Balassa-Samuelson effect notwithstanding. Kieler (2003) shows how average inflation rates might differ across the euro-area countries over the long-run depending on the how fast remaining differences in price levels are reduced. The results suggest that trend inflation rates could vary from around 1-1¼ percent in Germany and France to 2-3¼ percent in Portugal, Greece, and Spain, assuming an inflation target of 1.5 percent.

² See Keynes (1936); Tobin and Dolde (1971).

Index of Deflation Vulnerability-- Data Sources and Definition of Variables

1. Most of the data were drawn from two main sources: Haver Analytics' EMERGE database (for emerging market economies) and the OECD's Main Economic Indicators database (for OECD members). The Haver data are derived from national sources, and some attempt is made to harmonize data types across countries. The OECD data are high-frequency data (many series are available on a monthly basis). The remaining data are from the IMF's International Financial Statistics (IFS) and WEO and Global Data Source databases.
2. In all, 14 measures of deflationary pressure were compiled for each of the 35 economies, at least from 1994 to 2002 (or until the latest possible observation). Each measure was a binary (1/0) indicator, with a "1" reflecting possible deflationary pressure from that source.
3. *Prices (3 measures)*. Each measure of inflation scored a 1 if the rate for that quarter was less than 1/2 percent. Inflation was measured as a Q4/Q4 change in the price index (for CPI and core CPI) or GDP price deflator. Quarterly CPI inflation data are available for all 35 countries from the IFS database. GDP price deflators are derived from the ratio of nominal GDP (from IFS) to real GDP (from WEO and IFS). Because some emerging markets did not report core CPI to the IFS, it had to be supplemented using data from Haver, where available.
4. *Output Gaps (3 measures)*. The following measures of excess capacity and weak demand were used: (i) whether the output gap had increased by more than 2 percentage points over the past 4 quarters; (ii) whether the current output gap was more than 2 percent; (iii) whether real GDP growth over the past three years was less than the annual average growth over the preceding decade. Output gap data were available only for 21 countries (mostly industrial), provided by IMF desk economists. For the remaining 14 economies, a Hodrick-Prescott filter was used to create potential output data. While the smoothed approximation to potential GDP is not perfect, the estimates seemed to match recent demand and supply pressures. Using the Hodrick-Prescott filter for the industrial economies (where the output gap data are available directly) does not change the results.
5. *Stock Market Prices (1 measure)*. To measure pressures on the asset markets, this indicator measured the change in the broad measure of the stock market over the past three years (that is, the change over the past 36 months). The stock price index data were available in Datastream and were roughly comparable to the coverage of the U.S. S&P 500.
6. *Exchange Rates (1 measure)*. The exchange rate measure scored a 1 if the real, effective exchange rate (REER) had appreciated by more than 4 percent on a Q4/Q4 basis—measuring downward price pressures from the external sector. The REER was available from JPMorgan for all economies, except Poland, Russia, and China. JPMorgan's index is not available for those countries because its base year is 1990=100. For those three countries, the REER was taken from IFS.

7. *Private, Nominal Credit Growth (Total Lending to the Private Sector, 2 measures)*. The following two measures of a breakdown of credit allocation were used: (i) whether Q4/Q4 credit growth was less than Q4/Q4 nominal GDP growth; and (ii) whether cumulative credit growth over the past three years was less than 10 percent. Credit growth was only measured by the nominal value of credit (or lending) to the private sector, and the growth rate was measured on a year-on-year basis. The private credit data were, unfortunately, not available on a consistent basis across all countries. For most (13) emerging market economies, the only data available were from the IFS (line 32d.ZF..., Claims on the Private Sector). For most industrial economies, private sector credit data were available from the OECD's MEI database (Australia, Austria, Denmark, Finland, Greece, Ireland, Italy, New Zealand, Norway, Poland, Sweden, and Switzerland). Data for the remaining euro area economies came from national authorities. Data for the G-7 economies came from a combination of Haver data and national authorities.

8. *Money Supply Growth (1 measure)*. The money growth measure scored a 1 if broad money growth on a y/y basis grew slower than base money by two percentage points (or less) over the past eight quarters, to capture the relative efficacy of the monetary transmission mechanism. Money supply data were available for all emerging market economies, except China and Russia. For the remaining non-euro area economies, we used the national authorities' definitions of broad money (where available) in the Haver database. When the data were not strictly identified as broad money, we used M3 (or M2 in the rare cases where M3 was not available). For base money, we used the value of currency in circulation as a measure of base money, and if that was not available, we used M0. For the euro-area economies, it is technically possible to measure money supply growth, because the national authorities compute the national contribution to euro area money supply. However, we decided to exclude the euro area economies from this measure.

9. *Data Aggregation and Weighting*. For the weighting procedure, countries were divided into three cohorts on the basis of the ratio of equity market capitalization to GDP. Countries that have a relatively large equity market were given greater weight. A similar scheme was used to reflect the heterogeneity in the financial sector, using the stock of outstanding private credit relative to GDP as an indicator to divide countries into three corresponding cohorts.

10. A country that was in the top cohort in either category received a weight of 3 on that score, a country in the middle cohort received a weight of 2, and an economy in the bottom cohort, 1. As an example, if in an economy equity market declined by at least 30 percent *and* its market size was in the top cohort, it received a score of 3. In this example with 11 indicators, and weight adjustment, an economy in the top cohort for equity market size with a 30 percent decline thus receives a value of 0.23 (3/13) in the index, whereas a country in the third cohort and the requisite decline would receive a score of 0.09 (1/11).

Chart 1a. CPI and GDP Deflator in G-7

(percent change from a year earlier)

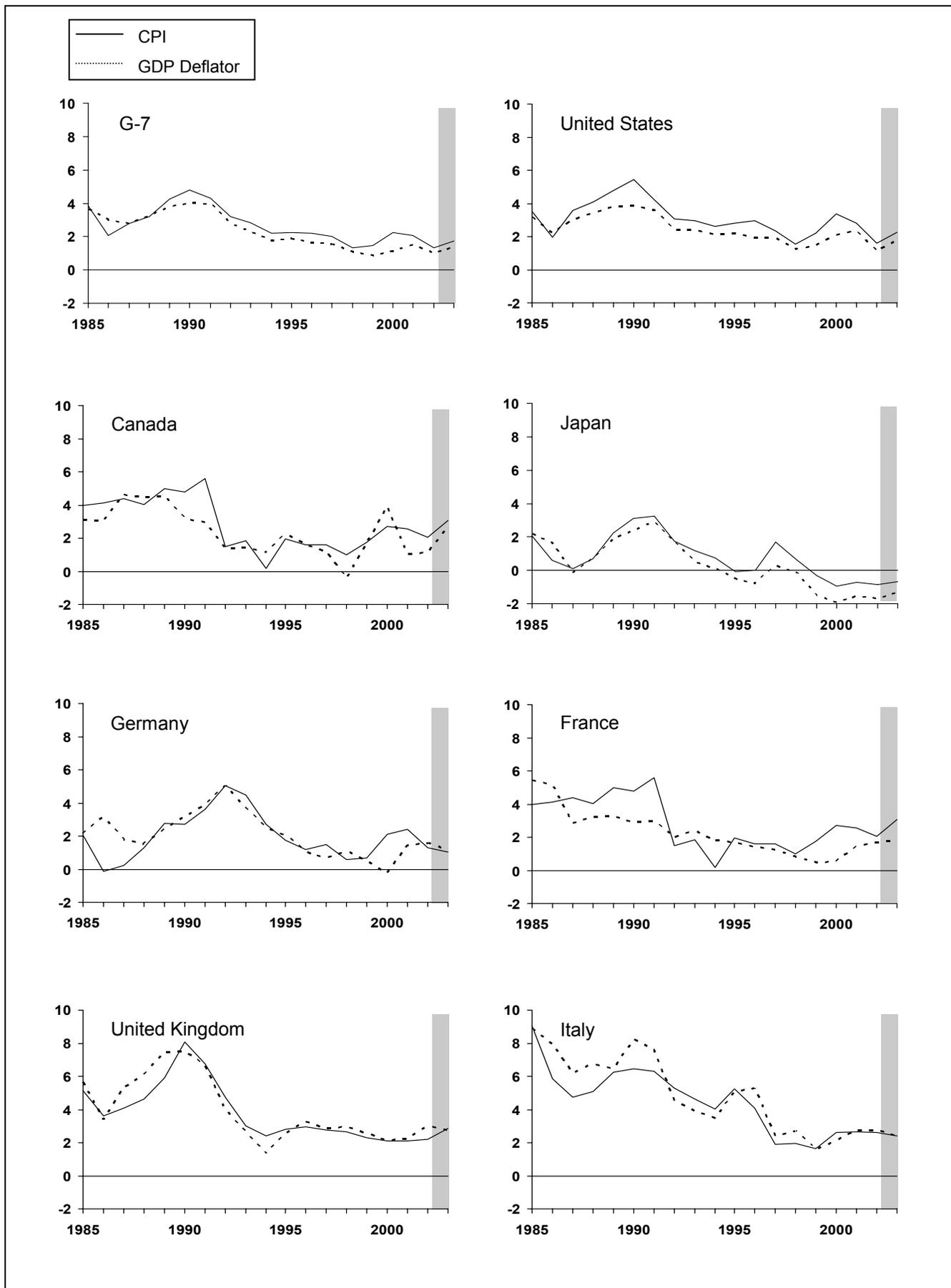


Chart 1b. CPI and GDP Deflator in Other Advanced Economies

(percent change from a year earlier)

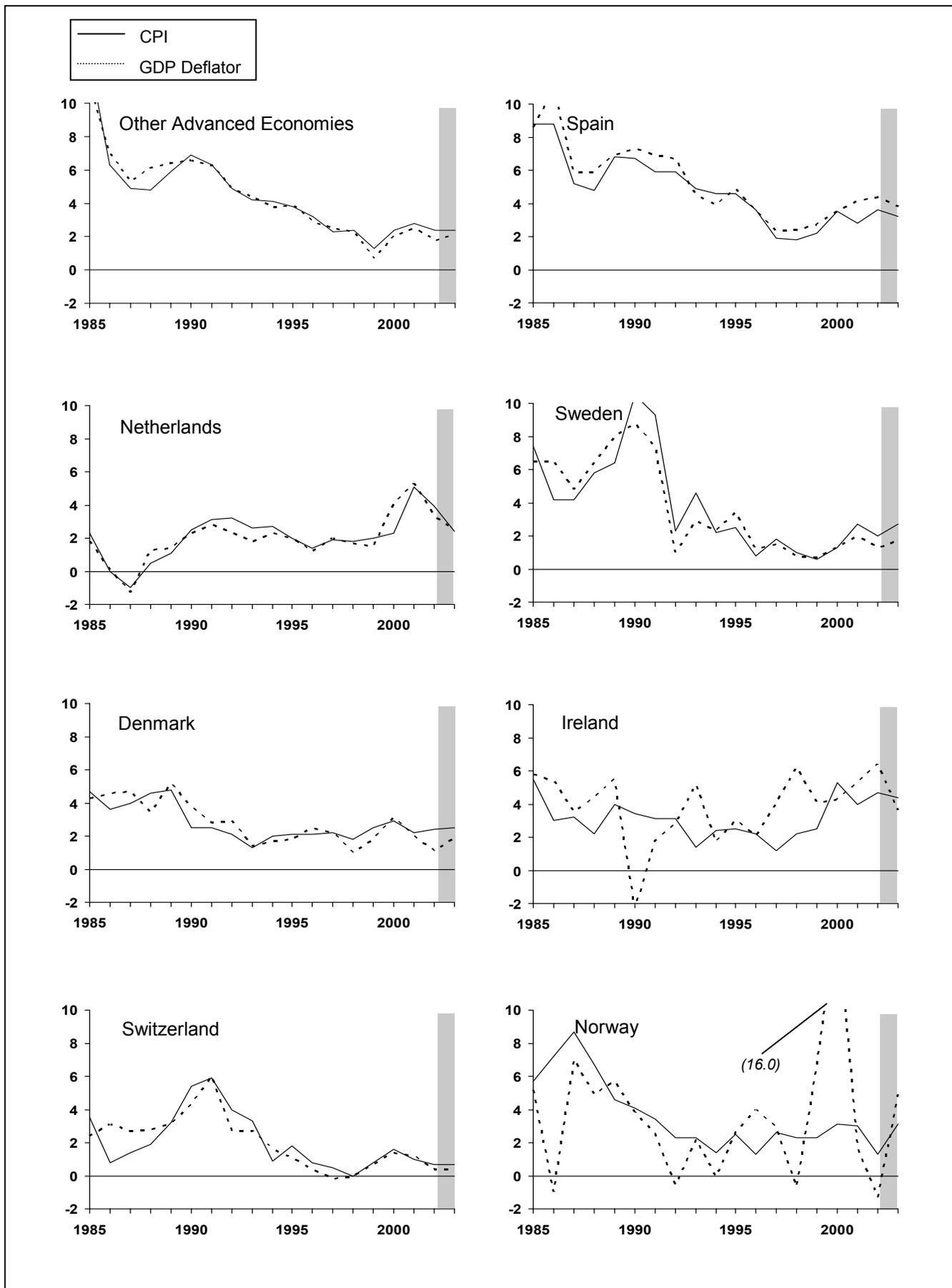


Chart 1c. CPI and GDP Deflator in Asian Economies

(percent change from a year earlier)

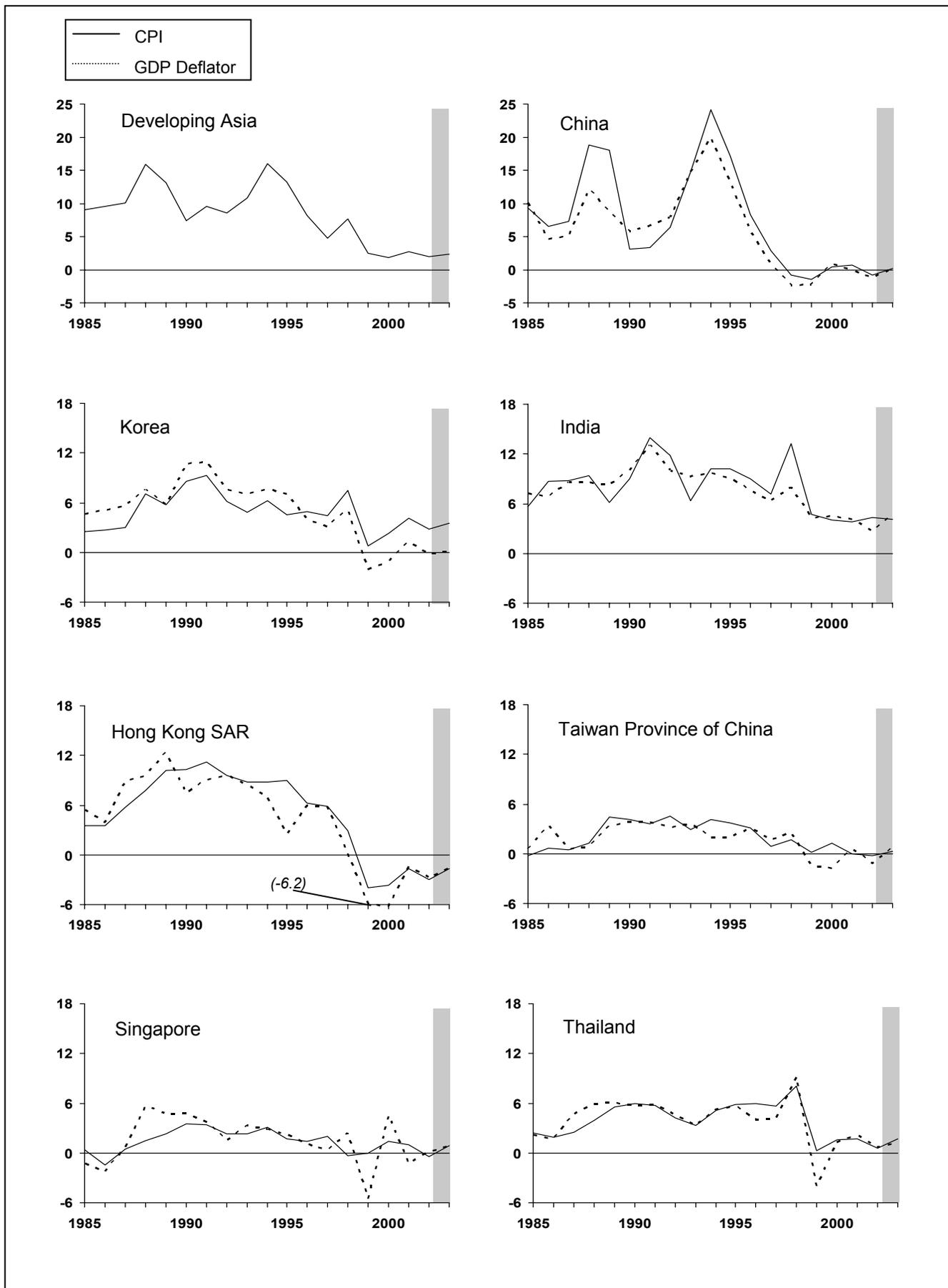


Chart 1d. CPI and GDP Deflator in other Emerging Market Economies

(percent change from a year earlier)

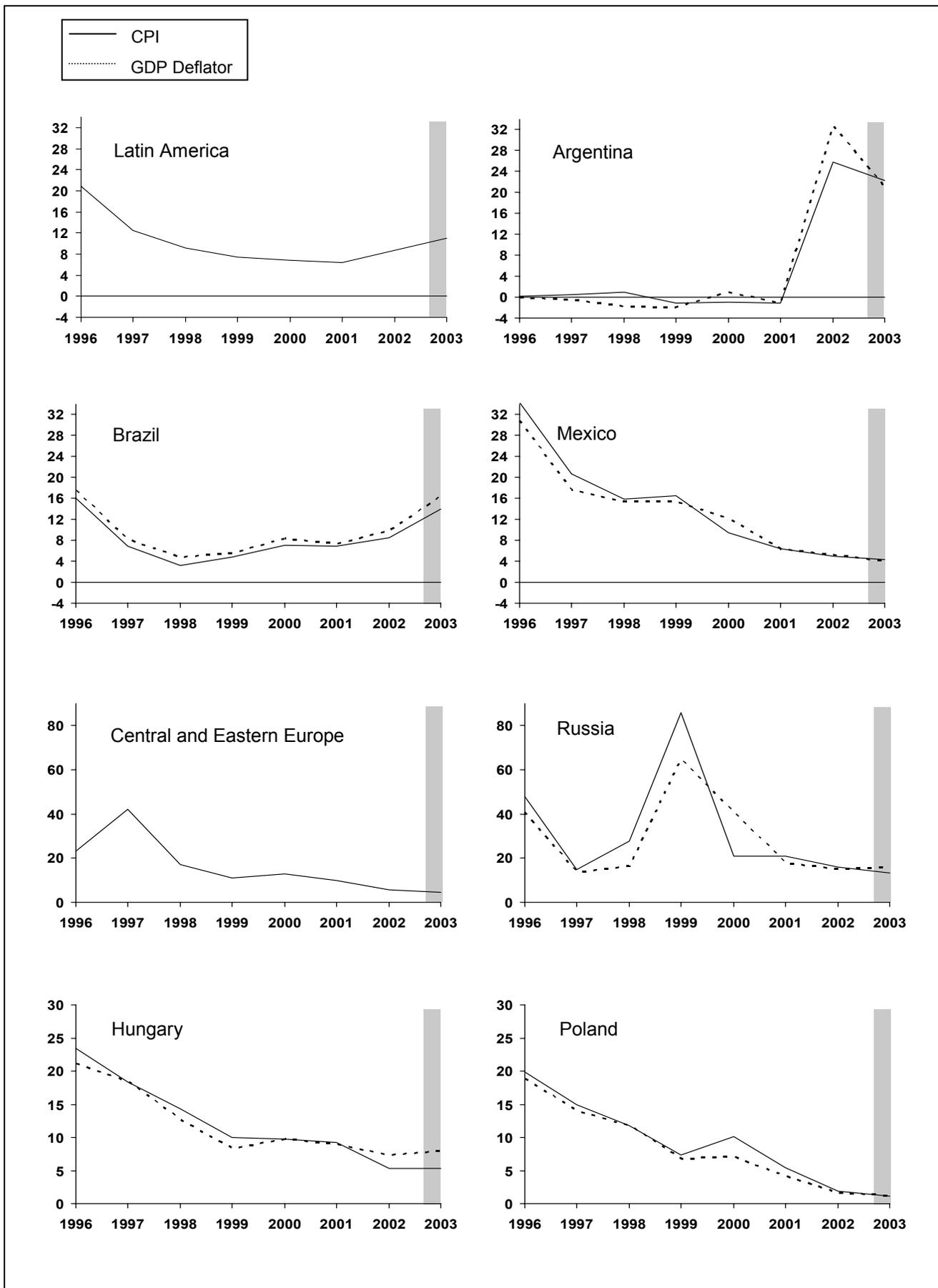


Chart 2a. Goods Prices
(percent change from a year earlier)

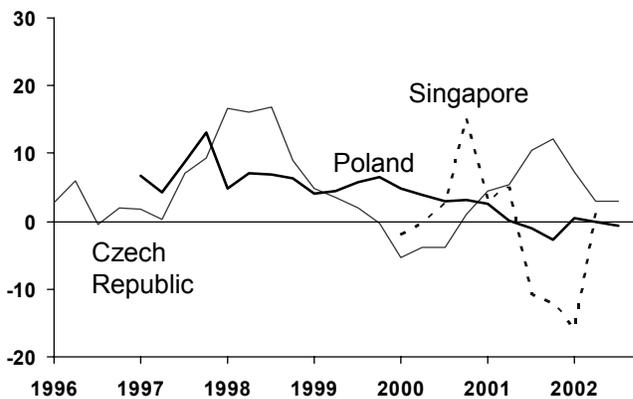
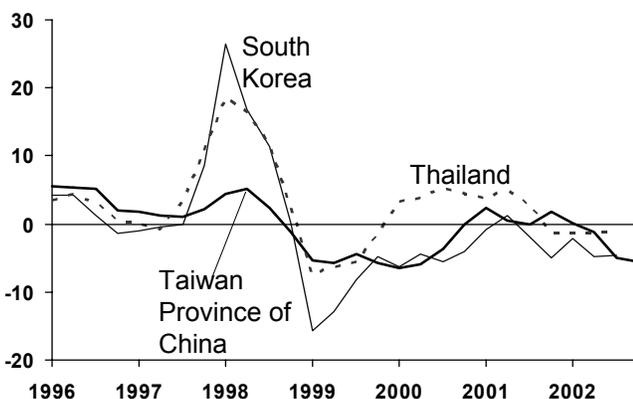
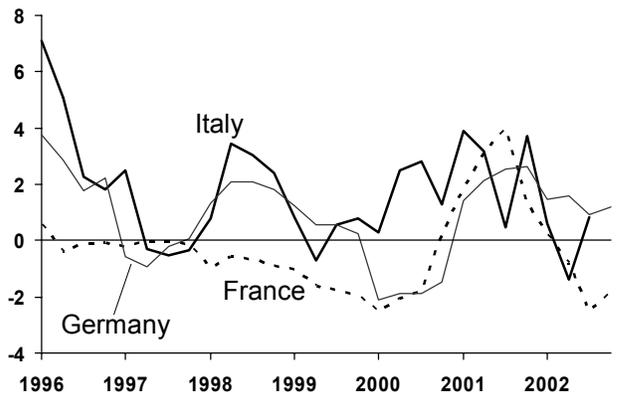
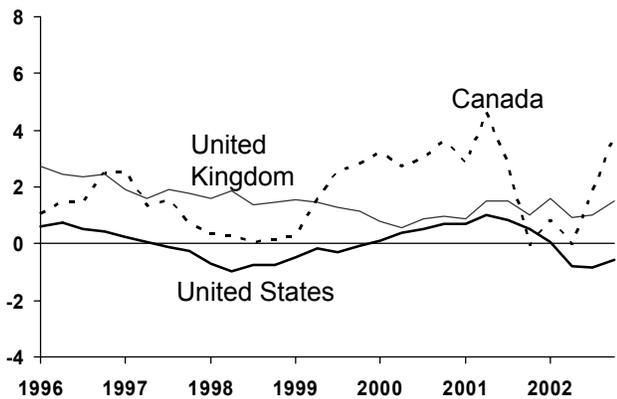


Chart 2b. Producer Prices

(percent change from a year earlier)

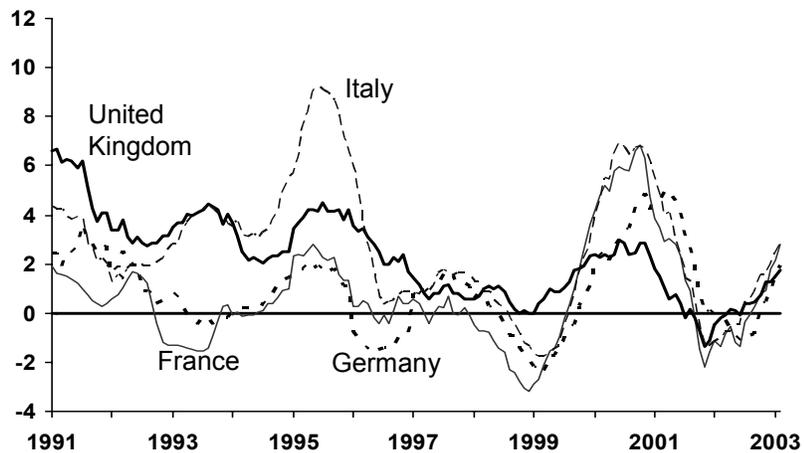
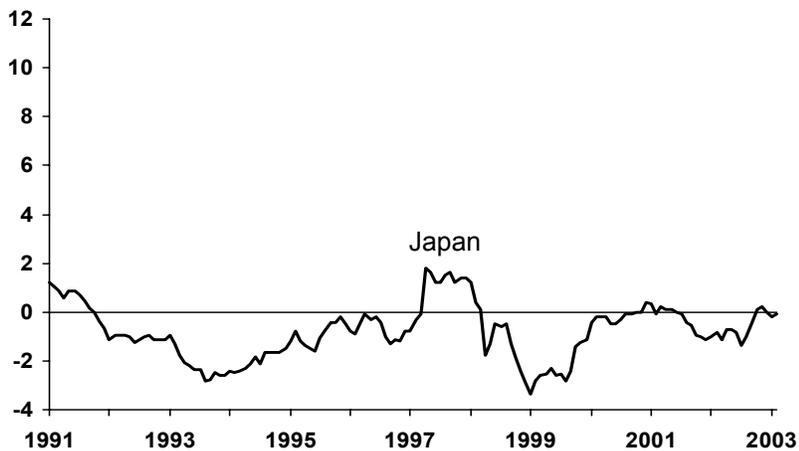
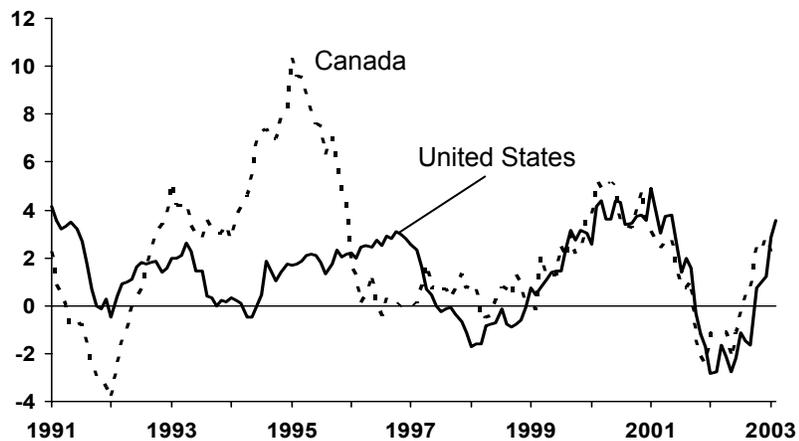


Chart 3. Average Inflation Rates (CPI)

(in percent)

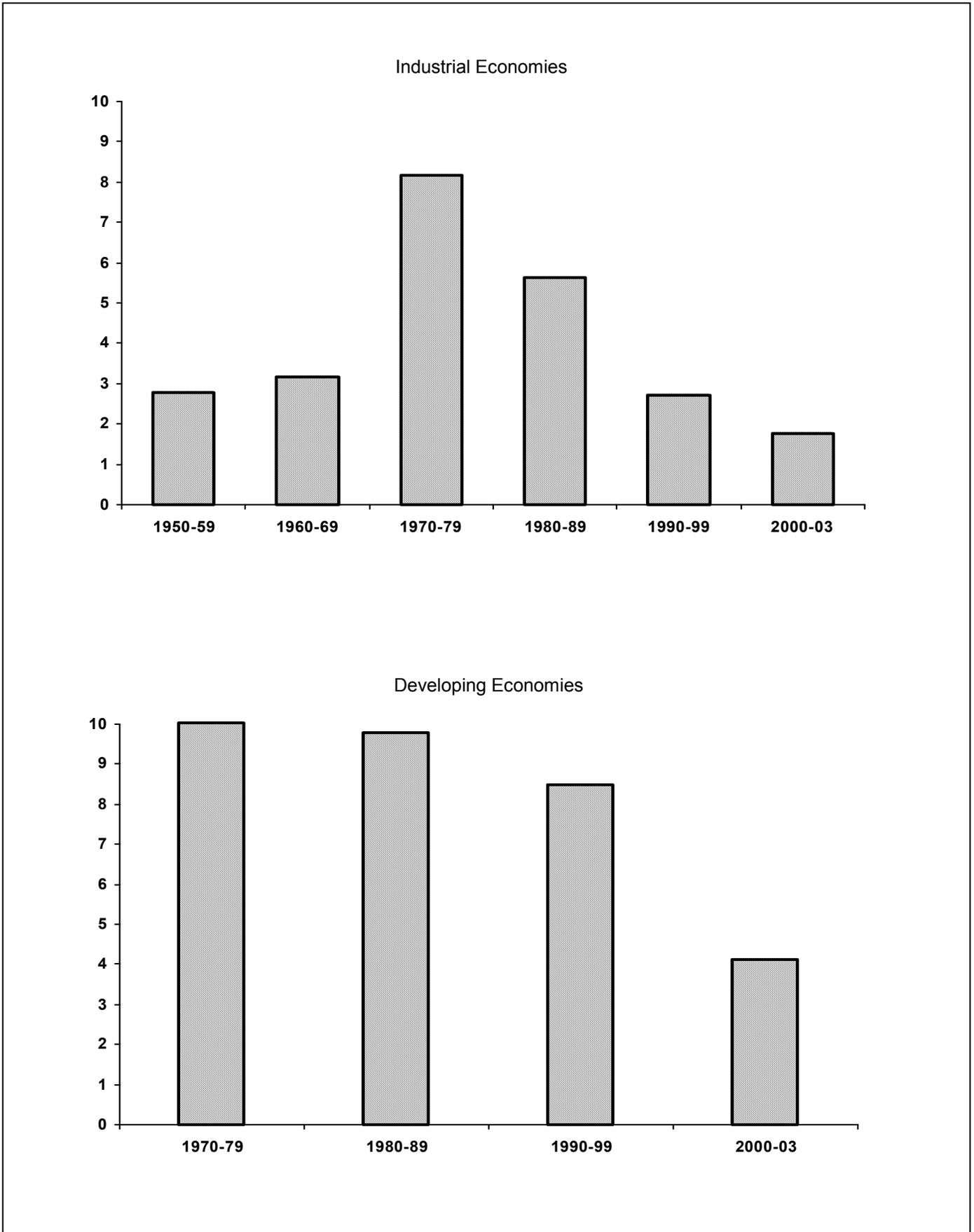


Chart 4. Consumer Prices and Inflation: United States and United Kingdom (1801-2002)

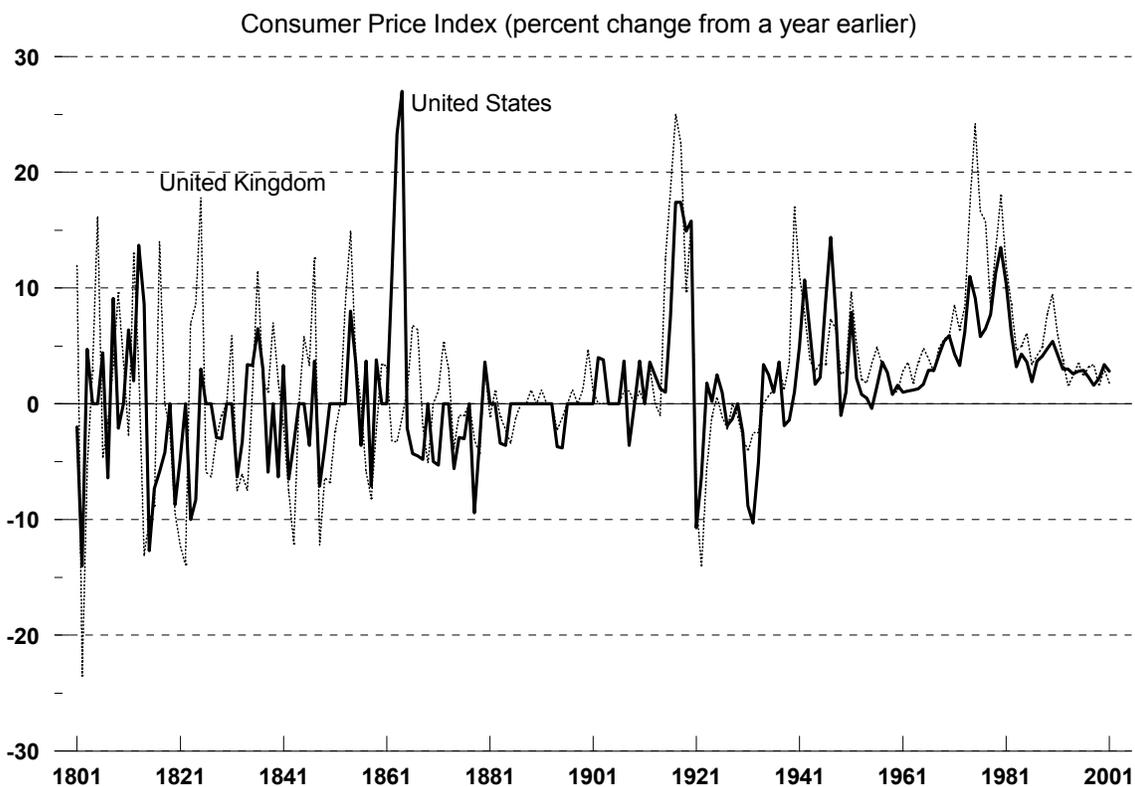
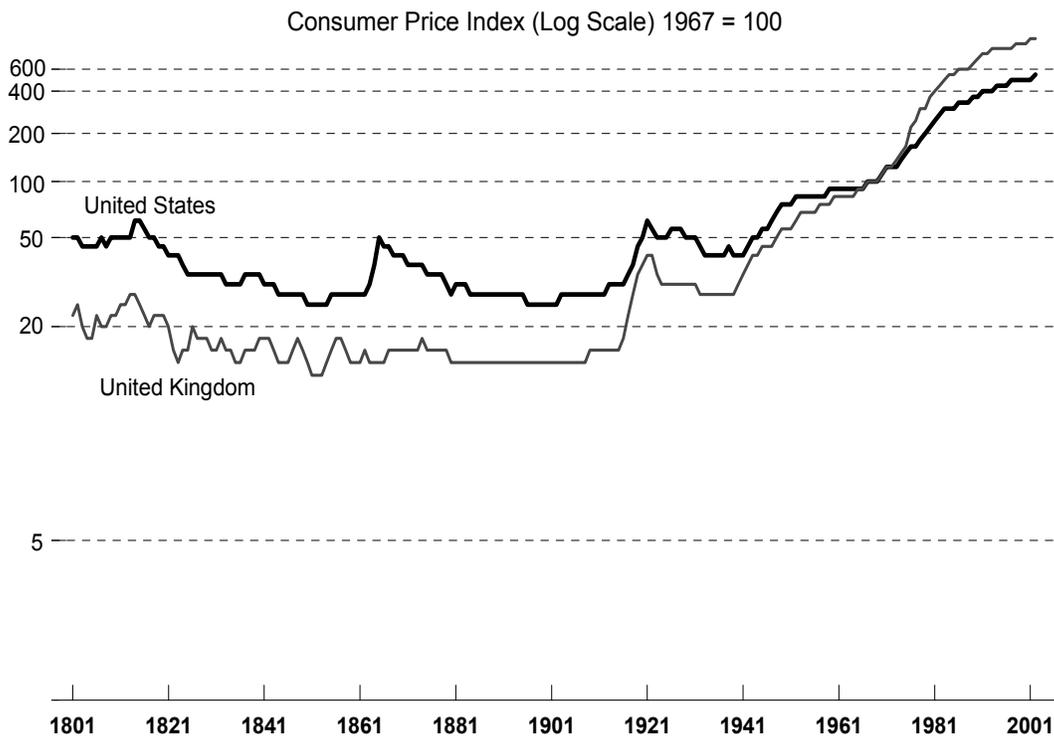


Chart 5. Yield Differential Between Nominal and Index-Linked Government Bonds

(basis points)

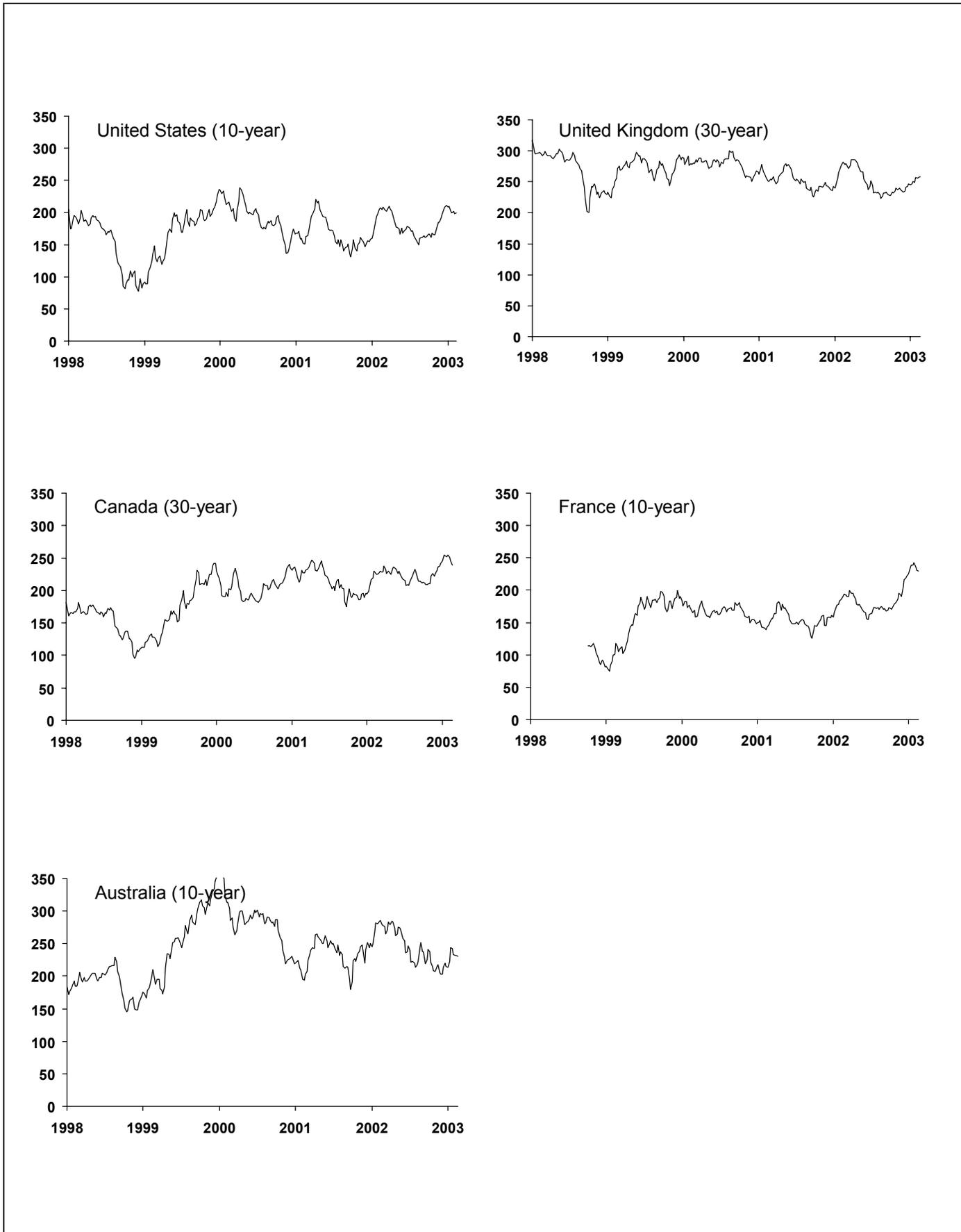
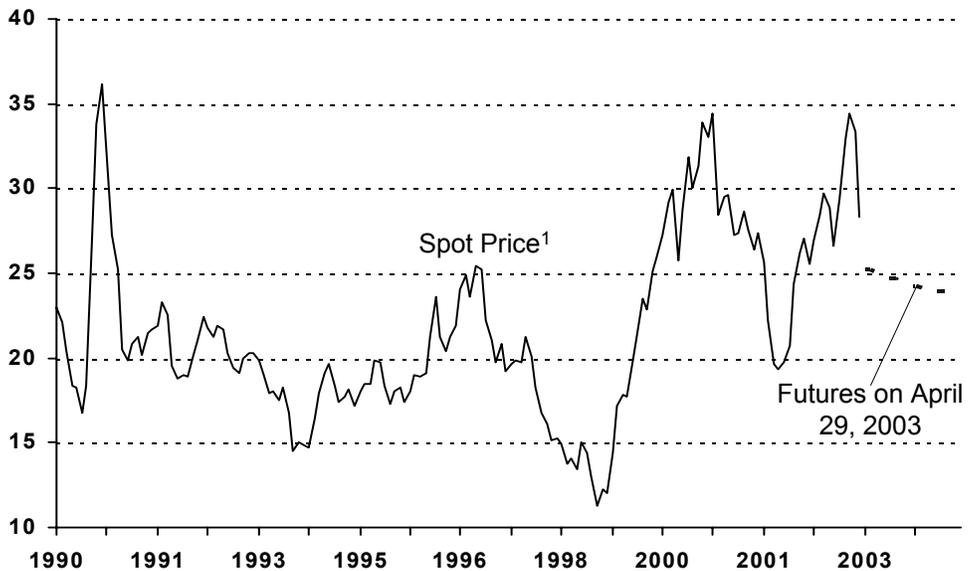


Chart 6. Commodity Prices

a. Oil Prices: Spot and Futures Contracts

(U.S. Dollars per barrel)



¹Spot Price are monthly averages of West Texas through April 2003.

b. Commodity Prices

(Index; 1990=100)

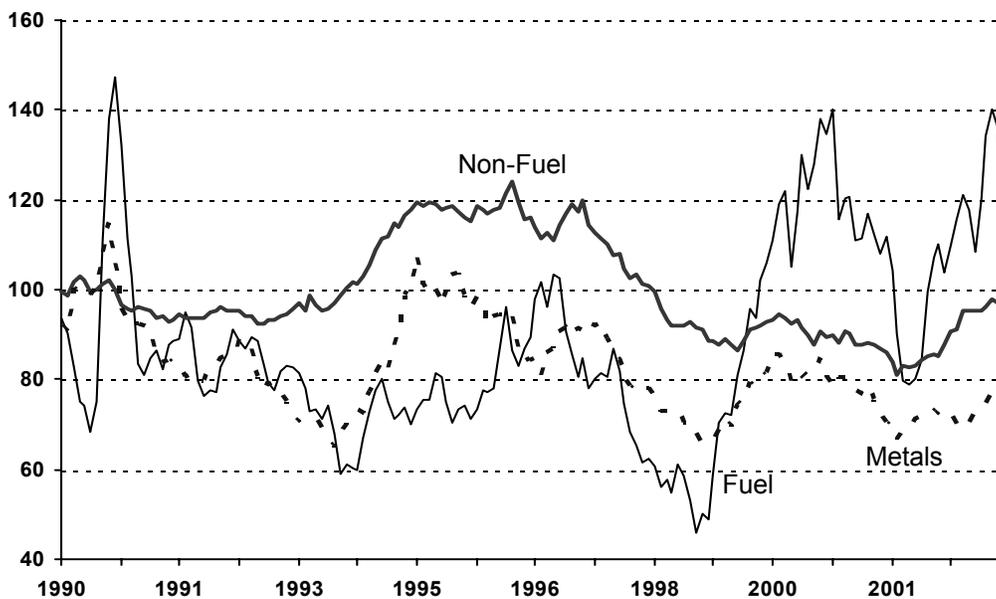


Chart 7a. GDP Growth and Output Gap in G-7

(percent change from a year earlier)

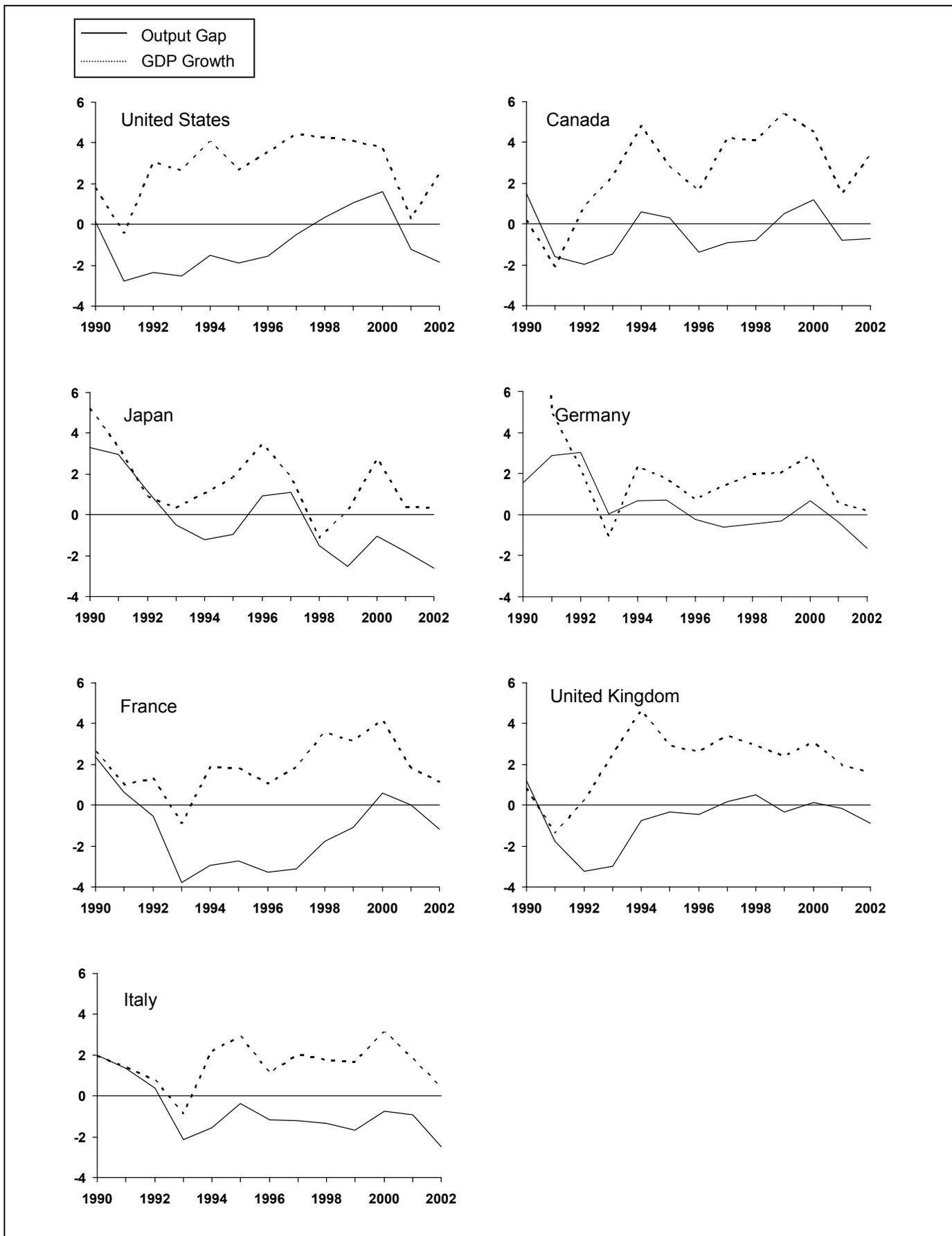


Chart 7b. GDP Growth and Output Gap in Asian Emerging Market Economies

(percent change from a year earlier)

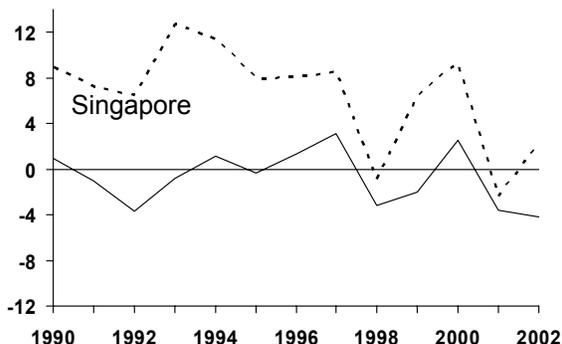
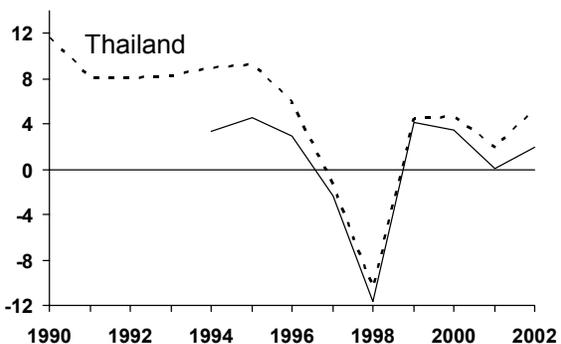
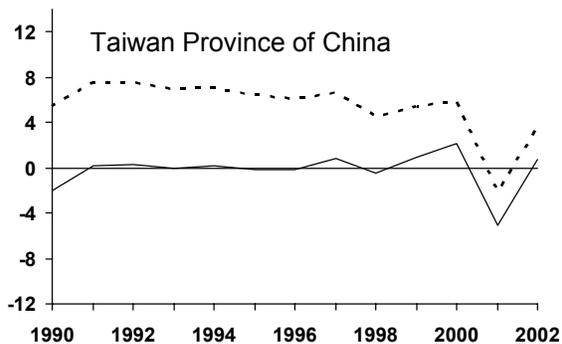
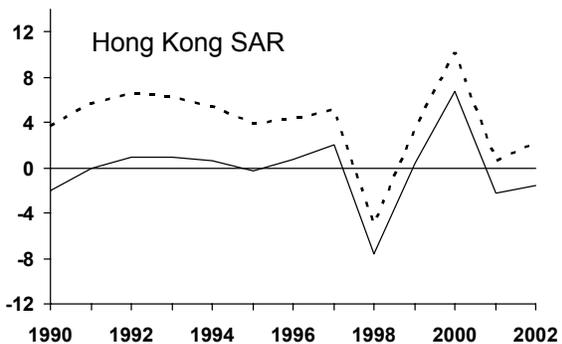
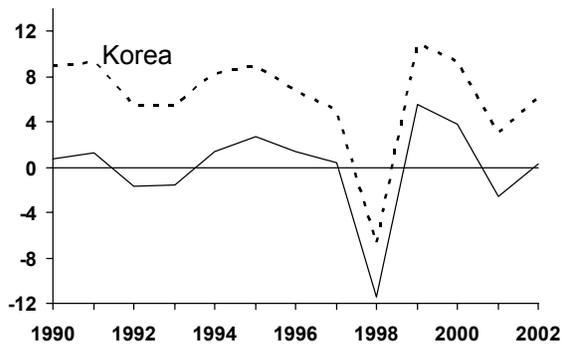
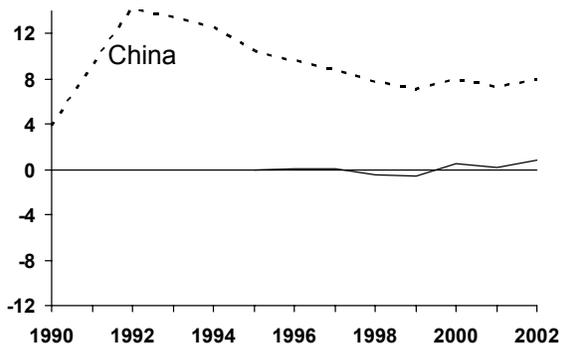
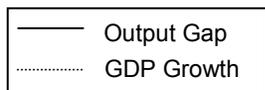


Chart 7c. GDP Growth and Output Gap in other Emerging Market Economies

(percent change from a year earlier)

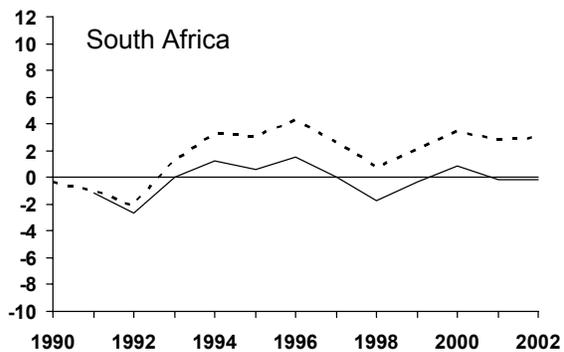
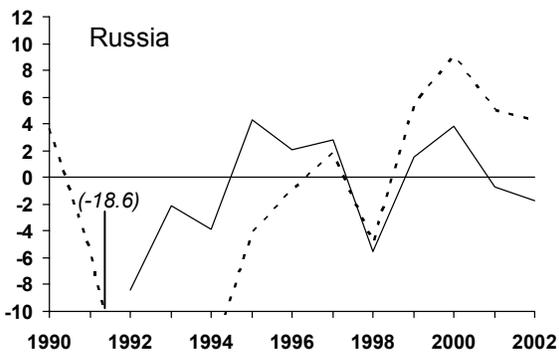
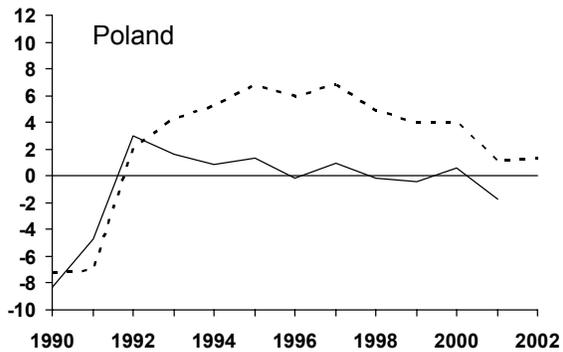
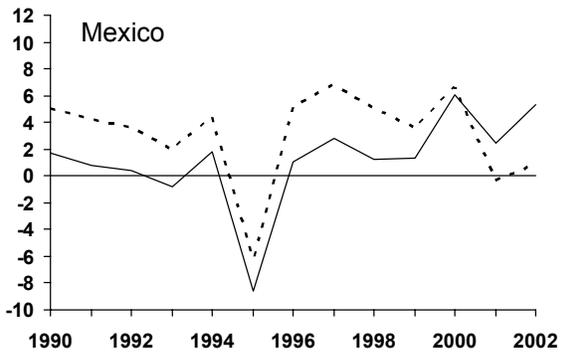
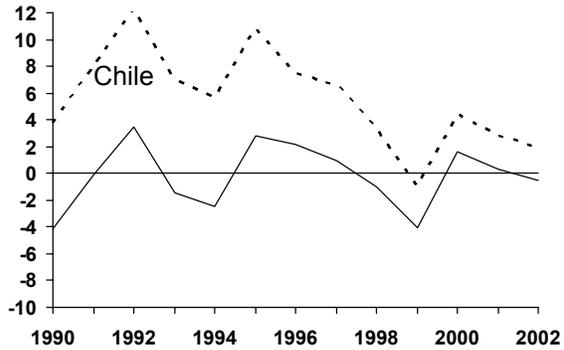
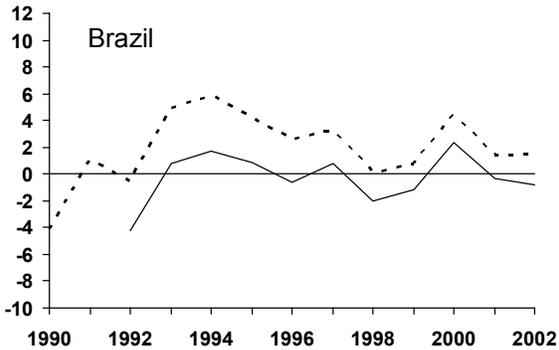
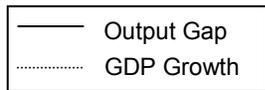


Chart 8a. Equity Prices in Industrial Countries

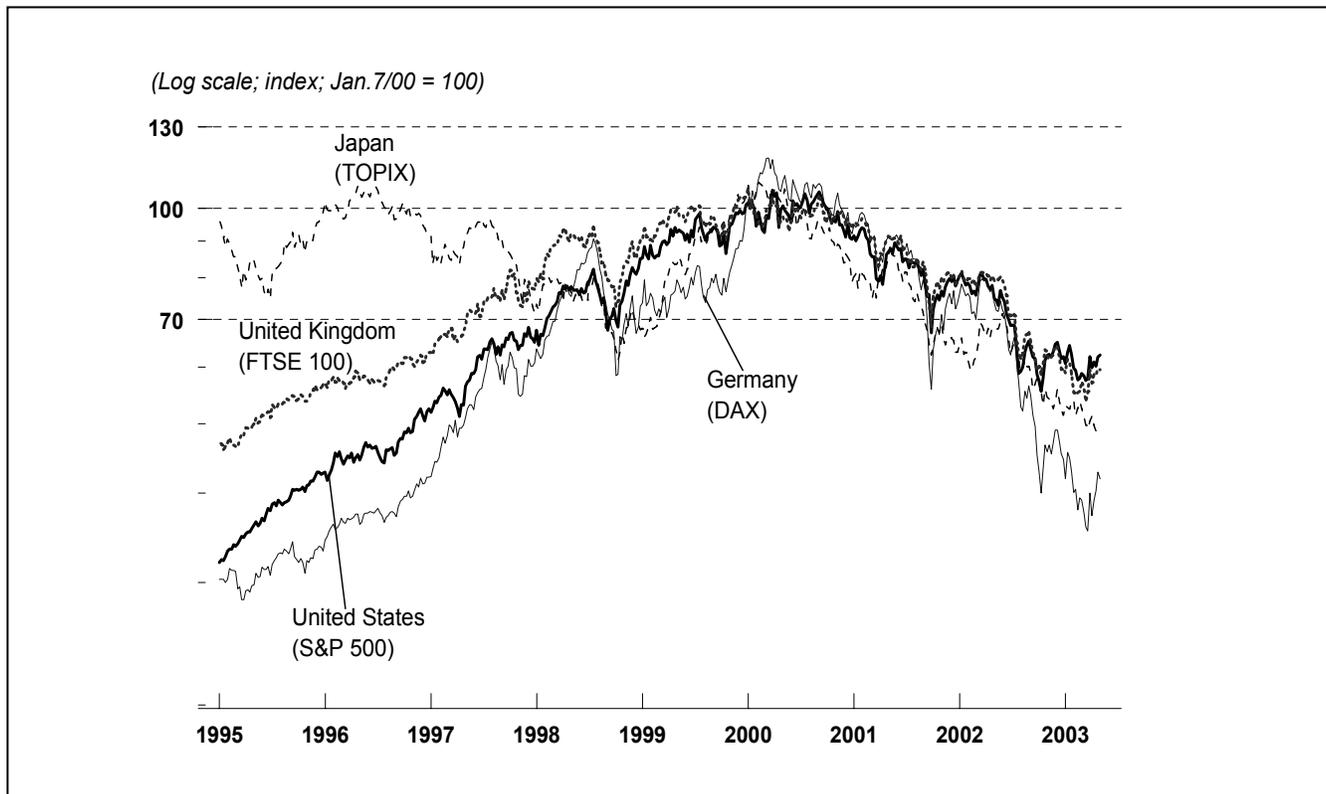


Chart 8b. Equity Prices in Emerging Markets

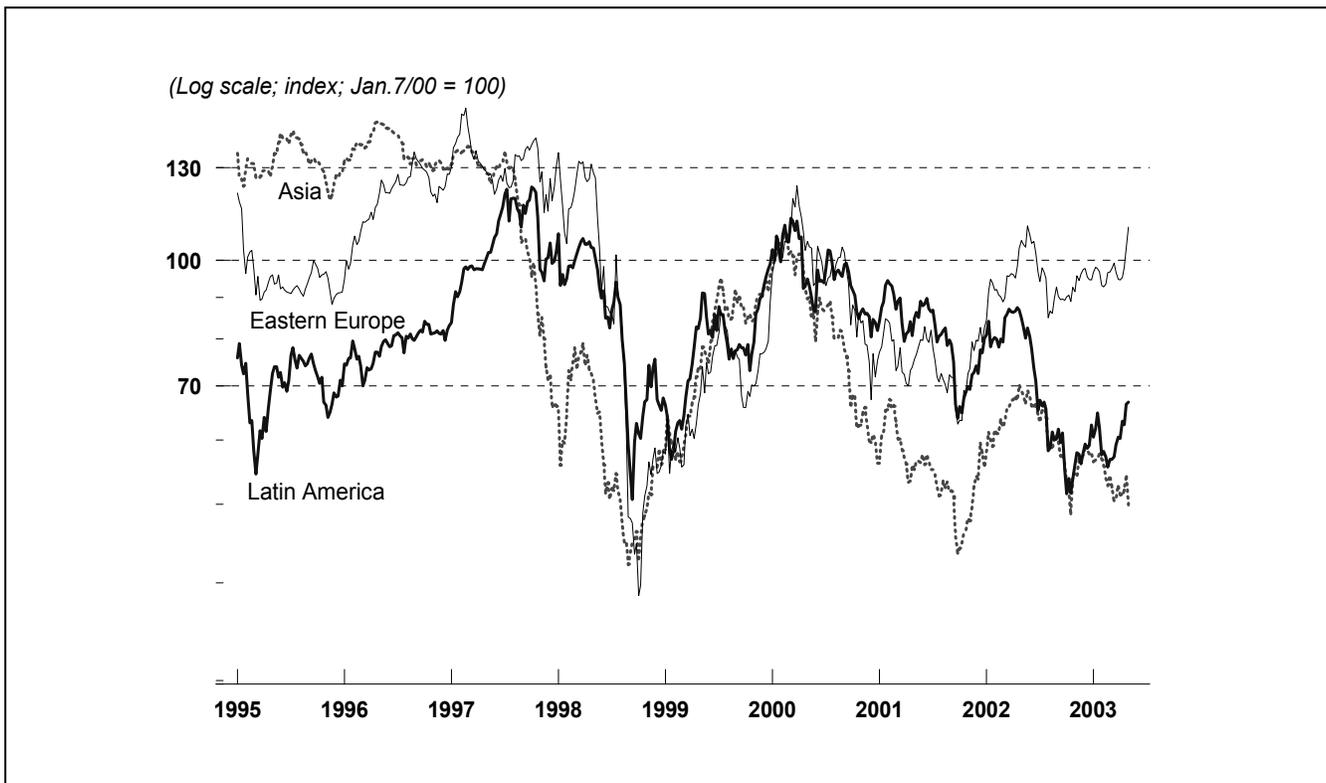


Chart 9. Price Earning Ratios in Advanced Economies

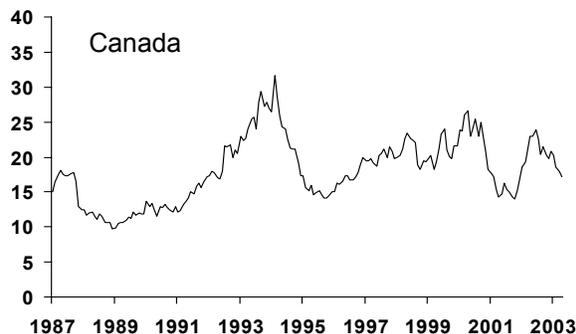
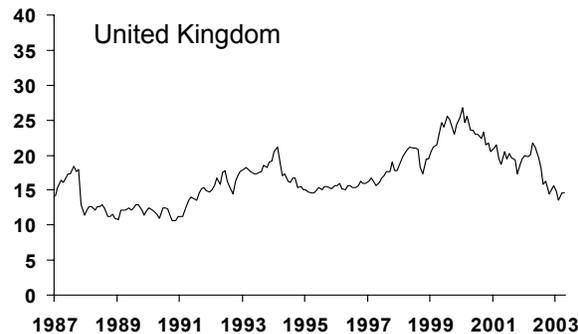
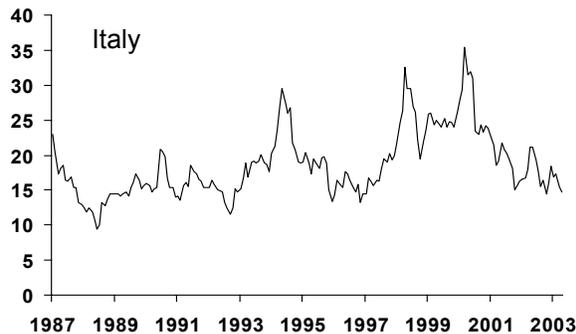
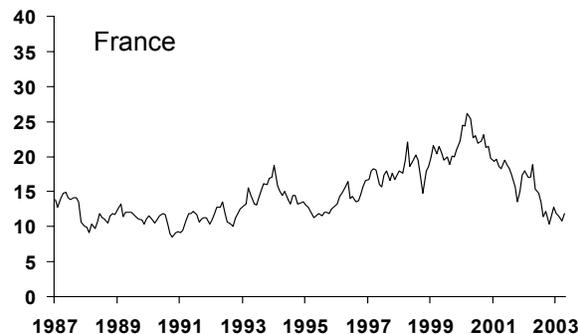
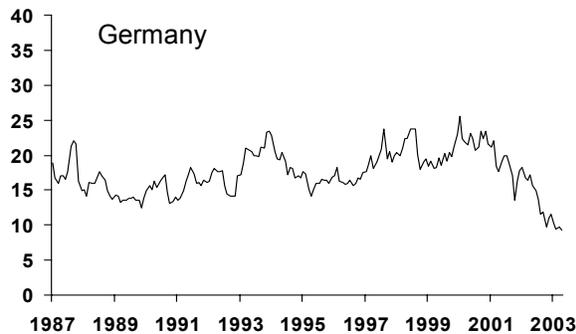
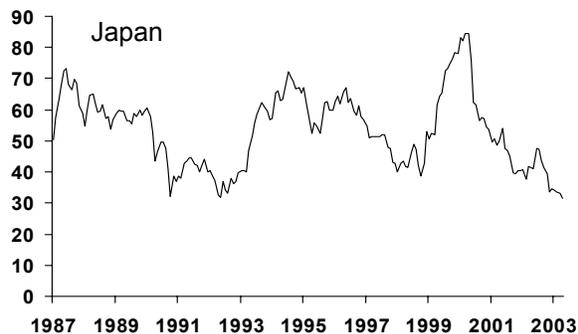
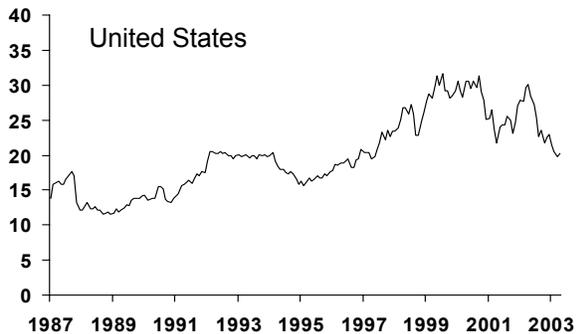


Chart 10. Real Effective Exchange Rates

(index; 1990 = 100)

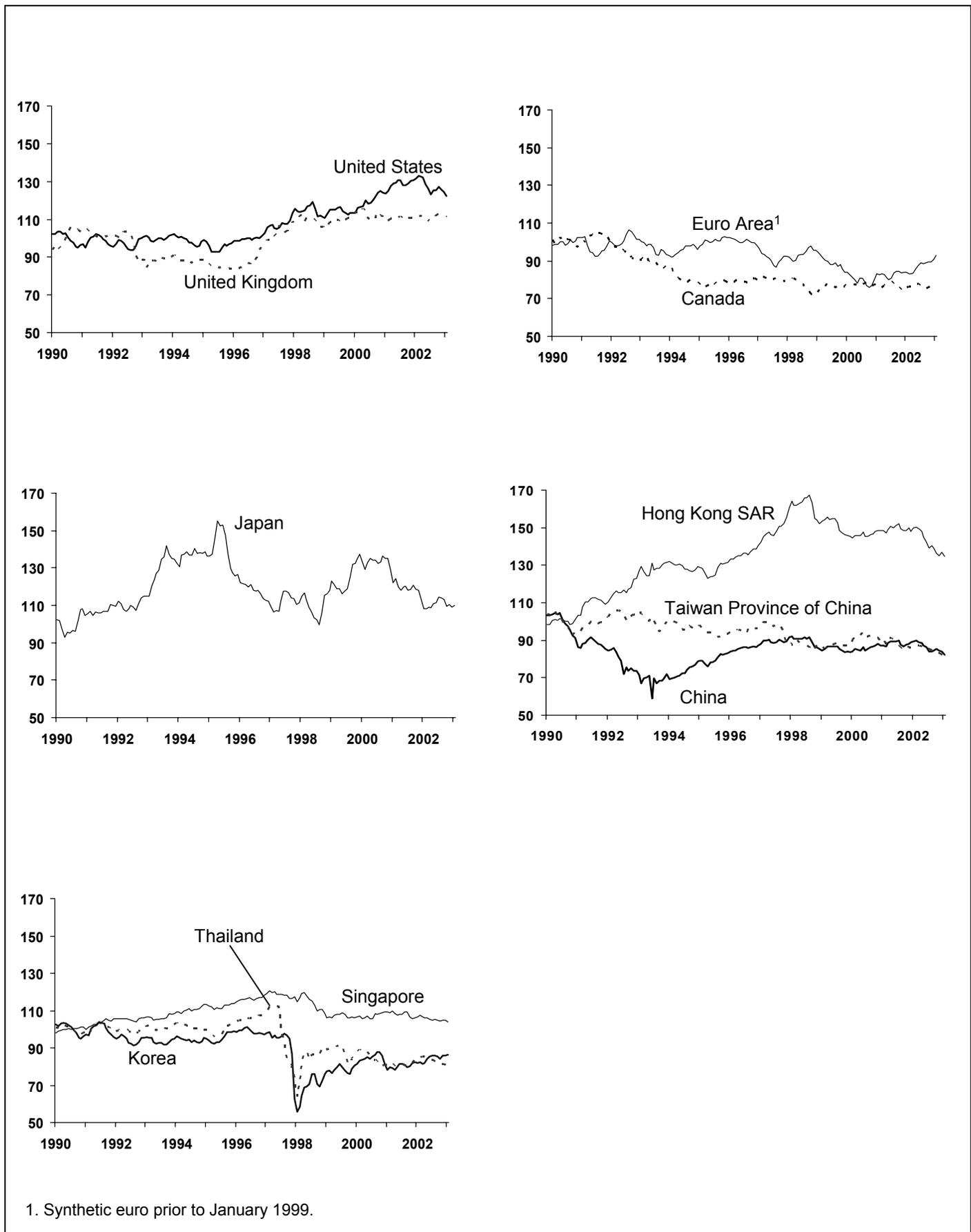


Chart 11. Private Sector Credit
(Nominal Credit Growth - Nominal GDP Growth: in percent)

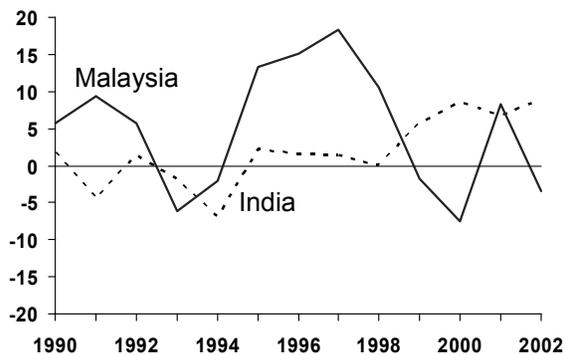
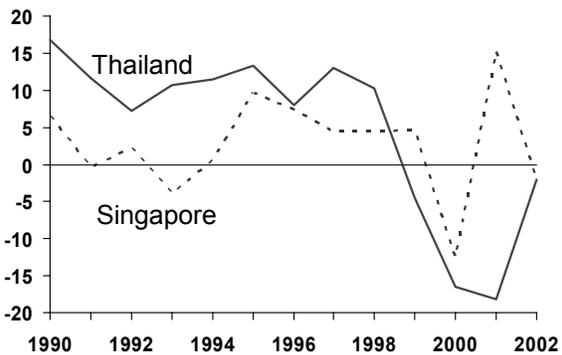
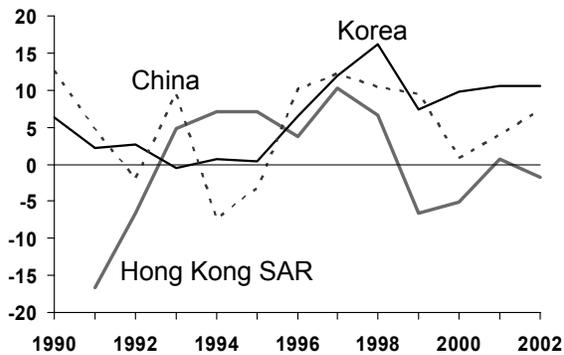
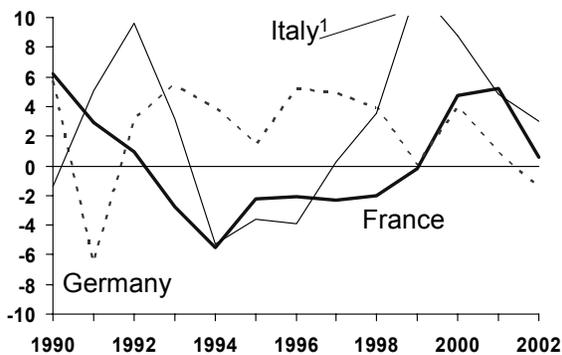
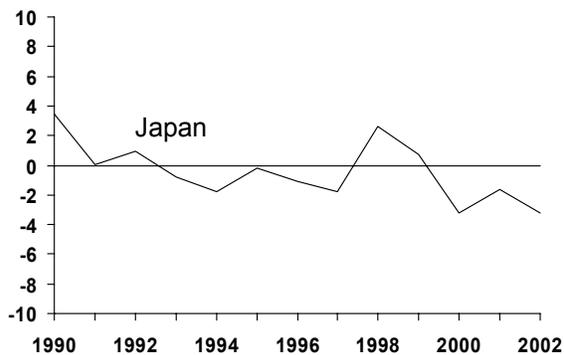
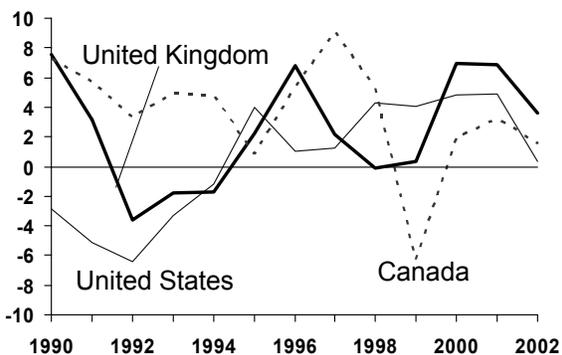


Chart 12a. Stock Markets (Comparison of Japan, U.S. and Germany-Monthly Data)

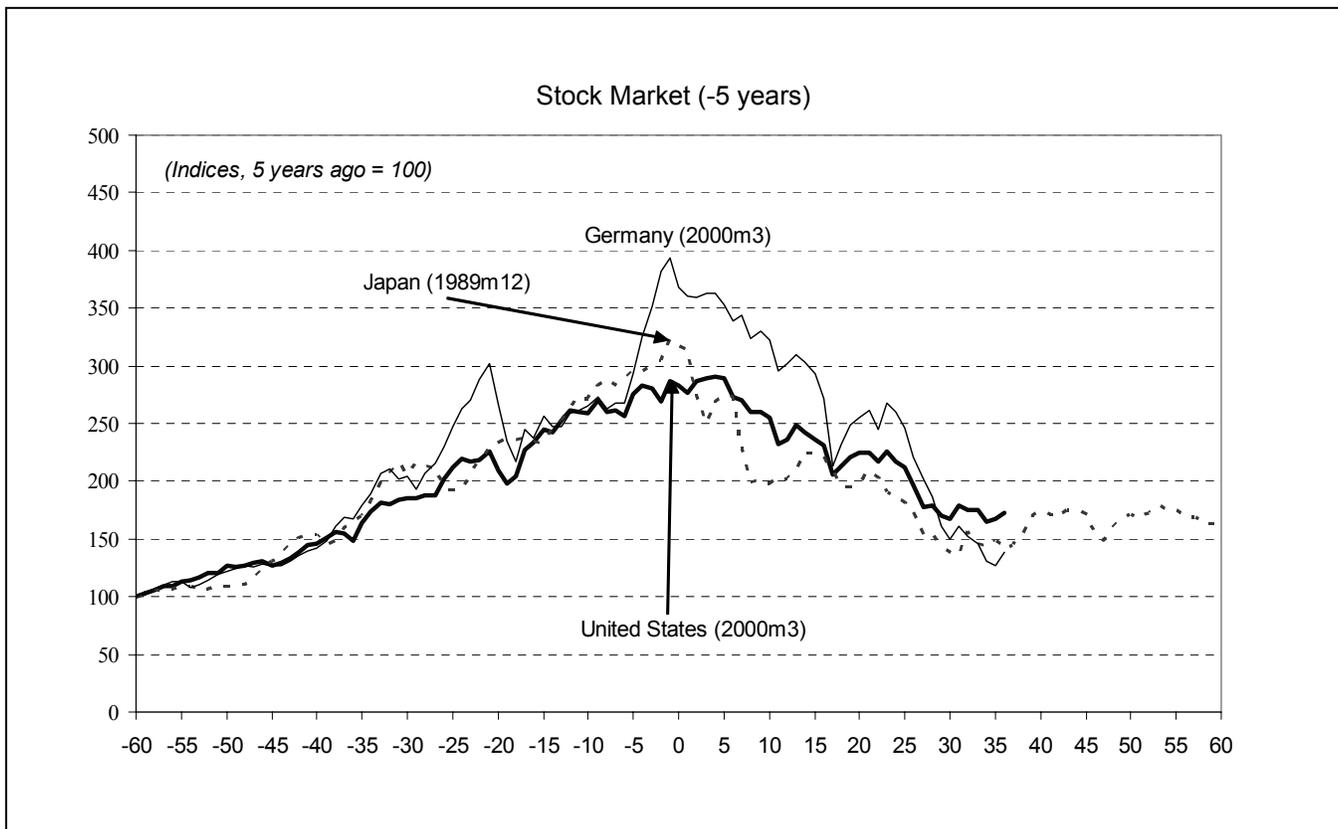


Chart 12b. Real Residential Price Indices

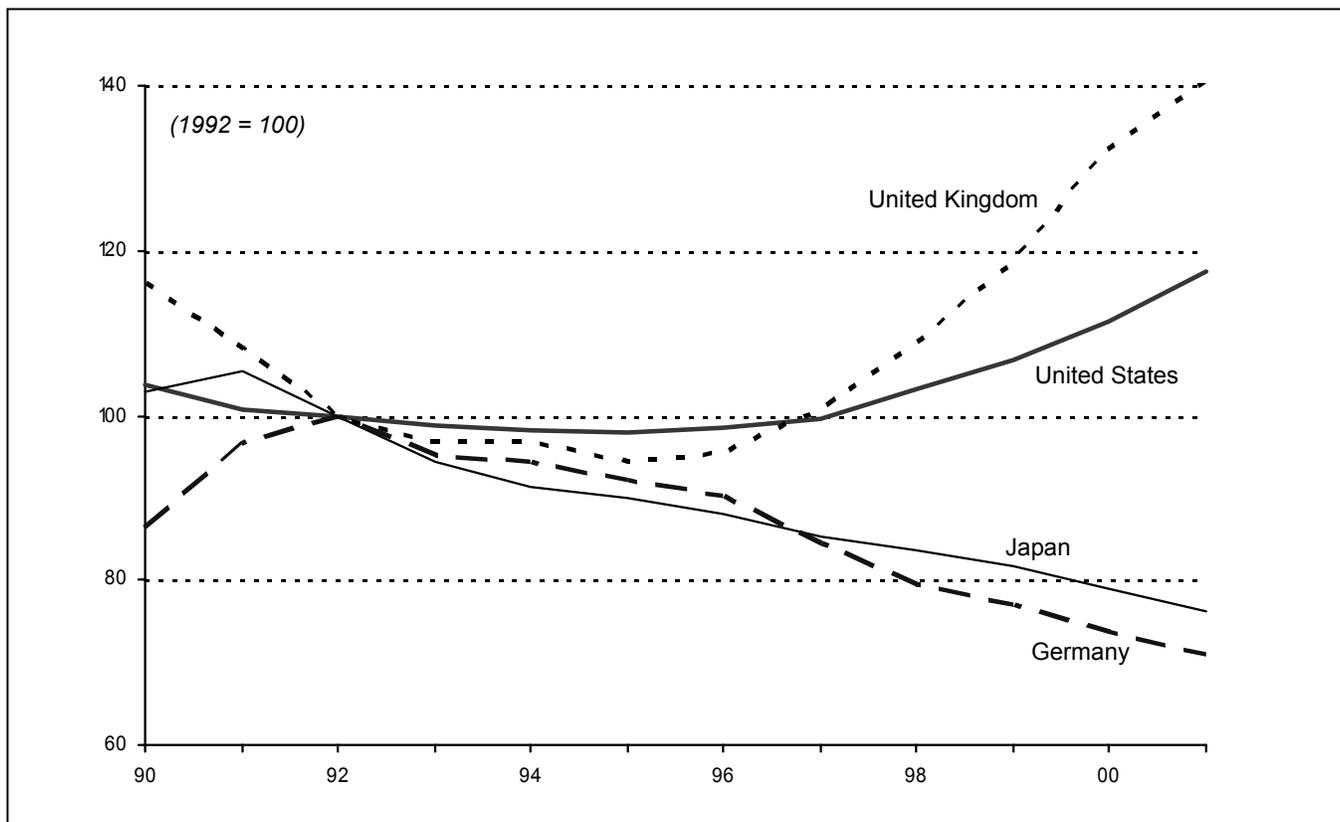


Chart 13a. China's Trade Shares

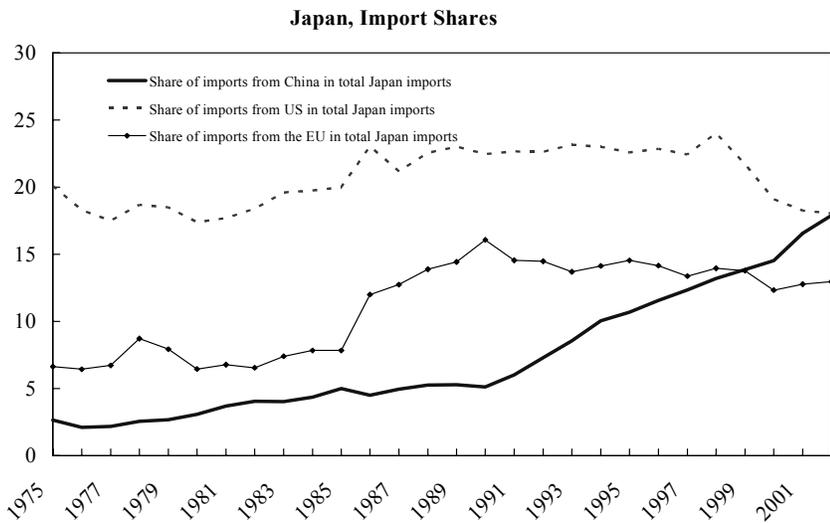
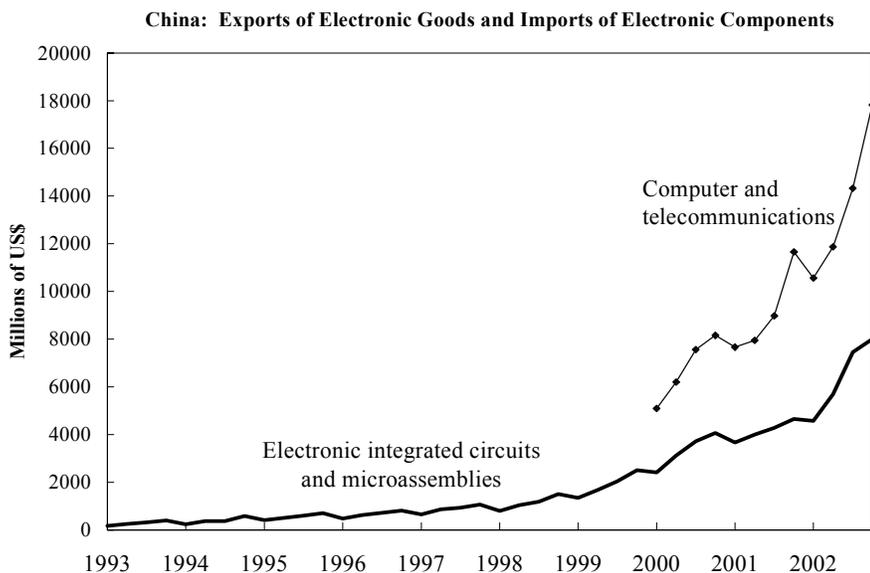
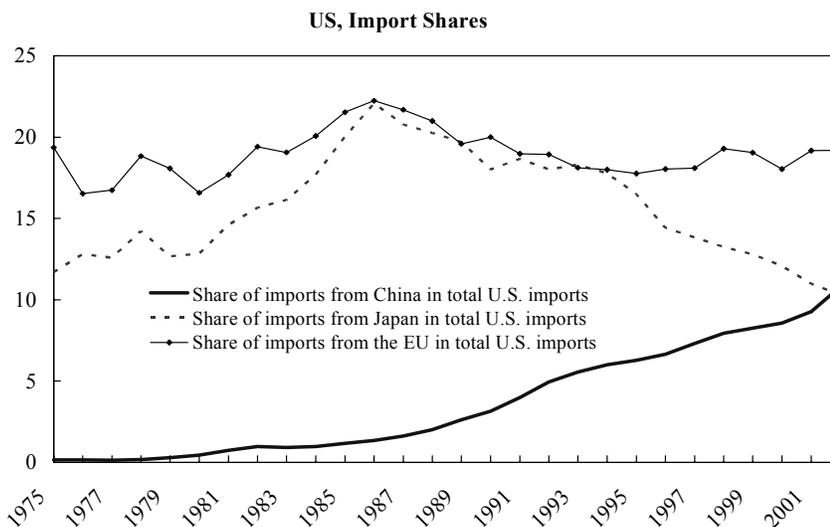
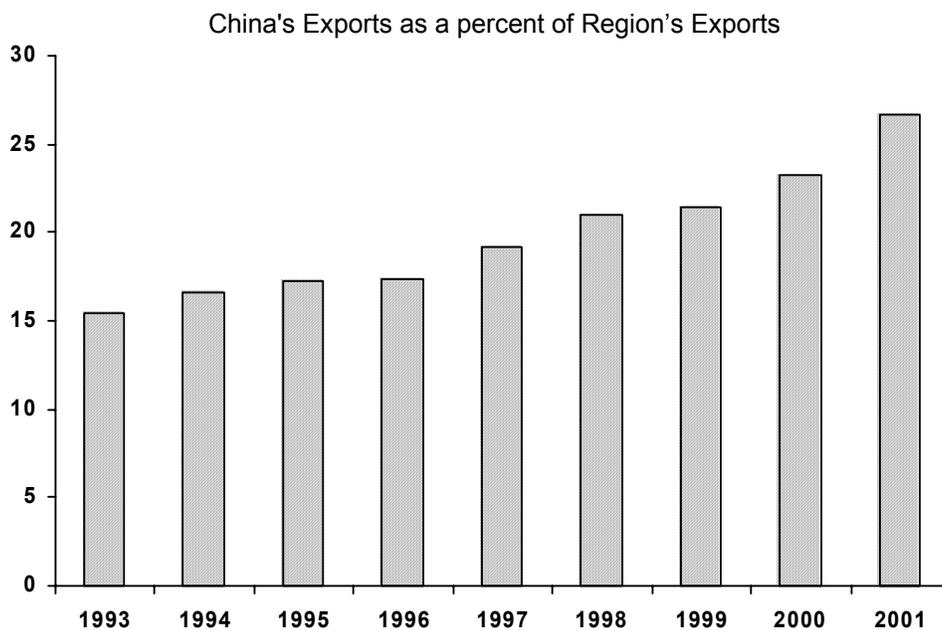
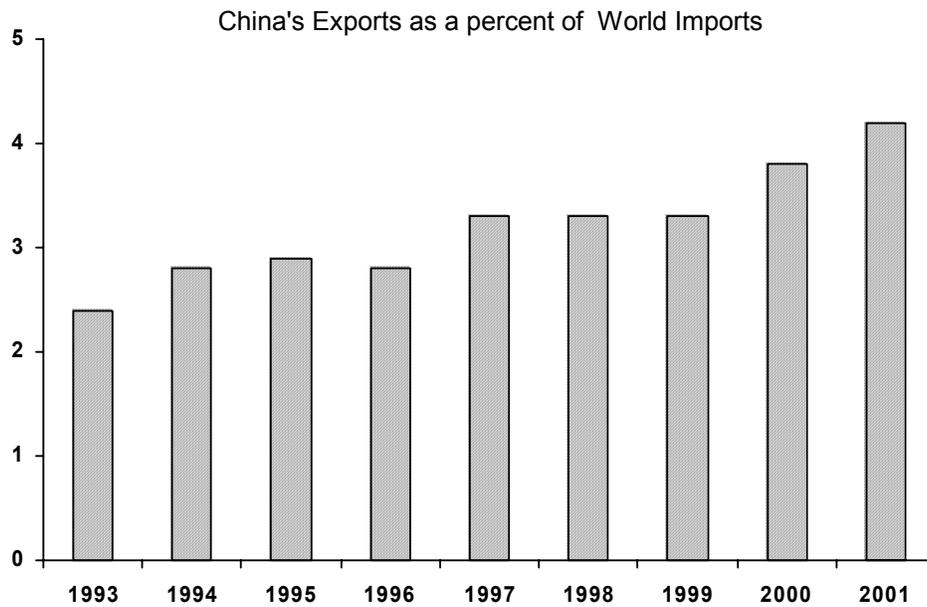


Chart 13b. China-Regional and Global Trade



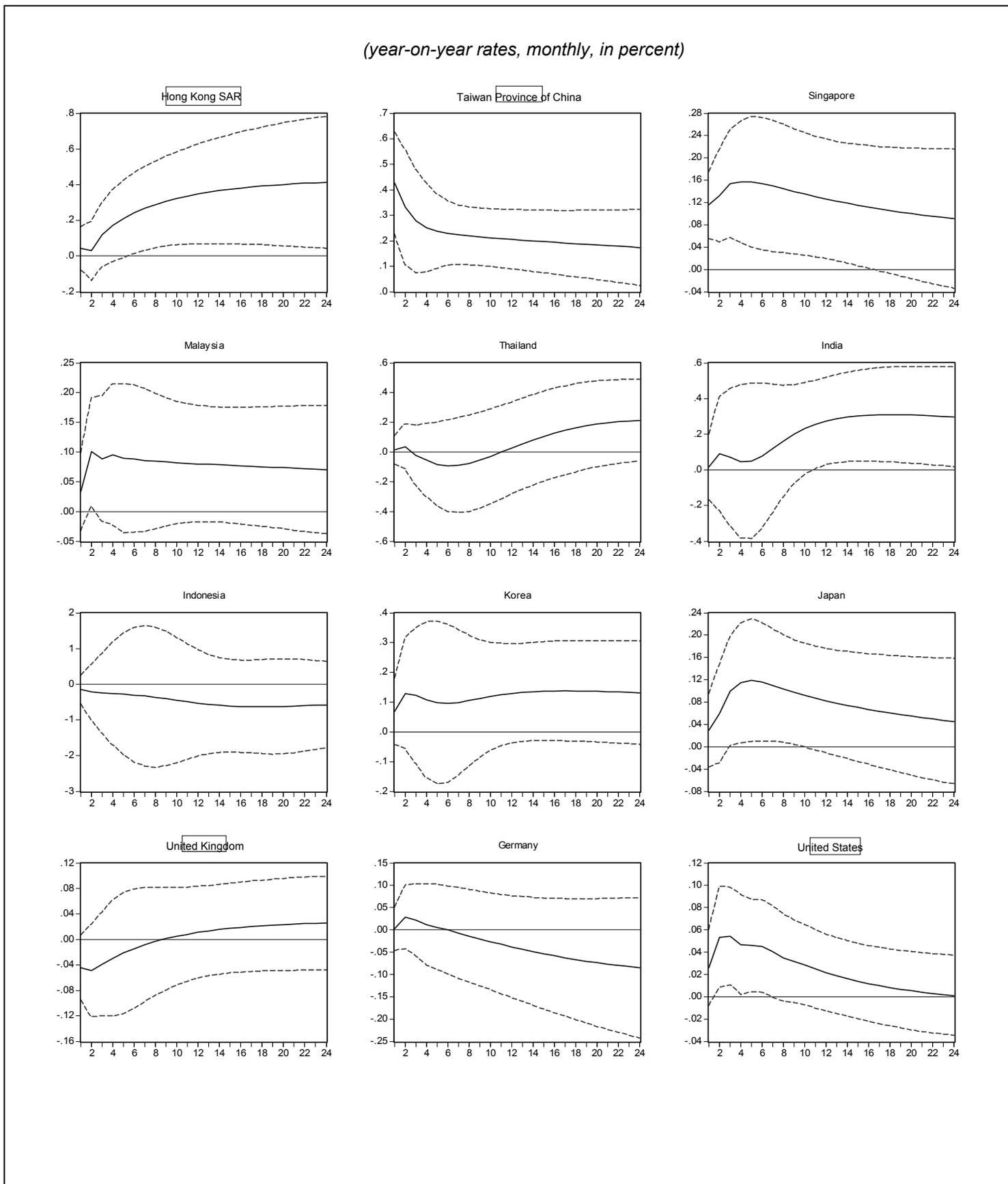
Note: China's exports exclude those to the region.

Region comprises of Hong Kong SAR, Singapore, Thailand, Korea, Taiwan Province of China, Malaysia, Indonesia, and Philippines.

Chart 14. China-Transmission of Deflation

(Change in Inflation in Partner Countries in Response to a 0.7 Percentage Point (One Standard Deviation) Increase in Inflation in China)

(year-on-year rates, monthly, in percent)



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