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SWITZERLAND

Selected Issues

Prepared by Anastassios Gagales and Christoph Klingen (EU1)

Approved by European I Department

May 8, 2003

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I. Low Inflation in Switzerland[1]

A. Introduction

1. Switzerland has always been a low inflation country by international standards, but in the past ten years it has come the closest of any industrial country to achieving price stability. Low inflation was institutionalized in 2000 with the adoption of a new monetary policy framework that specifically mandates the SNB to keep long-term inflation below two percent, but positive.[2]

2. This paper takes a close look at the proximate determinants and short-term dynamics of inflation in Switzerland. The main conclusions are:

- Underlying inflation of about 1 percent reflects a slightly higher rate for domestic goods and services and very low increases in prices of imported goods.
- The variability of inflation has also been low, with discreet factors—adjustments in rents, VAT and product market reforms—accounting for much of the variance of inflation within a fairly narrow 0-2 percent range.
- Low inflation has not prevented substantial shifts in relative prices and in a typical month as many as one third of all prices may be declining.
- In a low inflation environment there is significant potential for overall inflation to turn negative. To the extent that negative inflation reflected the fruits of productivity increases and product market liberalization, the economy would be presented with an opportunity. But if negative inflation were the result of a prolonged economic slump, policy makers could, as discussed in Chapter II, be faced with a serious challenge.

3. The chapter is structured as follows: Section B identifies salient features of the inflation experience in Switzerland; Section C uses a wage-price model to gauge the sensitivity of inflation to the business cycle and the exchange rate; and Section D concludes.

B. Inflation Close-Up

4. **Inflation has been historically low in Switzerland**. It has averaged 3.3 percent over the past forty years, the lowest (along with Germany) among OECD countries (Figure I-1). Over the much longer period 1923-2002, average inflation was only 2.3 percent.[3] The several

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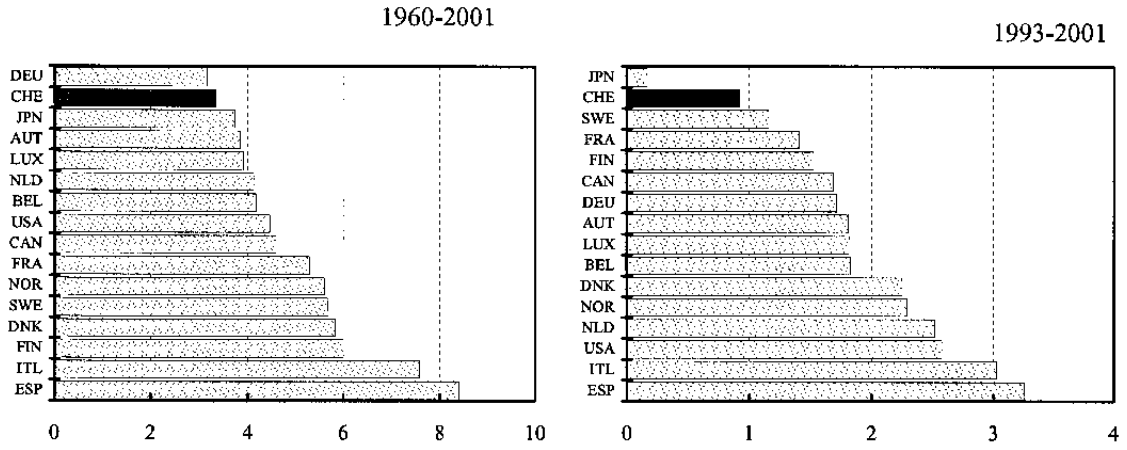
[1] Prepared by Anastassios Gagales.

[2] The new monetary policy framework is described in Krajnyak (2001) and Jordan and Peytrignet (2001).

[3] Estimate based on spliced series from Siegenthaler (1996).

inflationary bouts that have occurred have been less pronounced than in other industrial countries as the SNB has been successful in preventing them from becoming entrenched into expectations. This success reflects a tight rein over money growth (Figure I-2).

Figure I-1. Inflation in Selected OECD Countries
(Annual average rates of change in percent)



Sources: ADB; OECD; and IMF staff calculations.

Figure I-2. Inflation and Money Growth in OECD Countries, 1970-2002

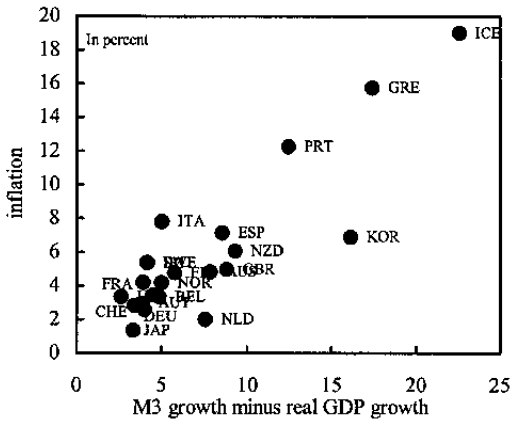
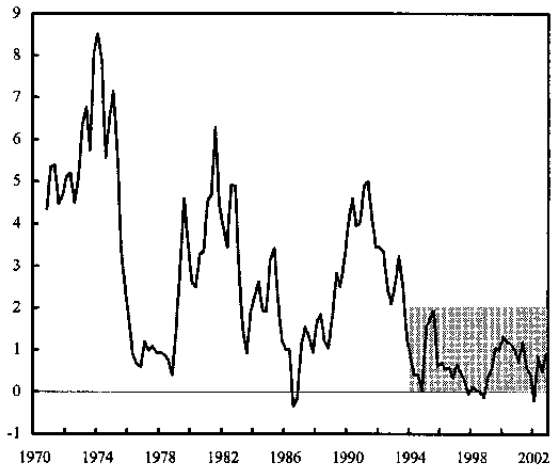
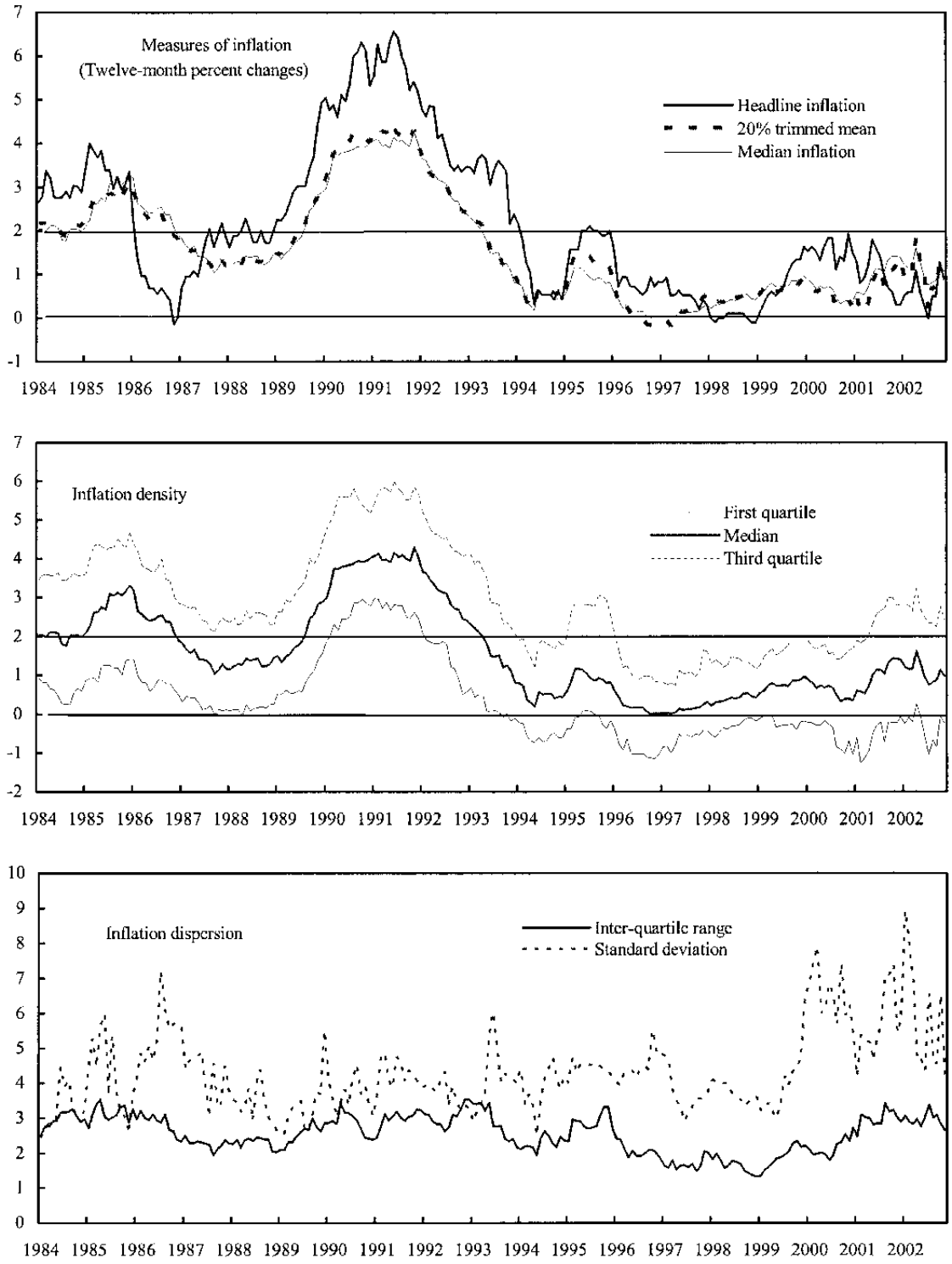


Figure I-3. Headline Inflation
(Annual rate of change, in percent)



5. **In the past decade, inflation has dropped to a low level by even Switzerland's standards** (Figure I-3). The monetary relaxation in the wake of the oil shocks in the 1970s and the overheating in the late 1980s gave rise to two inflationary surges, followed by rapid disinflations, that kept average consumer price inflation at 3½ percent in 1980-93. Subsequently, average inflation has declined to only 1 percent. Inflation volatility has also been low. Inflation has fluctuated in a 0-2 percent range and the standard deviation of 12-month inflation has been 0.6 percent or one third of its level in 1980-93.

Figure I-4. The Anatomy of Swiss Inflation, 1984-2002



Sources: Federal Statistical Service and IMF staff calculations.

Table I-1. Switzerland: Consumer Price Inflation, 1994-2002

	Weights	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average 1994-2002	Standard deviation 1994-2002
						December/December percent changes						
Headline CPI		0.4	1.9	0.8	0.4	-0.2	1.7	1.5	0.3	0.9	0.9	0.6
Domestic items	0.743	0.9	2.7	0.7	0.4	0.3	0.9	1.0	1.8	1.1	1.1	0.7
Rents	0.201	0.1	2.0	0.9	0.0	0.1	1.0	3.0	1.7	0.5	1.0	0.9
Telecommunications	0.018	1.4	2.1	-2.7	-9.4	-2.3	-13.0	-14.5	-0.9	-0.1	-4.6	5.6
Other domestic	0.524	1.2	3.0	0.8	1.0	0.5	1.6	0.8	1.9	1.3	1.3	0.7
Regulated prices	0.145	1.7	3.3	0.9	-0.3	0.2	-0.6	-0.6	1.0	1.2	0.7	1.1
Foreign items	0.257	-1.0	-0.3	1.0	0.5	-1.5	3.9	3.1	-3.8	0.3	0.2	2.1
Oil	0.042	-4.2	-0.7	15.4	-2.8	-14.4	31.3	20.0	-19.6	2.8	1.9	14.7
Other foreign	0.214	-0.6	-0.3	-1.1	1.0	0.6	0.1	0.0	-0.3	-0.1	-0.1	0.5
Memo items:												
Inflation adjusted for one-off factors 1/		0.7	0.7	0.3	0.8	0.5	0.4	1.0	1.2	0.9	0.7	0.3
Core inflation I 2/		0.8	2.4	0.4	0.1	0.3	0.9	0.8	0.9	0.9	0.8	0.6
Core inflation II 3/		0.6	2.2	0.3	0.2	0.3	1.3	1.2	0.9	0.8	0.9	0.6
Producer prices		0.0	-0.7	-1.9	-0.2	-2.0	0.4	0.8	0.0	-0.5	-0.5	0.9
Import prices		1.0	-2.0	-2.9	3.0	-5.5	4.1	5.5	-6.1	0.0	-0.4	3.7
Crude oil, $/barrel		20.7	11.2	31.1	-26.7	-39.6	139.9	1.4	-26.8	50.5	8.5	48.8
SwF/US$ (appreciation:+)		9.2	12.5	-14.2	-8.2	5.4	-16.4	-6.3	1.8	13.0	-0.2	10.1
NEER		3.5	8.5	-8.9	3.1	0.8	-6.2	3.5	4.0	2.5	1.1	4.8
						Contributions, in percent						
Headline CPI		0.4	1.9	0.8	0.4	-0.2	1.7	1.5	0.3	0.9	...	...
Domestic items		0.7	2.0	0.5	0.3	0.2	0.7	0.7	1.3	0.8	...	...
Rents		0.0	0.4	0.2	0.0	0.0	0.2	0.6	0.4	0.1	...	...
Telecommunications		0.0	0.0	0.0	-0.2	0.0	-0.2	-0.3	0.0	0.0	...	...
Other domestic		0.6	1.6	0.4	0.5	0.2	0.8	0.4	1.0	0.7	...	...
o/w Regulated prices		0.3	0.5	0.1	0.0	0.0	-0.1	-0.1	0.1	0.2	...	...
											...	...
Foreign items		-0.3	-0.1	0.3	0.1	-0.4	1.0	0.8	-1.0	0.1	...	...
Oil		-0.2	0.0	0.6	-0.1	-0.6	1.3	0.8	-0.8	0.1	...	...
Other foreign		-0.1	-0.1	-0.2	0.2	0.1	0.0	0.0	-0.1	0.0	...	...

Sources: Federal Statistics Office; and Fund staff calculations.

1/ VAT changes, telecommunications, and oil prices.

2/ Core inflation I excludes from headline inflation food items, drinks, tobacco, seasonal products and energy.

3/ Core inflation II excludes from Core I administered prices.

6. **A picture of stable, low inflation in the past decade is even clearer using non-parametric measures of inflation and correcting for discrete changes (Figure I-4).** Non-parametric measures (e.g. median and trimmed means) are robust to noise introduced by outliers that tend to distort the information content of headline inflation.[4] Inflation volatility has been accentuated by rent adjustments linked to interest rate changes. In addition, increases in VAT rates, one-off price drops associated with the opening up of the telecommunications sector and agricultural policy reform, and gyrations in oil prices have added to inflation volatility. Adjusted for these factors, the standard deviation of inflation has been only 0.3 percent (Table I-1).

Relative price adjustments

7. **The dispersion of inflation rates of individual items in the CPI has been quite stable.** The interquantile range[5] has been roughly 3 percentage points, i.e., 50 percent of the price changes have been ±1½ percentage points about median inflation regardless of the level of inflation (Figure I-4). This empirical regularity implies a high incidence of price declines in the current low inflation environment as sizable *relative* price declines can materialize only through *absolute* price declines.

8. **Thus, low average inflation has not prevented considerable downward price adjustment.** At any given month since 1994, at least one quarter of the items in the consumer basket (not always the same items) have registered price declines (middle panel in Figure I-4). Price declines were more frequent when the output gap was widest in 1997—almost half of the items in the CPI basket declined in price during that period. The largest declines were registered in telecommunications and computer hardware, where the cumulative drop reached -60 percent, food items (mainly dairy products), clothing and some services. Overall, absolute price declines shaved 0.35 percentage points off the average annual inflation rate. On the upside, above average inflation rates have been concentrated in services: at any one month since 1994 roughly one fifth of all items increased at annual rates of at least 2 percent.

9. **An important relative price change in the CPI basket has been the decline of imported goods prices relative to domestic goods.** Prices of imported items have been more volatile than domestic ones reflecting, principally, gyrations in the exchange rate and oil prices.[6] They have also tended to increase on average less than prices of domestic goods and services due to the trend appreciation of the Swiss franc and, in recent years, dramatic

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[4] Faber, S. and A. Fischer (2000) find that (weighted) trimmed inflation in Switzerland is better predicted by lagged broad money than headline inflation. The correlation was found to be robust over a wide range (15 to 50 percent) of the trim parameter.

[5] The interquantile range is defined as the range between the first and third quartile and contains 50 percent of individual price changes.

[6] The standard deviation of imported inflation was 2.1 percent compared to 0.7 percent for domestic inflation (last column in Table I-1).

drops in the prices of information and telecommunications technology products (Figure I-5). In 1994-2002, the average price increase of domestic goods and services was 1.1 percent per year compared to only 0.2 percent for imported goods. This inflation differential has resulted in a trend decline of import prices relative to the CPI (Figure I-6).

Figure I-5.Domestic and Foreign Inflation

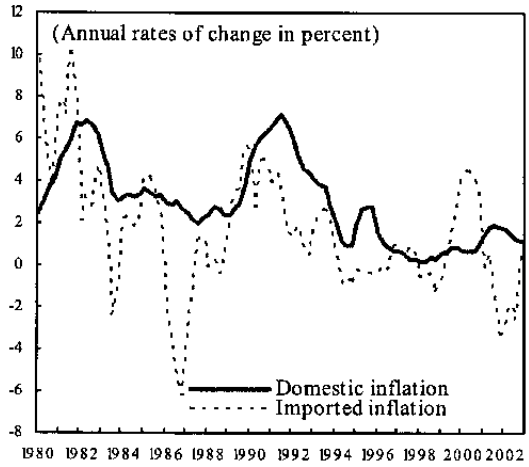
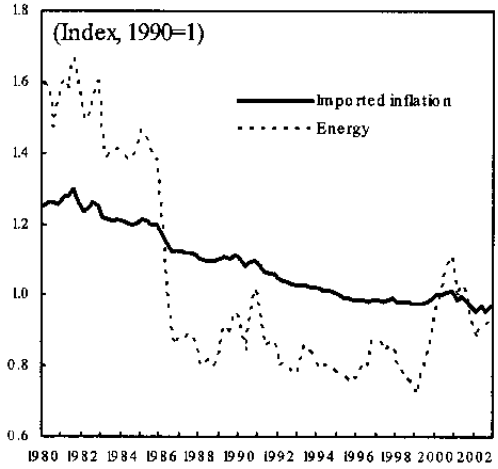


Figure I-6. Relative Price Development



Domestic inflation

10. **Low productivity growth in sheltered sectors, and the slow pace of liberalization, have underpinned above average domestic inflation.** Large non-traded/traded goods inflation and productivity growth differentials are consistent with a Balassa-Samuelson effect. Two measures of the non-traded/traded goods price—the ratios of consumer/producer prices and of the domestic/foreign component of the CPI—exhibit a similar upward trend over the past twenty years. Notwithstanding some divergence in the wake of liberalization efforts in the late 1990s,[7] both measures increased by a cumulative 43 percent or 1.6 percent annually (Figure I-7). There are also significant differentials in sectoral productivity growth: in manufacturing, which is most exposed to competitive pressures, labor productivity increased in 1990-98 by 3.8 percentage points per year faster than in the rest of the economy (Table I-2). However, the labor productivity differential tends to overstate the Balassa-Samuelson effect as it abstracts from the impact of capital deepening on labor productivity and variations in relative markups.[8]

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[7] Liberalization has affected mainly telecommunication charges and the prices of certain dairy products, which dropped cumulatively in 1996-2002 by 40 percent and 10-20 percent, respectively.

[8] In a two-sector neoclassical model with mobile labor across sectors, the change in the relative price of non-traded/traded goods price is related *negatively* to the total factor productivity growth differential in the two sectors and *positively* to the change in relative market power (measured by the relative markups).

Table I-2. Labor Productivity [1/]

	Manufacturing	Non-manufacturing	Total economy	Cumulative productivity differential	Percent change
1990	100.0	100.0	100.0	100.0	
1991	101.6	99.0	99.6	102.7	2.7
1992	109.3	101.7	103.4	107.6	4.7
1993	114.0	104.4	106.6	109.1	1.4
1994	123.5	103.9	108.1	118.9	8.9
1995	124.7	102.1	106.9	122.0	2.7
1996	127.8	101.6	107.1	125.7	3.0
1997	136.2	102.5	109.4	132.9	5.7
1998	139.1	103.2	110.4	134.8	1.4

Sources: Federal Statistical Office; and Fund staff estimates.

1/ In full time employment equivalents.

Figure I-7. Traded/Non-traded Goods Prices

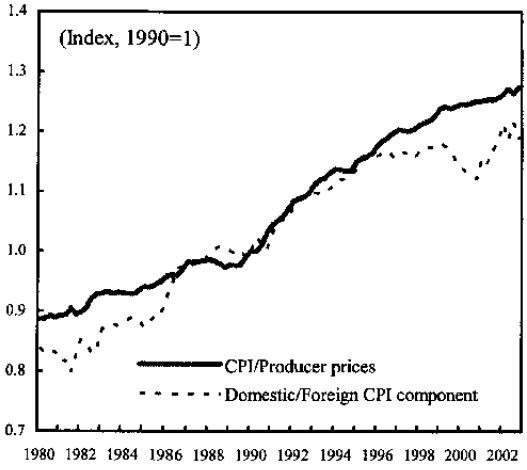
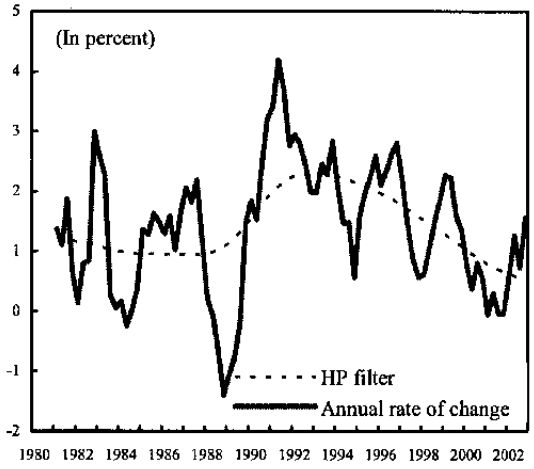


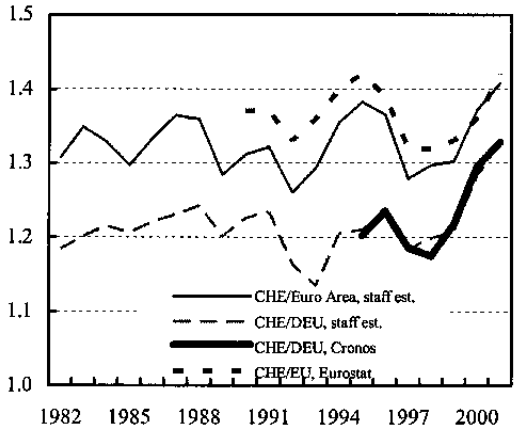
Figure I-8. Traded/Non-traded Goods Prices



11. **The productivity differential appears to have increased temporarily in the early 1990s (Figure I-8).** This reflects restructuring in the traded goods sector, mainly manufacturing and financial services (Gagales, 2002). According to the Balassa-Samuelson model, differences in sectoral productivity growth put pressure on wages in lagging sectors to increase faster than the rate consistent with productivity growth thus leading to faster price increases in those sectors and, if accommodated by monetary policy, higher headline inflation. With the productivity differential at 1½ percentage points and the sheltered sectors representing 40 percent of the Swiss economy, the Balassa-Samuelson effect could account for 0.6 percentage points of headline inflation.

12. **Cross-country price level convergence does not appear to have been at work.** According to Eurostat estimates (BFS, 2002) the price level remains at roughly 35 percent above the EU average (20 percent above Germany) without signs of convergence as the lower rate of inflation relative to the EU has been offset by exchange rate appreciation (Figure I-9). The price differential is larger in services than in traded goods, where arbitrage opportunities are greater, especially in border regions. The differential reflects Switzerland's higher standard of living (which boosts prices of non-traded goods and services) and market segmentation (which nurtures inefficiencies and monopoly profits) that more than offset the effect of low indirect taxes. It also reflects the slower pace of liberalization in Switzerland relative to its trading partners.[9] In a low inflation environment, and if the trend nominal appreciation of the Swiss franc were to continue, any significant price level convergence would entail declines in non-traded goods' prices and, most likely, also in headline inflation. However, to the extent that such declines were associated with faster productivity, they would represent a positive supply shock. Falling prices need not be a problem for monetary policy to the extent that higher real interest rates would be consistent with higher productivity growth, although there would remain the danger of generalized deflationary expectations (see Chapter II).

Figure I-9. Relative Price Levels



Sources: Eurostat; OECD; and IMF staff estimates.

[9] See Gagales (2002). The slow pace of liberalization can also account for the finding in Aebersold and Brunetti (1998), who estimate that the Balassa-Samuelson effect accounts for ½ of the price level differential between Switzerland and Germany.

Imported inflation

13. **Given the openness of the Swiss economy, foreign inflation and the exchange rate are important determinants of inflation.** Imports and exports of goods and non-factor services each amount to about 40 percent of GDP—compared to 29 percent in Germany and only 12 percent in the United States. Moreover, imported items carry a weight of 26.7 percent in the CPI basket (non-energy: 22.5 percent; energy: 4.2 percent).[10] Foreign prices and the exchange rate filter into domestic prices *directly* via the distribution and production chains; and *indirectly* via second round effects on the cost of intermediate products, wages and inflationary expectations.

14. **That said, the relationship between the prices of imported items in the CPI and the import deflator appeared to break down in the early 1990s (Figure I-10).** A weak correlation between the two is not unique to Switzerland and is related to several factors: compositional differences between the two price indices (e.g., a portion of imports are used primarily as inputs for the production of exports and, thus, have no effect on domestic prices); the significance of domestic value added (distribution costs, import duties, taxes and profit margins) in the consumer price of imported items; monopolistic market structures;[11] and the SNB's low tolerance for inflation.[12] However, the disconnect in the 1990s was particularly pronounced and persistent, including for energy products; it also occurred at the producer price level (Figures I-11 and I-12). The breakdown in the relationship between the prices of imported items in the CPI and the import deflator does not appear to reflect a change in the pricing strategy of foreign exporters to Switzerland as the pass-through of exchange rate changes to the import deflator remained fairly stable in the 1990s

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[10] With GNFS imports at 40 percent of GDP and inputs estimated in the national accounts at ½ of gross output, the weight of imported items in the consumer basket is at par with the share of imports in gross output.

[11] The new open economy macroeconomics literature tries to account for this disconnect with imperfect competition and nominal rigidities (e.g., menu costs). Two complementary modeling strategies have emerged: in the first, imported goods are assumed to go through a distribution channel that adds significant local value added; in the second, all imports are treated as intermediate goods, often mixed with domestic goods to produce final consumer goods. Depending on market structure, exporters price their products either in their own or in local currency. Using an optimizing framework, Bacchetta and Wincoop (2002) show that when there is competition in the domestic final goods market, exporters tend to price final goods in domestic currency, in which case the pass-through to consumer prices is zero even when the pass-through to import prices is complete. There is substantial empirical evidence that pricing-to-market behavior is pervasive and tends to be pronounced among European exporters, which represent Switzerland's main trading partners (Gil-Pareja, 2002).

[12] In low inflation environments and in economies with a credible inflation targeting regime, pass-through is smaller as monetary policy generally offsets the effect of imported inflation on inflation to keep inflation within target (Choudhri and Hakura, 2001).

(Figure I-13).[13] A possible explanation is that the prolonged period of economic slack and the enterprise restructuring that took place in Switzerland during that period had a persistent impact on domestic firms' and distributors' pricing policies.

Figure I-10. Import Prices and CPI

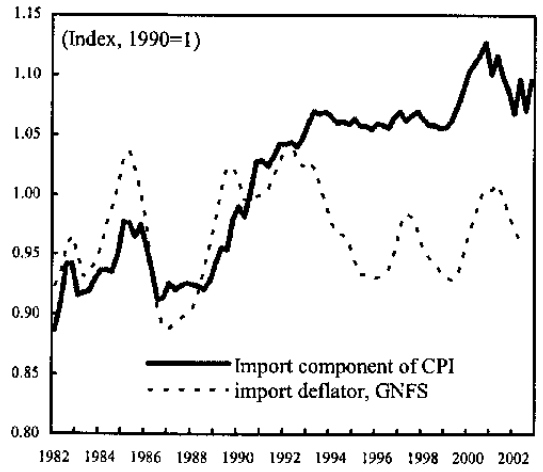


Figure I-11. Import Prices and PPI

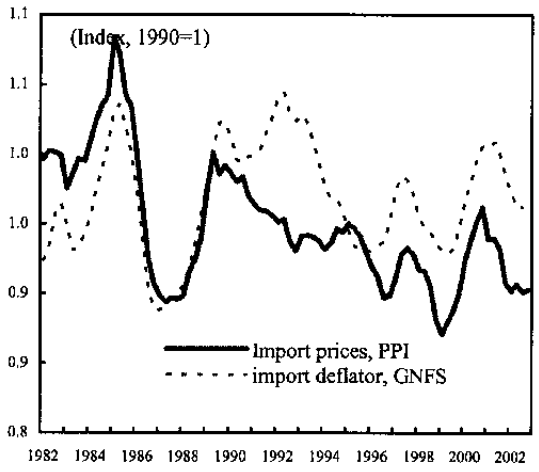


Figure I-12. Energy Prices

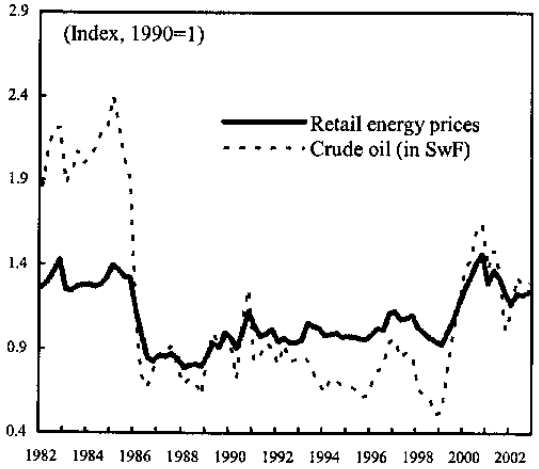
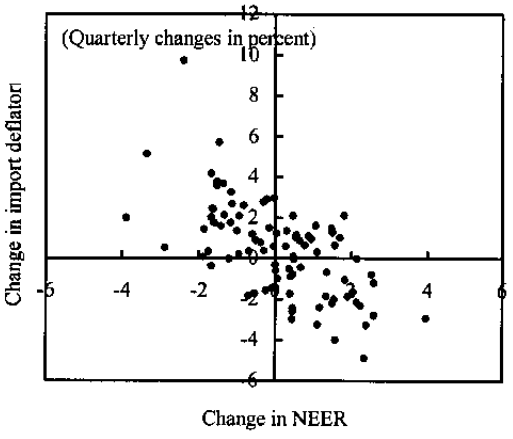


Figure I-13. Foreign Prices and NEER, 1980-2002



[13] The correlation was -0.69 in 1980:2-1990:4 and -0.62 in 1991:1-2002:4. Increases in the nominal effective exchange rate denote appreciation.

C. Proximate Determinants of Inflation

15. In this section a standard price-wage model is used to further analyze the inflation process in Switzerland and, in particular, the sensitivity of inflation to the business cycle and exchange rate gyrations. The approach abstracts from a broader explanation of inflation—which, as in other countries, can ultimately be traced to money growth. Rather, the emphasis is on the proximate determinants of inflation and the conditions under which inflation might be pushed outside the 0-2 percent range it has fluctuated in during the past decade.[14]

16. **Econometric analysis (see Appendix) finds considerable support for a relatively stable long-run relationship between consumer prices, labor costs, imported prices, and the productivity differential between traded and non-traded goods sectors.** In the short run, the output gap also has a significant impact on inflation. The main findings can be summarized as follows:

- **In the long-run, there is full pass-through of exchange rate and foreign price changes to the CPI.** The coefficient of foreign prices in the long-run price equation, which reflects the direct pass-through, is similar to the weight of imported goods in the CPI (around 25 percent). But the system pass-through is unity because wage inflation sparked by price rises reinforces the initial price increase. Full pass-through implies that the trend nominal appreciation of the Swiss franc does not affect the long-term price level differential against trading partners.

- **However, the speed of pass-through is slow.** It takes nearly 5 years before half of the full pass-through, including the effects induced by secondary wage changes, is complete—i.e. by the end of the fifth year, the price level would have declined by 5 percent, *ceteris paribus*, for a permanent 10 percent appreciation. Even so, this means that a 10 percent appreciation reduces the annual inflation rate by about 1 percentage point on average in the medium term.

- **The productivity growth differential between the traded and the non-traded goods sectors is estimated to have contributed 0.8 percentage points to annual inflation in 1994-2002.** This is broadly in line with the earlier back-of-the-envelope calculation of the Balassa-Samuelson effect. In effect, the just under 1 percent inflation rate accommodated by monetary policy in the past decade was consistent with negligible traded goods inflation—both foreign and domestic.

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[14] See Jordan et. al. (2002) and Krajnyak (2001) for VAR models of inflation in Switzerland that account explicitly for the effect of monetary growth; their general conclusion is that broad money aggregates affect inflation with a 2-3 year lag. Other recent attempts to model inflation in Switzerland include Valdivia (1998), who uses a non-linear Phillips curve model; Laxton and Prasad (1997), who use MULTIMOD to examine the responsiveness of inflation to variations in money growth; and Stalder (2001), who estimates a medium-size structural model in which inflation is driven by interest rates and the exchange rate.

- **The output gap has a significant impact on inflation dynamics**. Its cyclical impact on markups is reinforced via Phillips curve effects on wages.

17. **The estimates are reasonably stable, apart from the period 1991Q2–1992Q2 when there was a breakdown in the relationship between import prices and their domestic component**. Of course, the model provides only a reduced-form representation of the inflation process and, as such, is potentially hostage to the Lucas (1976) critique. Two types of policy change could affect the stability of the model. First, to the extent that the economy-wide markup is affected by the opening-up of sheltered sectors (agriculture, construction and services) and the integration of the domestic market, the model could be less stable going forward if liberalization were stepped up. Second, changes in the monetary policy framework or the policy rules—e.g. a switch to quantitative monetary easing in the face of an interest rate floor—could affect expectations, price setting behavior, and the monetary policy transmission mechanism in general.

18. **The model implies that the business cycle and exchange rate fluctuations account for a significant part of the variability of inflation**. Moreover, it would not take major deviations of exchange rates or the output gap from their historical variability to push inflation outside of the 0-2 percent range—especially if the output gap and exchange rate movements reinforced each other given their negative correlation.[15]

- **Sustained appreciation could cut inflation significantly**. The nominal effective exchange rate has been fluctuating considerably around its trend with a standard deviation of 3.4 percent (Figure I-14). The average phase of these fluctuations stretches over two years and the average peak deviation from trend is 5 percent (Figure I-15 and I-16). A spread-out appreciation of this order of magnitude would temporarily shave 0.3-0.4 percentage points from inflation with the maximum impact being felt after 5-6 quarters. A more abrupt 5 percent appreciation that lasts for one year has an even sharper and more immediate impact on inflation: at its peak, in the fourth quarter, it reduces inflation by 0.5 percentage points (Figure I-17).

- **Likewise, a persistent output gap can significantly reduce inflation**. The recent business cycle experience has been characterized by abrupt and persistent shifts in real GDP growth (Jaeger, 1999). A moderate slowdown in economic activity would last about three years with output dropping 1½ percent below potential. The model predicts a strong effect of variations in the output gap on inflation. A gradual widening of the output gap over a period of four years to an average of 0.75 percent has its maximum impact at the end of the third year when inflation is 0.6 percentage points below trend. A step increase in the output gap by 1½ percentage points for a period of one year would have its maximum impact at the end of the first year (Figure I-18).

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[15] The correlation between deviations of the NEER from its trend and the output gap was -0.27 in 1980-2002.

Figure I-14. Exchange Rate Volatility

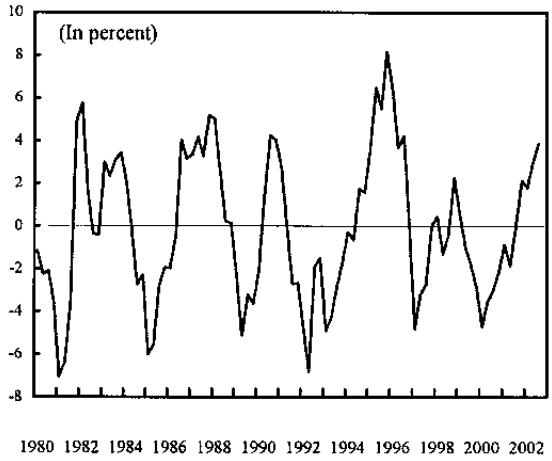


Figure I-15. Periods of NEER Weakness

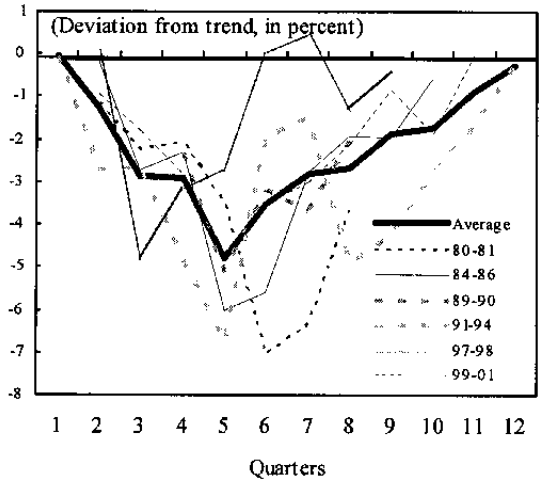


Figure I-16. Periods of NEER Strength

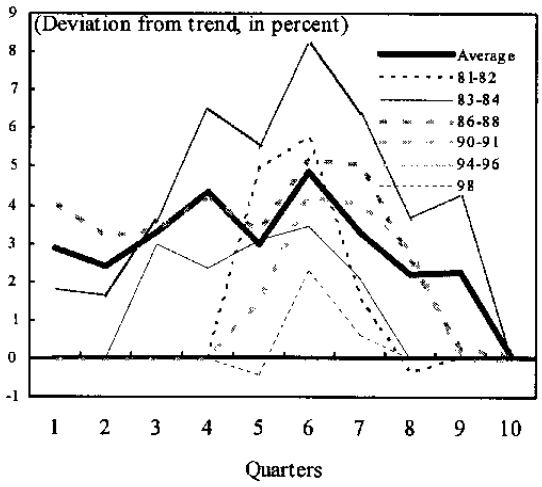


Figure I-17. Impulse Response of Inflation to NEER Appreciation

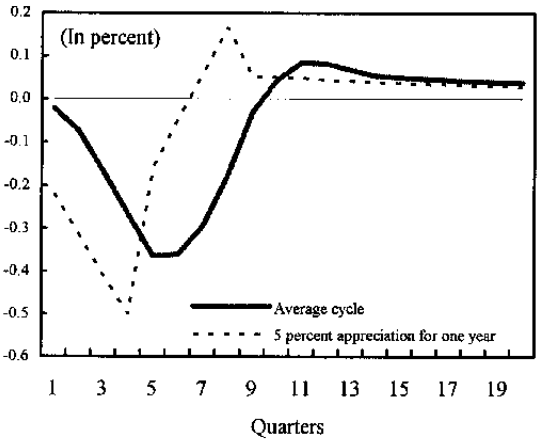
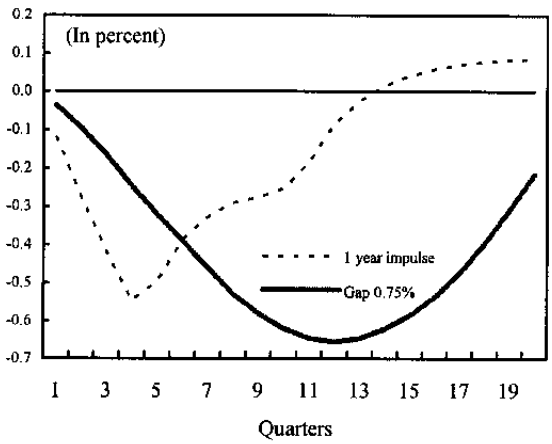


Figure I-18. Impulse Response of Inflation Widening Output Gap



19. **In the current context, the pass-through of the earlier widening of the output gap and the exchange rate appreciation has probably not been completed, suggesting that inflation has not yet bottomed out**. Assuming the recent easing of oil prices is sustained, the gradual elimination of the output gap over the next four years (baseline scenario in Figure I-19), and no further appreciation of the nominal effective exchange rate, the model predicts non-rent inflation to average ½ percent in 2003 and 2004 before rising to 1¾ percent in 2006 (Figure I-20).

20. **As the model projects inflation to bottom out close to zero, it would not take much to push inflation into negative territory**. For example, a slower closing of the output gap, especially if accompanied by additional appreciation (1 percent annually) could easily push inflation down to -½ percent in 2004 (Scenario 1). However, the model predicts that negative inflation would not become ingrained and would eventually return to around 1-2 percent in the medium term. The upside risks appear small: a faster closing of the output gap would raise average inflation to ¾ percent in 2003-05 (Scenario 2).

Figure I-19. Output Gap Scenarios

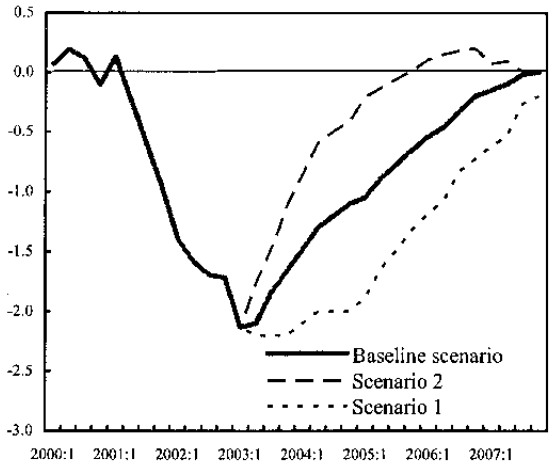
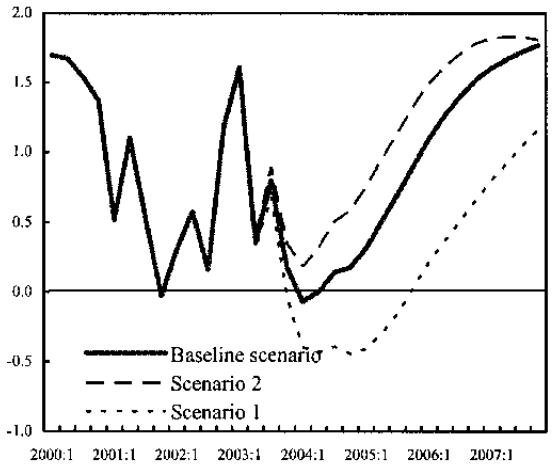


Figure I-20. Non-Rent Inflation Scenarios



21. **While the simulations suggest a moderate risk that the overall price level could begin to fall in the period ahead, they abstract from a fuller equilibrium assessment of inflation prospects that takes into account recent policy actions**. For example, the surge in money supply in early 2003 from the relaxation of monetary policy implies that the forces to close the output gap—or, if the gap is overstated, to put upward pressure on prices—are likely in the pipeline. The lags involved, however, are difficult to gauge. At the same time, negative inflation also contains some risks of engendering deflationary expectations that are not properly captured by the econometric estimates. In essence, the dynamics of deflation could be quite different from those predicted by the experience of the past 10-20 years of low but positive inflation.

D. Conclusion

22. Inflation in Switzerland has been close to zero for almost a decade now. Behind this impressive achievement has been a very low imported component of inflation, on average, with somewhat higher domestically-generated inflation. Close to zero means that many prices often fall. It also means that generalized price declines are never far away. This could

come about as a result of liberalization of sheltered domestic sectors—the sharp falls in liberalized prices in the late 1990s are a good example—which will present an opportunity for policy makers. Macroeconomic factors could also conspire to drive inflation into negative territory. Given the openness of the economy, pass-through of exchange rate appreciation could pull down the CPI. Likewise, a prolonged slump could do the same. In this case, monetary policy might face an uphill task of countering negative inflation expectations given the zero floor for interest rates.

A Price-Wage Model of Inflation

Price equation

23. Following de Brouwer and Ericsson (1998), the price level (*P*) is determined in the long-run by a trendless markup (*k*) over total unit costs, including unit labor costs (*ULC*), intermediate non-energy import prices (*PM*) and energy prices (*PE*):

$$P=(1+k)\cdot ULC^{a}\cdot PM^{b}\cdot PE^{c} \qquad (1)$$

24. The markup may change over the business cycle and is expressed as a function of the output gap (*GAP*). Under linear homogeneity $a+b+c=1$ and error correction price dynamics, short-term inflation behavior is given by:

$$\begin{aligned}\Delta p = {} & \theta\cdot(p_{-1}-k-a\cdot ulc_{-1}-b\cdot pm_{-1}-(1-a-b)\cdot pe_{-1}) \\ & +\varphi\cdot gap+\varphi_1\cdot\Delta gap+a_1\Delta ulc+b_1\cdot\Delta pm+c_1\cdot\Delta pe+\varepsilon\end{aligned} \qquad (2)$$

where lowercase letters denote logarithms and Δ stands for the first difference operator. The term in parenthesis denotes the deviation of the price level from its equilibrium level. Money growth, the main determinant of inflation in the longer run, is accounted for only implicitly via its effects on the exchange rate and the output gap; and on the parameters of the model.

25. Given the evidence in Section B that there is a significant productivity growth differential between the traded and non-traded goods sectors, the model is recast in a two-sector framework (traded and non-traded goods sectors are denoted respectively by *T* and *N*). Consumer prices, which have a large domestic component, are assumed to depend on unit labor costs in the non-traded goods sector:

$$p = k + a\cdot ulc_N + b\cdot pm +(1-a-b)\cdot pe \qquad (1')$$

In Switzerland, ulc_N is not observed directly but can be inferred from the identity:

$$ulc = \lambda\cdot ulc_T +(1-\lambda)\cdot ulc_N$$

where λ stands the share of the traded goods sector in total employment. Denoting by δ the productivity growth differential between the two sectors, ulc_N can be expressed as:

$$ulc_N = ulc + \lambda\cdot\sigma$$

where σ stands for the cumulative productivity differential since the base period. Substituting the above expression in (1') gives the augmented long-term price equation:

$$p = k + a\cdot ulc +a\cdot\lambda\cdot\sigma + b\cdot pm +(1-a-b)\cdot pe \qquad (1'')$$

and the corresponding dynamic equation:

$$\Delta p = \theta \cdot (p_{-1} - k - a \cdot ulc_{-1} - a \cdot \lambda \cdot \sigma_{-1} - b \cdot pm_{-1} - (1-a-b) \cdot pe_{-1}) + \varphi \cdot gap + \varphi_1 \cdot \Delta gap + a_1 \cdot \Delta ulc + b_1 \cdot \Delta pm + c_1 \cdot \Delta pe + \varepsilon \quad (2')$$

From equations (2) and (2') it is evident that, if *ulc* and σ are positively correlated, the exclusion of the latter from (2) biases upwards the estimate of *a* because it forces it to pick up also the Balassa-Samuelson effect.

26. To estimate the long-run relationship, a system cointegration analysis was conducted for $\{p, ulc, pm, pe, \sigma\}$, the results of which are summarized in Table I-3. The tests support the existence of one cointegrating vector. The estimated coefficients are plausible (with the exception of the coefficient of oil prices, which appears with the wrong sign) and satisfy linear homogeneity. However, the estimate of the cointegrating vector is sensitive to the choice of the sample.

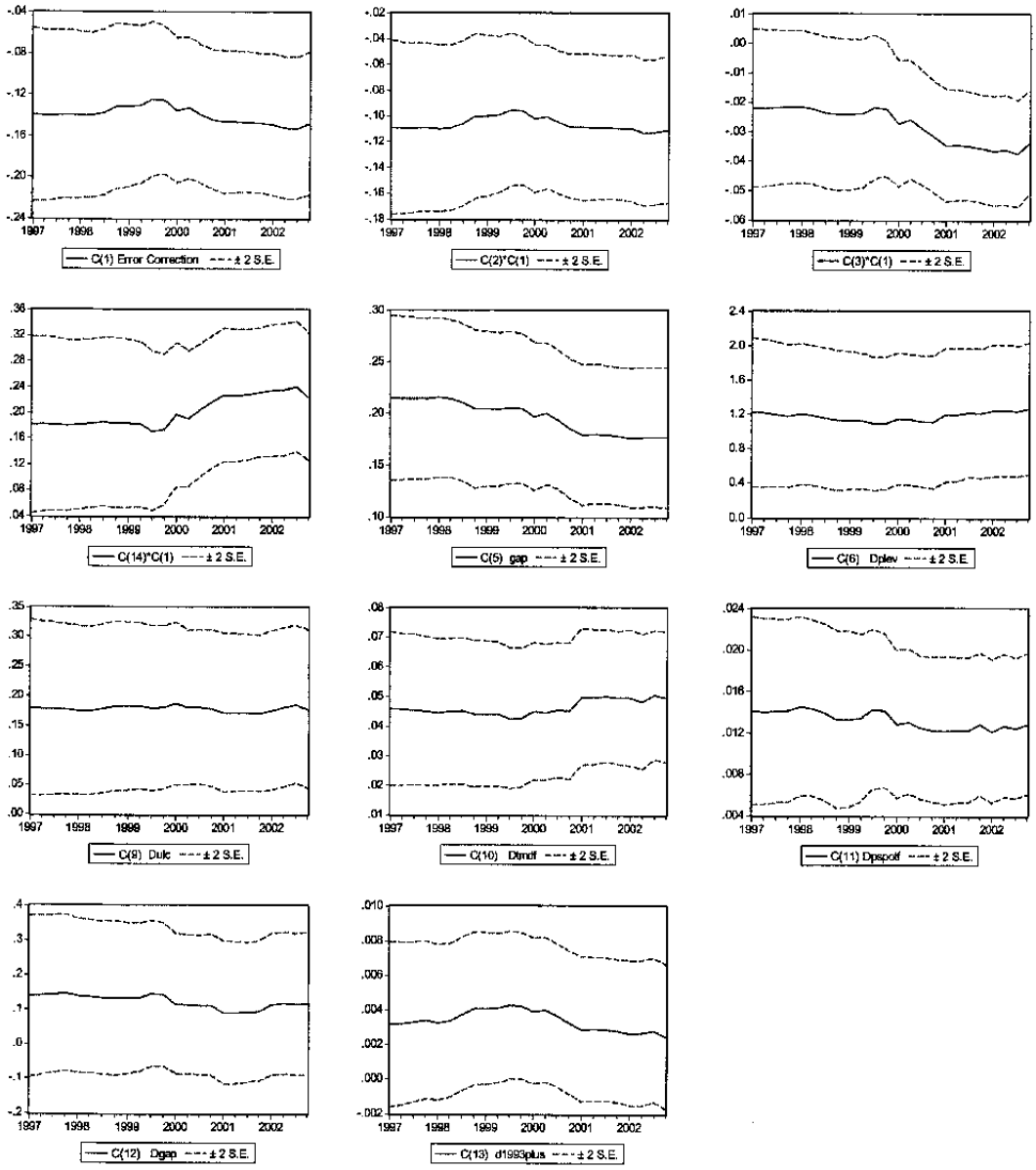
27. Equation (2'') is estimated with quarterly data for the period 1981:1-2002:4, excluding observations for 1991:2-1992:2 when the relation between import and domestic prices appears to have broken down.[16] The final form of the equation is given by (Table I-4):

$$\Delta p = -0.15\ (p_{-1} - plev + 1.51 - 0.75\ ulc_{-1} - 0.19\ \sigma_{-1} - 0.23\ pm_{-1} - 0.025\ pe_{-1}) + 1.26\Delta\ plev + 0.17\ gap_{-2} + 0.12\Delta gap + 0.18\Delta ulc_{-1} + 0.05\Delta pm + 0.01\Delta pe \quad (3)$$

28. The inclusion of observations for 1991:2-1992:2 derails the coefficient of the productivity differential but does not affect materially the other coefficients. The equation fits the data equally well in the 1980s and the 1990s. Figure I-21 summarizes the results of recursive estimates. Although some coefficients shift around 2000, when the economy recovered from the protracted recession, these are well within the ±2 standard errors band suggesting that the model is reasonably stable.

[16] Rents are excluded from the CPI as their adjustment is governed by longer-term contracts and regulations, including indexation of rents to the mortgage rate. The unit labor cost has been interpolated from annual data and the productivity differential is proxied by the ratio of consumer over producer prices; non-oil import prices are proxied by the weighed average of trading partners' non-oil export deflators. The cost of energy is proxied by the Swiss franc equivalent of the spot price of oil. The output gap is interpolated from annual estimates based on the production function approach. The estimated equation includes also *plev*—which controls for changes in VAT rates, the liberalization of telecommunications and retail trade—and seasonal dummies.

Figure I-21. Inflation Equation: Recursive Coefficients



29. The main features of the estimates are:

- Linear homogeneity is accepted by the data.
- The speed at which prices adjust to deviations from their long-term level (given by the error correction term) is slow. With only 14 percent of a disequilibrium in the markup being corrected each quarter, the implied half-life is 5 quarters.[17] This estimate, however, abstracts from feedback from secondary wage adjustments
- Imported inflation is an important determinant of consumer inflation. The 23 percent long-term pass-through for non-energy imports and 2.5 percent for energy imports are similar to the weights of these two items in the CPI basket.[18] This, however, represents only the direct effect on inflation. If indirect effect through wages are also taken into account, the linear homogeneity condition ensures that pass-though is full (see below).
- The output gap has a large and statistically significant effect on inflation. Its change (acceleration principle) has an equally large but statistically insignificant effect.
- Import prices and unit labor costs affect inflation mainly via the error correction term. Their direct short-term effect is quantitatively small, albeit statistically significant.

30. To check the robustness of the equation to errors in measuring the output gap and the possibility of non-linear effects, the equation was estimated also with an HP-based output gap and with a quadratic output gap term.[19] The HP-based estimate yielded a slightly higher coefficient for the output gap (a reflection of the smaller amplitude of this series) without affecting materially the other coefficient estimates and the overall fit of the model. The quadratic term was invariably numerically small and statistically insignificant—similar to the conclusion in Valdivia (1999)—and its inclusion was inconsequential for the rest of the coefficient estimates.

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[17] The half-life is given by $ln(0.5)/ln(1-\theta)$.

[18] The weight of imported items in the CPI basket has hovered around 25 percent since 1992, down from almost 30 percent in the 1980s.

[19] Sources of measurement error in the production function based estimate of the output gap include the capital stock estimates (due to the lack of direct measurements), incomplete data on capacity utilization and problems in estimating capacity utilization in the services sector, and difficulty in measuring the NAIRU in an environment where a flexible foreign labor supply acts as a shock absorber in the labor market. On the other hand, the HP based estimate of the output gap, being mechanical, may fail to accurately capture excess demand pressures.

Wage equation

31. Wages are assumed to adjust to deviations of the labor share from its trend level, as well as to cyclical conditions (captured by the output gap), trend productivity growth, inflation and the exchange rate. Again, an error correction formulation is used for the dynamics. The estimates (see Table I-5) can be summarized as:

$$\Delta w = -0.10(w_{-1}-lphp_{-1}-p_{-1}-s_{-1}) + 0.19\, gap_{-3} + 1.85\, \Delta lphp + 0.08(\Delta p_{-1}+\Delta p_{-2}) - 0.01\Delta x + 0.43\Delta w_{-1} + \xi \qquad (4)$$

where w stands for the wage rate (lacking direct observation, the quarterly series is interpolated from annual figures), *lphp* denotes (HP-based) trend labor productivity (high frequency productivity fluctuations do not appear to have a significant effect on wages), s denotes the trend labor share and x stands for the nominal effective exchange rate (IFS based). Unit labor costs, based on smoothed labor productivity, are given by $w-lphp$. Equation (4) provides conditional nominal wage forecasts for predetermined paths of inflation, the exchange rate, productivity growth and the output gap.

32. Equation (4) is estimated over the period 1988:1-2002:4 which is relatively homogeneous with respect to the cyclical flexibility of the labor supply.[20] The overall fit is reasonable, although in 2000-02 the equation predicts a more agile (compared to the actual) response of wages to economic conditions (Table I-5). The coefficient of the error correction term suggests that wages adjust more slowly than prices to deviations from their steady-state path. As in the case of the inflation equation, the output gap exerts a strong and statistically significant impact wage growth. Using an HP-based estimate of the gap does not alter the properties of the equation and, as in the case of the inflation equation, the output gap does not appear to have significant non-linear effects. Recursive estimates do not suggest the presence of structural breaks (Figure I-22).

Underlying inflation

33. Underlying inflation is determined by the long-run price and wage equations, the terms in parentheses in equations (3) and (4), after substituting out $ulc = w - lphp$ from the price equation:

$$p = k + a\cdot(w - lphp) + b\cdot pm + (1-a-b)\cdot pe + a\cdot\lambda\cdot\sigma$$

$$w = lphp + p + s$$

which, after solving for p taking first differences, gives:

---

[20] Stalder (2002) finds evidence that cyclical flexibility of the labor supply declined in the 1990s—as foreign labor supply and the participation rate became less sensitive to labor market conditions—thus making wages more responsive to labor market conditions than in the past. The bilateral agreements with the EU are expected to increase the cyclical flexibility of labor supply.

$$\Delta p = \alpha \cdot (1-\alpha)^{-1} \cdot \Delta s + b \cdot (1-\alpha)^{-1} \cdot \Delta pm + (1-a-b) \cdot (1-\alpha)^{-1} \cdot \Delta pe + a \cdot (1-\alpha)^{-1} \cdot \lambda \cdot \Delta\sigma \quad (5)$$

This equation incorporates both the *direct* and *indirect* effect (through wages) of imported inflation and the productivity differential on inflation.

- Because of linear homogeneity in the markup equation, the trend exchange rate appreciation and foreign inflation pass through *fully* to domestic inflation.

- The productivity growth differential between the traded and the non-traded goods sectors imparts a positive bias to overall inflation (if accommodated by monetary policy). For $a=0.75$, $\lambda=0.19$ and with the relative non-traded/traded goods price increasing at an annual average rate of 1.4 percent in 1994-2002, model predicts a Balassa-Samuelson effect of 0.8 percentage points; and for a foreign inflation of 0.2 percent during the same period, it predicts also an underlying inflation of 1 percent, which is very close to average inflation (0.9 percent, Table I-1).

Figure I-22. Wage Equation: Recursive Coefficients

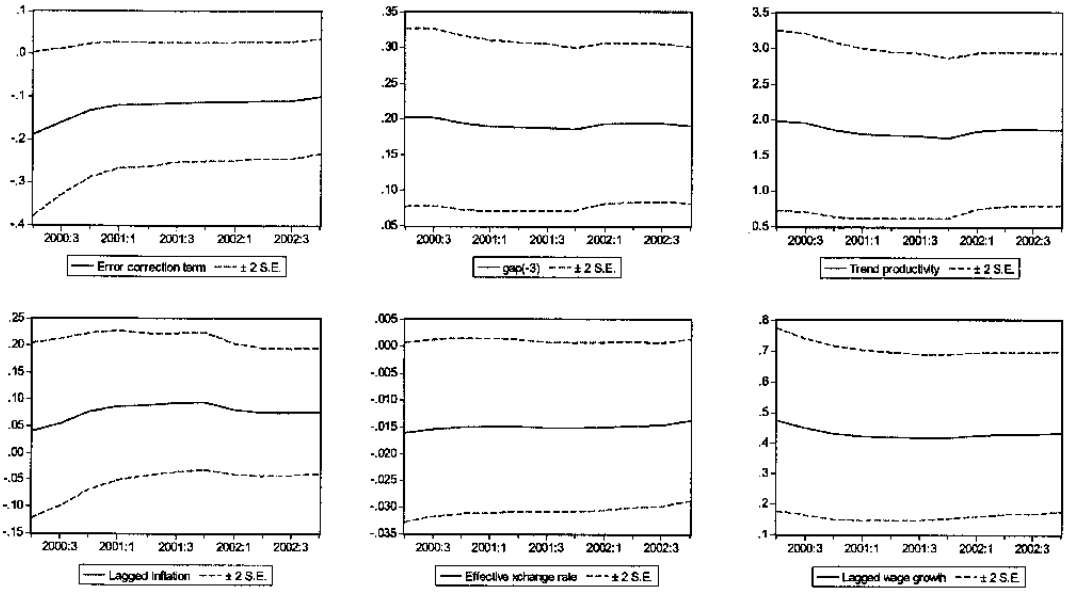


Table I-3. Inflation Equation—Cointegration Analysis

Sample(adjusted): 1981:2 2002:4
Included observations: 87 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: LOG(P)-LOG(PLEV) LOG(ULC) LOG(PM) LOG(PE) BS
Exogenous series: GAP
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.431860	96.79275	68.52	76.07
At most 1 *	0.214037	47.60409	47.21	54.46
At most 2	0.159612	26.65047	29.68	35.65
At most 3	0.118707	11.52190	15.41	20.04
At most 4	0.006052	0.528163	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.431860	49.18867	33.46	38.77
At most 1	0.214037	20.95361	27.07	32.24
At most 2	0.159612	15.12857	20.97	25.52
At most 3	0.118707	10.99374	14.07	18.63
At most 4	0.006052	0.528163	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels

1 Cointegrating Equation(s): Log likelihood 1527.272

Normalized cointegrating coefficients (std.err. in parentheses)

LOG(P)-LOG(PLEV)	LOG(ULC)	LOG(PM)	LOG(PE)	BS
1.000000	-0.648494	-0.414262	0.044025	-0.126601
	(0.03574)	(0.05934)	(0.01423)	(0.02881)

Adjustment coefficients (std.err. in parentheses)

D(LOG(P)-LOG(PLEV))	-0.072439

Table I-4. Inflation Equation

Dependent Variable: LOG(P/P(-1))
Sample: 1981:1 1991:1 1992:3 2002:4
Included observations: 83
Convergence achieved after 5 iterations
LOG(P/P(-1))=C(1)*(LOG(P(-1))-LOG(PLEV(-1))-C(2)*LOG(ULC(
-1))-C(2)*0.25*BS(-1)-C(3)*LOG(PMF(-1))-(1-C(2)-C(3))
*LOG(PE(-1))-C(14))+C(5)*GAP(-1)/100+C(6)*LOG(PLEV
/PLEV(-1))+C(9)*LOG(ULC(-1)/ULC(-2))+C(10)*LOG(PM/PM(-1))
+C(11)*LOG(PE/PE(-1))+C(12)*(GAP-GAP(-1))/100
+C(13)*D1993PLUS+C(15)*D1+C(16)*D2+C(17)*D3

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.148386	0.034536	-4.296561	0.0001
C(2)	0.746347	0.035874	20.80489	0.0000
C(3)	0.228513	0.045464	5.026255	0.0000
C(14)	-1.511850	0.180634	-8.369670	0.0000
C(5)	0.176465	0.034053	5.182049	0.0000
C(6)	1.260082	0.382955	3.290417	0.0016
C(9)	0.177676	0.067058	2.649573	0.0100
C(10)	0.049642	0.010965	4.527364	0.0000
C(11)	0.012843	0.003426	3.748792	0.0004
C(12)	0.116392	0.103121	1.128695	0.2629
C(13)	0.002442	0.002087	1.170084	0.2460
C(15)	0.002332	0.001346	1.733253	0.0875
C(16)	-0.001840	0.001326	-1.387540	0.1697
C(17)	-0.002787	0.001276	-2.184789	0.0323

R-squared	0.716470	Mean dependent var	0.005225
Adjusted R-squared	0.663051	S.D. dependent var	0.007045
S.E. of regression	0.004089	Akaike info criterion	-8.008202
Sum squared resid	0.001154	Schwarz criterion	-7.600205
Log likelihood	346.3404	Durbin-Watson stat	1.957061

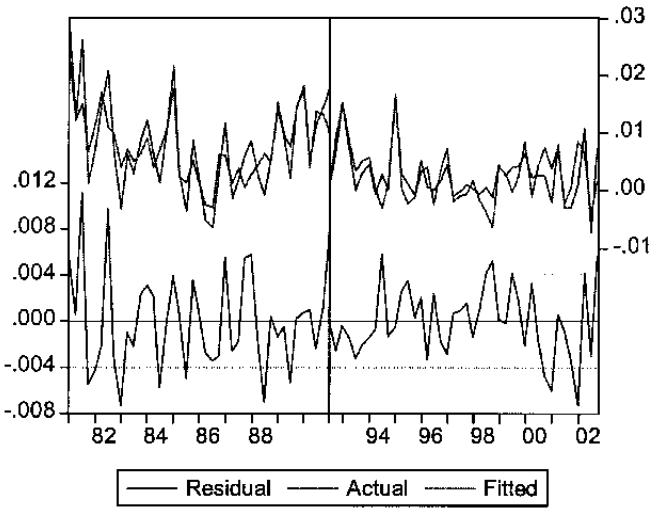
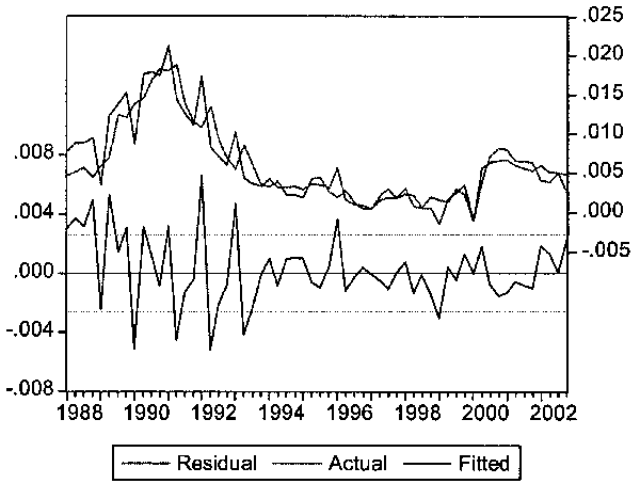


Table I-5. Wage Equation

Dependent Variable: LOG(W/W(-1))
Method: Least Squares
Date: 02/09/03 Time: 22:10
Sample: 1988:1 2002:4
Included observations: 60
LOG(W/W(-1))=C(21)*(LOG(ULC(-1)-LOG(P(-1))-LOG(SHAREAHP(-1)))
+C(25)*GAP(-3)/100+C(26)*LOG(LPHP/LPHP(-1))+C(28)
*LOG(PXH(-1)/PXH(-3))+C(22)*LOG(NEER_IFS(-2)/NEER_IFS(-6))
+C(30)*D001+C(31)*LOG(W(-1)/W(-2))

	Coefficient	Std. Error	t-Statistic	Prob.
C(21)	-0.099939	0.067041	-1.490720	0.1420
C(25)	0.190610	0.054968	3.467658	0.0011
C(26)	1.854309	0.535865	3.460401	0.0011
C(28)	0.077551	0.058709	1.320943	0.1922
C(22)	-0.013733	0.007552	-1.818472	0.0746
C(30)	-0.004664	0.002675	-1.743203	0.0871
C(31)	0.434714	0.131082	3.316360	0.0017

R-squared	0.782264	Mean dependent var	0.006268
Adjusted R-squared	0.757615	S.D. dependent var	0.005252
S.E. of regression	0.002586	Akaike info criterion	-8.968478
Sum squared resid	0.000354	Schwarz criterion	-8.724138
Log likelihood	276.0543	Durbin-Watson stat	2.222754



References

Aebersold, C. and A. Brunetti, 1998, "Die langfristige reale Aufwertung des Schweizer Frankens gegenüber der D-Mark" Aussenwirtschaft, Vol. 53. No III., pp. 365-386.

Bundesamt für Statistik, 2002, "Internationale Preisvergleiche und Kaufparitäten", Neuchâtel, Switzerland.

Choudhri, E. and D. Hakura, 2001, "Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?", IMF Working Paper 01/194.

De Brouwer, G. and N. Ericsson, 1998, "Modeling Inflation in Australia", Journal of Business and Economic Statistics, October, pp. 433-449.

Faber, S. and A. Fischer, 2000, "Kerninflationsraten in der Schweiz", SNB Quarterly Bulletin, December.

Gagales, A., 2002, "Growth in Switzerland: Can Better Performance be Sustained?", IMF Working Paper 02/153.

Gil-Pareja, S, 2002, "Export Price Discrimination in Europe and Exchange Rates", Review of International Economics, 10(2), pp. 299-312.

Jaeger, A, 1999, "Alternative Models of the Swiss Business Cycle", Switzerland, Selected Issues and Statistical Appendix, SM/99/31.

Jordan, T. and M. Peytrignet, (2001) "Die Inflationsprognose der Schweizerischen Nationalbank", SNB Quarterly Bulletin, June.

Jordan, T., P. Kugler, C. Lenz and M. Savioz (2002), "Inflationsprognosen mit vektorautoregressiven Modellen", SNB Quarterly Bulletin, March.

Krajnyak, K, 2001, "Monetary Policy Transmission and the New Policy Framework", in IMF Country Report 1/75, Washington.

Laxton, D and E. Prasad, 1997, "Possible Effcets of EMU: an Analysis Using MULTIMOD Simulations" in "Switzerland: Selected Issues and Statistical Appendix", IMF SM/97/23.

Lucas, R., 1976, "Econometric Policy Evaluation: A Critique" in K. Brunner and A. Meltzer (eds.), "The Phillips Curve and Labor Markets", Carnegie-Rochester Conference Series, Vol. 1, pp 19-46.

Siegenthaler, H, 1996, "Historische Statistik der Schweiz", Chronos Verlag, Zürich.

Stalder, P., 2001, "Forecasting Swiss Inflation with a Structural Macromodel: the Role of Technical Progress and the 'Mortgage Rate-Housing Rent' Link", in BIS Papers No. 3 "Empirical Studies of Structural Changes and Inflation", August.

Stalder, P., 2002, "The Changing Role of Foreign Labor and Female participation: Impacts on wage-price dynamics and unemployment in Switzerland", paper presented at the Central Bank Workshop on Macroeconomic Modeling at the FRB, Washington D.C.

Valdivia, V., 1998, "The Tradeoff Between Inflation and Real Activity", IMF Country Report 98/43.

II. Challenges for Monetary Policy[21]

34. Over the past decade Switzerland's central bank has been amongst the most successful in delivering on the commitment to price stability. Given the important economic benefits of low and stable inflation, this achievement should not be squandered lightly nor should it be taken for granted. But what are the implications for the conduct of monetary policy of the current setting, where interest rates are hard up against the zero constraint, the economy is still in the doldrums, the currency has been appreciating, and inflation is seemingly dead? This chapter argues that Switzerland's monetary framework is sufficiently flexible to master the challenges of today. Should the economy recover soon and the exchange rate not appreciate substantially the zero-interest floor might not pose a serious constraint, thanks to earlier aggressive interest rate cuts. However, more adverse developments could confront the Swiss National Bank (SNB) with the unpleasant choice between resorting to non-conventional monetary policy options or accepting a drawn-out period of weak economic activity. Aiming for somewhat higher inflation on average than in the past decade might help avoid difficult policy judgment calls in future downswings.

A. Switzerland's Inflation Record

35. **Over the past decade Switzerland's inflation performance has been impeccable** (Figure II-1). The SNB not only lived up to its price stability objective by keeping medium-term inflation in the 0-2 percent range, even actual inflation exceeded the 2 percent threshold only in a single month and fell below 0 percent in a mere three months. In the last cycle, inflation peaked at 1.9 percent and has since eased to around 1 percent. With this record, Switzerland boasts the lowest inflation rate of all industrialized countries during the past decade, save Japan, which has fallen into deflation.

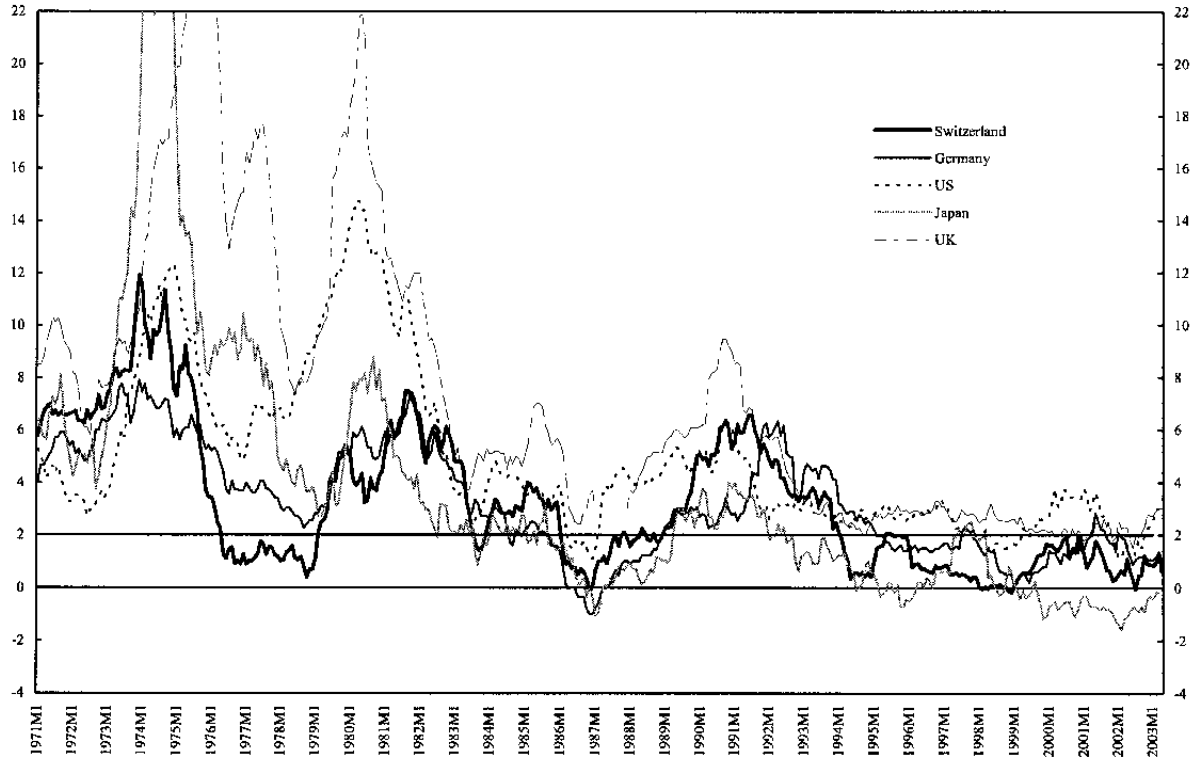
36. **Price stability has been a hard-won achievement that should not be taken for granted**. The demise of the disciplining effects from the gold standard or the fixed exchange rate regime meant that little stood in the way of exploiting the benefits of easy money in the 1970s and 1980s. But these benefits proved fleeting at best and gave rise to a period of stagflation. Price stability has since been accepted as the priority objective of most central banks. Nonetheless, as the SNB's Bruno Gehrig puts is "the chapter of secured price stability is by no means closed or somehow ticked off." (Gehrig, 2003, p. 4).

37. **The SNB's price stability objective appears more stringent in practice than that of other countries**. Countries that quantify inflation or price stability objectives typically aim for prices to increase by 2 or 2½ percent on average over the medium term (Box II-1). The SNB's mandate is broader: it is to conduct monetary and exchange rate policies in the general interest of the country and to ensure price stability while duly considering the business cycle, according to the new Central Bank Law under discussion. Its independence is

[21] Prepared by Christoph Klingen.

guaranteed in the constitution. The SNB equates price stability with a rise in the CPI of less than 2 percent per year. Short-term overruns are deemed acceptable. With this framework, the SNB could pursue a monetary policy not very dissimilar from that of other major central banks. However, actual inflation outcomes have been several notches lower than elsewhere, be it by intention, by coincidence, or for business cycle reasons.

Figure II-1. Selected Countries: CPI-Inflation, 1971-2003



Source: National authorities.

Box II-1: Inflation and Price Stability Objectives in Selected Countries

Euro area: Price stability is defined as a year-on-year increase in the Harmonized Index of Consumer Prices for the euro area of below 2 percent. Price stability according to this definition is to be maintained over the medium term.

United Kingdom: The price stability objective is to achieve underlying inflation (measured by the RPI excluding mortgage interest rates) of 2.5 percent.

New Zealand: According to the newly released Policy Target Agreement, price stability is defined as annual increases in the Consumer Price Index of between 1 and 3 percent on average over the medium term. Previously, price stability was deemed to be 0 to 3 percent inflation over 12 months.

Sweden: The Riksbank's target is a 2 percent rate of inflation, with a margin of ±1 percentage point.

Canada: The Bank of Canada aims to keep inflation at the midpoint of its 1 to 3 percent inflation-control target range. This target is expressed in terms of total CPI inflation, but the Bank uses a measure of core inflation as an operational guide.

Australia: In the Statement on the Conduct of Monetary Policy the Governor and the Treasurer agreed that the appropriate target for monetary policy is to achieve an inflation rate of 2-3 percent on average. The inflation target is defined as a medium-term average rather than as a hard-edged target band within which inflation is to be held at all times.

B. The Theory of Optimal Inflation[22]

38. **A long line of literature concludes that a small, but positive and stable, rate of inflation probably serves the economy best**. While the precise quantification of the optimal inflation rate remains subject to debate and depends on country-specific characteristics, the consensus figures are somewhere below 3 percent and bound away from zero percent. The optimal rate is a low one because inflation inhibits the smooth functioning of the pricing mechanism, like "sand" in a gear box, and increases the effective tax burden on capital. On the other hand, it is not zero, or negative, as inflation might also "grease," to some extent, the adjustment of relative prices and alleviate the danger of monetary policy hitting the zero interest floor. Moreover, conventional inflation measurement through the CPI index is subject to an upward bias of around ½ percentage point, as it typically does not correct for quality improvements.

[22] This section draws on IMF (2002a), Chapter I.

39. **Empirical research clearly establishes that double-digit inflation reduces economic growth** (e.g., Fischer, 1993, Barro, 1995, and Sarel, 1996). Typically high inflation goes hand in hand with high variability of inflation, thus undermining the functioning of the pricing mechanism by making price and wage setters more liable to confuse general price movements with relative price changes. By extension of this reasoning, unclear inflation targets and uncertain anti-inflation credentials of central banks also tend to be detrimental to growth.

40. **The case for inflation as low as possible rests with the interference of inflation with the taxation of capital.** Once inflation rates in the lower half of the single digits are reached the benefits of further disinflation become more difficult to show. The effective taxation of capital now becomes the main issue (Feldstein 1997, 1999). Because tax systems typically consider the nominal return on capital, i.e., the real return plus the compensation for inflation, savings are discouraged much more than statutory tax rates would suggest. Moreover, selective tax deductibility of interest expenses for certain investments, such as real estate, could result in inefficient use of savings. While tax reform would appear the most natural remedy for these distortions, administrative and political economy obstacles might be hard to overcome.

41. **On the other hand, moderate inflation might be preferable to no inflation as it eases relative price adjustment in the face of nominal rigidities.** Economic agents might be adverse to nominal wage and price cuts because of elements of money illusion, perceptions about "fairness", and employers' concerns about worker morale. In such a situation, a moderate increase of the general price level could facilitate necessary relative price adjustment.

42. **Inflation also provides for a safety margin against the risks of falling into a liquidity trap and deflation** (Summers 1991). An overly zealous inflation target leaves little room for lowering interest rates in response to an economic downturn or adverse shocks as nominal interest rates are naturally bounded at zero. Low inflation could turn into deflation with contractionary redistributive effects in a debt-deflation scenario, deferrals of demand and thus production, and unduly high real interest rates. While central banks are not powerless once interest rates hit zero, most of the usual guides to conducting monetary policy are no longer relevant, leaving them in uncharted territory (Mishkin, 2001).

43. **Finally, some inflation guards against deflationary developments in mature regions of a currency area.** Due to a higher productivity growth differential between traded and non-traded goods, catch-up regions tend to post a higher inflation rate than more economically advanced regions (Belassa-Samuelson effect). A stringent inflation target for the currency area as a whole therefore implies a very tight target for the mature regions. They would be left with only a small safety margin against deflation.

C. Relevance for Switzerland

44. **Only two of the above arguments for determining the optimal rate of inflation appear relevant for Switzerland: the distortions associated with effective capital taxation, arguing for inflation as low as possible, and the zero-interest bound on nominal interest rates, arguing for small positive inflation**. Current inflation rates appear far removed from levels where one would suspect the "sand" effects on the functioning of the price system to be a serious issue. To the extent that they are a marginal one, they could be offset by a clearer quantitative definition of the SNB's inflation objective. The current commitment to medium-term inflation of between 0 and 2 percent leaves some room for interpretation. It is not clear whether one is to expect inflation of 1½ percent as assumed in the medium-term fiscal plans, 1 percent as actual inflation since the mid-1990s, or even less as the disinflation process might not yet be complete. Likewise, the "grease" effects of inflation appear less important in the case of Switzerland. Labor markets are very flexible, with unemployment amongst the lowest in the world, and, notwithstanding product market distortions, relative prices are not entrenched, with about one third of prices falling over any 12-month period.[23] Finally, unlike in the euro area for example, the intra-regional Belassa-Samuelson effects should not be particularly prevalent, given the relative homogeneity of living standards across cantons and the high degree of resource mobility.

45. **Inflation has indeed seriously augmented the effective rate of capital taxation.** Over the last thirty years nominal long-term interest rates have averaged about 4½ percent with real rates around 2 percent. As a result, the statutory withholding tax on capital income of 30 percent translates into an effective rate of 67½ percent. The recent decline of inflation has helped to reduce this large effective rate: since 1995 nominal rates have averaged 2¼ percent and real rates about 1½ percent, making for an effective rate of 45 percent. Given that capital income should be taxed lightly on efficiency grounds, one would presume considerable welfare gains from disinflation.

46. **However, high effective tax rates on capital seem not to have discouraged savings**. At close to 30 percent of GDP, Switzerland boasts one of the highest domestic saving ratios in the world. High effective tax rates might not have eroded marginal incentives to save much after all due to the many investment vehicles, such as pension fund and life insurance investments, which attract much lower tax rates. In that case the concomitant distortion could be best addressed through lower and more uniform taxation of capital income (IMF, 2002b). Moreover, the gap between statutory and effective tax rates has not been unusual by international standards thus failing to provide a rationale for inflation rates in Switzerland to be lower than elsewhere.

47. **Switzerland's low interest rates and its safe-haven function suggest that the zero-floor on short-term interest rates could become binding at times**. Over the past couple of

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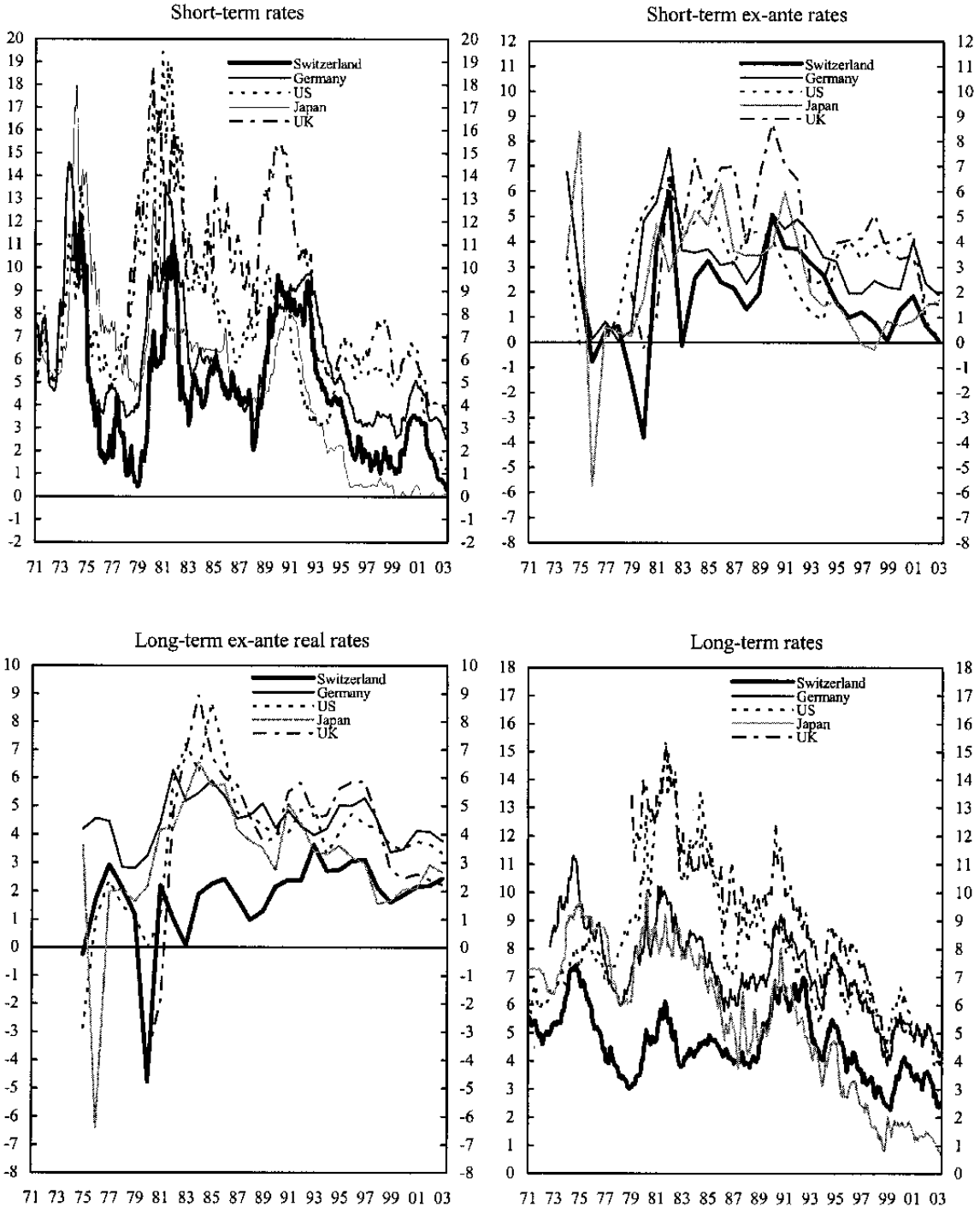
[23] See Chapter I.

decades, Switzerland's interest rates have been lower than in all other major economies, except for Japan in recent times. This applies to both nominal and real short-term and long-term rates (Figure II-2). Low real rates certainly offer considerable benefits to firms through favorable financing conditions, even if some of them are offset through the trend real appreciation of the currency. Low short-term nominal rates, however, constrain the SNB's room for maneuver at times of weak economic activity. The situation becomes particularly precarious if cyclical lows coincide with times of exchange rate appreciation. While Swiss businesses can cope with trend appreciation (0.6 percent in real terms and 1.2 percent in nominal terms), sudden and large deviations over and above trend can be disruptive and are a regular cause of concern for the SNB. As a rule of thumb, a 3 percent appreciation dampens activity about as much as a one percent increase of short-term interest rates.[24] As Figure II-3 illustrates, exchange rate movements influence monetary conditions quite strongly and appear to come at inopportune times compared to other advanced economies.

48. **Taylor rules suggest that the zero-floor on interest rates was indeed a binding constraint over extended periods in the 1990s and 1980s.** The Taylor rule provides a convenient shorthand for how central banks might want to set short-term interest rates in response to inflation pressures and the business cycle. It was found to track reasonably well the actual behavior of the U.S. Federal Reserve System (Taylor, 1993). Clearly, the reality of monetary policy decisions is much more complex: they try to be more forward looking and to take into account a wider array of parameters. In the case of Switzerland, exchange rate movements are particularly pertinent. Under a simple Taylor rule, i.e., oblivious of exchange rate effects, the zero floor on interest rates would have been binding only marginally in the second half of the 1990s (Figure II-4). But under an augmented Taylor rule, that also seeks to offset the effect of exchange rate movements on monetary conditions, the zero-interest floor would have been binding for most of the 1990s as well as extended periods in the 1980s (for technical issues regarding the calculations see Box II-2). Higher inflation would have facilitated a monetary policy matching more closely the one implied by the augmented Taylor rule.

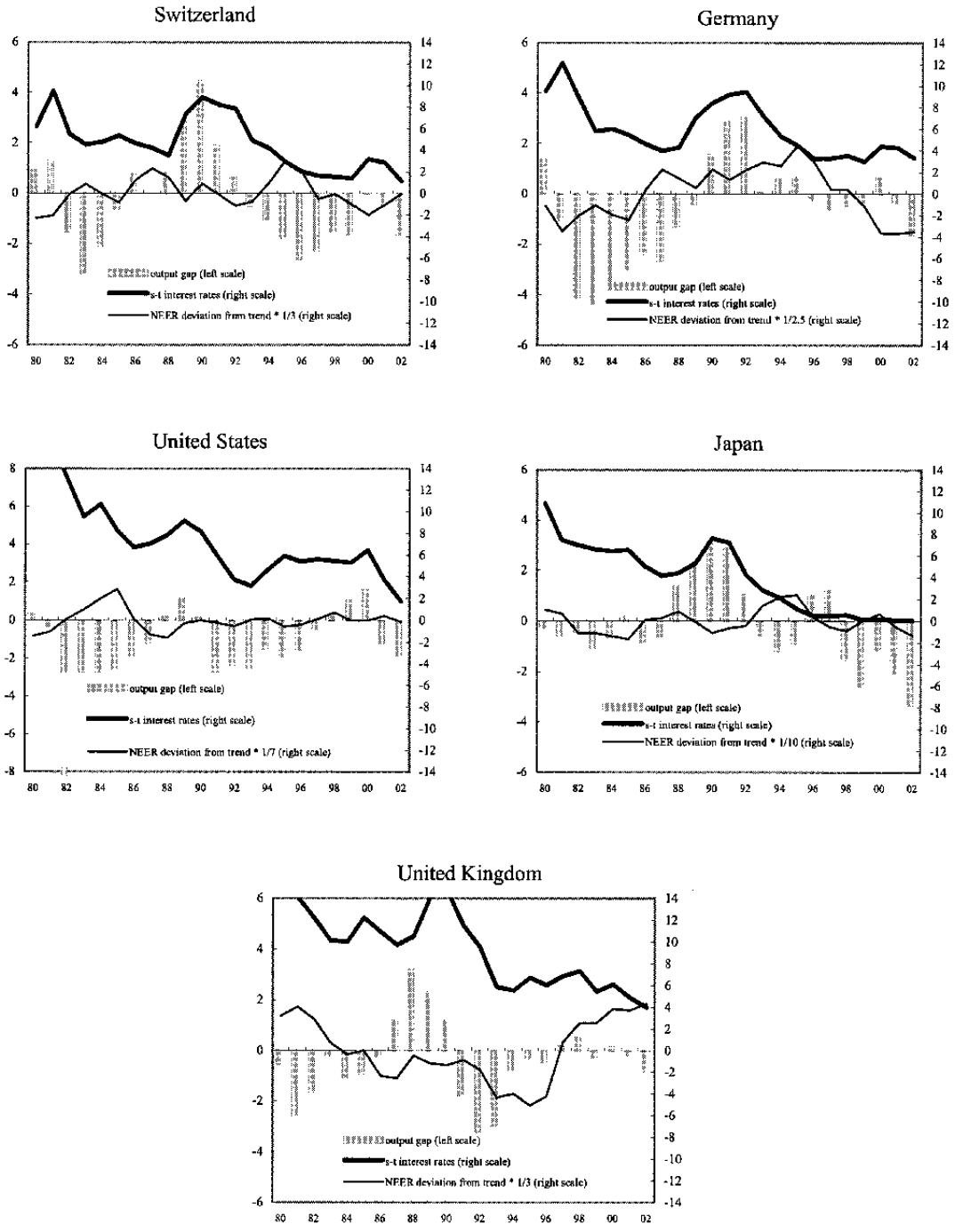
[24] Econometric analysis by IMF staff largely confirms this rule of thumb (IMF, 2001).

Figure II-2. Selected Countries: Interest Rate Developments, 1971-2003



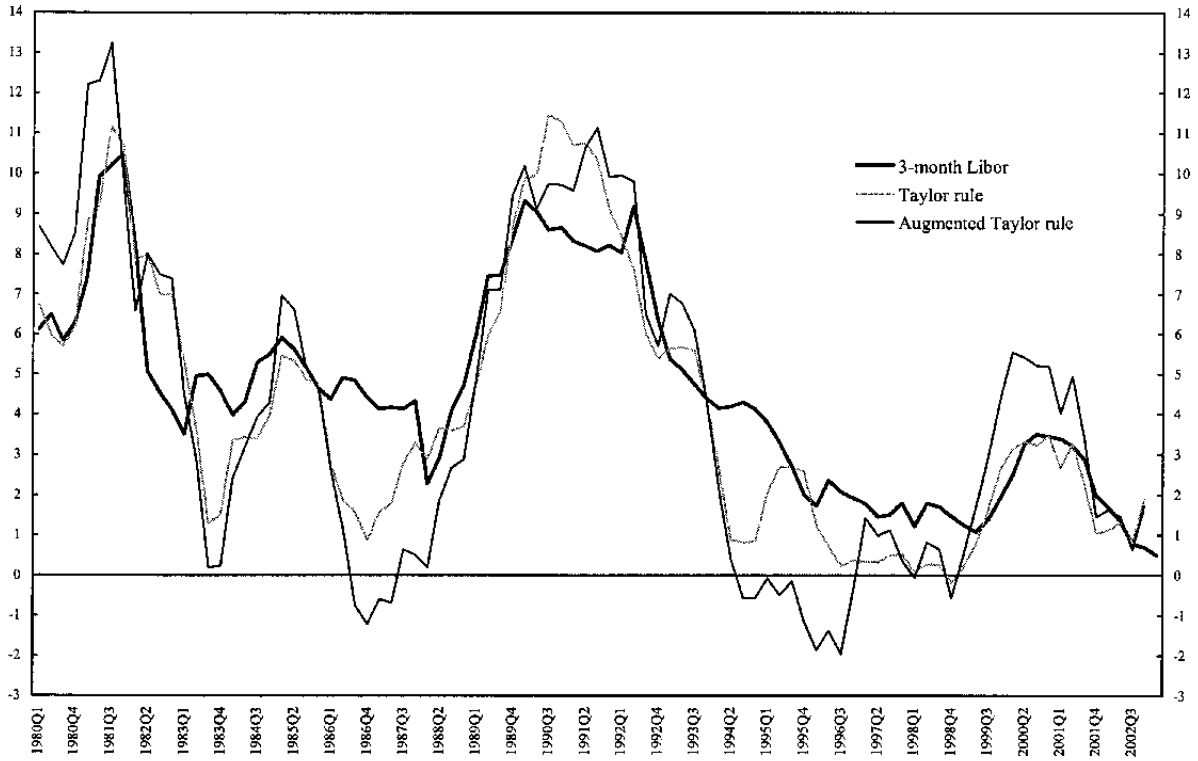
Sources: National authorities; and IMF staff calculations.

Figure II-3. Selected Countries: Monetary Conditions and the Business Cycle, 1980-2002



Sources: National authorities; and IMF staff calculations.

Figure II-4. Switzerland: Actual and Taylor-Rule Interest Rates, 1980-2002



Sources: Swiss authorities; and IMF staff calculations.

49. **Constraints on following a Taylor rule might be more of a concern now than they were in the 1990s.** True, the impossibility of bringing about negative nominal interest rates meant that the SNB could not pursue a Taylor rule in the 1990s. But the fact that it left interest rates well above zero suggests that it deliberately eschewed a Taylor-rule type interest policy. In all likelihood the necessity to break high inflation expectations at the beginning of the decade, when prices increased at annual rates of over five percent, called for some extra tightness. However, with inflation now at very low levels for a decade such considerations no longer apply. The SNB's monetary policy might therefore now coincide more closely with the Taylor rule.

Box II-2: Calculating Taylor Rule Interest Rates

According to the Taylor rule, central banks might want to set nominal interest rates (i_t) equal to equilibrium real interest rates (r*) plus prevailing inflation (π_t), introduce some extra tightness if inflation exceeds its target, and cut some slack if output (Y_t) falls below potential. Thus,

$$i_t = \tfrac{1}{2}*(\pi_t - \pi_t^{target}) + \tfrac{1}{2}*(Y_t - Y_t^{potential}) + (r^* + \pi_t).$$

The calculations shown in Figure II-4 assume a long-run real interest rate of 1.75 percent for the 3-month Libor, in line with average ex-post rates during 1980-2002. To capture the disinflation process over the sample period, target inflation follows a linearly declining trend from 4 percent in the first quarter of 1980 to 1.25 percent in the final quarter of 2002. Potential output is consistent with the latest estimates in the context of the IMF's WEO exercise and closely matches the estimates prepared by the OECD. The estimated output gap averaged 1.6 percent in 2002. Inflation is the 12-month increase of the consumer price index. Shorter frequencies of seasonally adjusted and smoothed inflation rates produce similar results, except for the finally quarter of 2002 where they fail to show the pick-up of Taylor-rule rates.

Under the augmented Taylor rule interest rate policy also depends on deviations of the nominal effective exchange rate (NEER) from its long-run trend. Thus,

$$i_t = \tfrac{1}{2}*(\pi_t - \pi_t^{target}) + \tfrac{1}{2}*(Y_t - Y_t^{potential}) + \tfrac{1}{3}*(1 - NEER / NEER^{trend}) + (r^* + \pi_t).$$

The trend exchange rate appreciates linearly and by 1.2 percent per year on average over the sample period.

50. **Moreover, long-term interest rates seem to react less strongly to changes in short-term interest rates than in other countries, bolstering the case for the need for ample room to maneuver on the short end of the yield curve.** Conventional monetary policy influences short-term interest rates directly, but ultimately it is the indirect effect on long-term rates that transmits the main effect on the real economy. In Switzerland, a given change of short-term rates appears to entail less movements in long-term rates than in other advanced economies. A simple regression of short-term rates on long-term rates for the period 1980-2002 suggests that long-term rates fall by 38 basis points following a 1 percent cut in short-term rates compared to 46 basis points in Germany, 75 basis points in Japan, 67 basis points in the US, and 65 basis points in the UK. While the results might be distorted by failing to control for other influences that could keep Swiss long-term rates unusually stable, the prima facie evidence is that the SNB would need to cut rates more aggressively than other central banks in order to secure the same effect on long-term rates. It will be in a position to do this only if "neutral" nominal rates and thus inflation are sufficiently elevated.

D. Monetary Policy Options at Low Interest Rates

51. **Very low inflation in itself is not a problem nor is it the root cause of the currently depressed level of economic activity in Switzerland.** With a long history of price stability under its belt, the Swiss economy is quite used to operating in a low-inflation environment. Current economic weakness is to be mainly blamed on soft external demand, the correction in the financial services sector, and the unwinding of an investment boom. The result, not the cause, of all this is very low inflation. Nonetheless, the causality need not be entirely one-directional: with low trend inflation anything from liquidity traps to debt deflation becomes more likely, thus potentially exacerbating economic slumps.

52. **The seriousness of hitting the zero-interest floor depends on the real economy repercussions and the effectiveness of other, non conventional, monetary policy tools.** It is not clear a-priori how the economy would evolve in the absence of further monetary action once the zero-floor has been reached. The possibilities range from a somewhat drawn-out period of weak economic activity to the risk of entering a deflationary spiral. Moreover, determined further monetary policy action might help mitigate such adverse developments, although it might come with costs of its own.

53. **Reaching the zero-interest rate floor implies negative "full-employment" real rates but not necessarily deflation.** As explained in the Appendix, being in a liquidity trap always implies that it would take negative real interest rates to swiftly restore aggregate demand to levels consistent with full utilization of resources. Given that nominal rates cannot fall further, inflation, or rather inflation expectations, must do the job. Failing that, one has little choice but to wait for the initial demand dislocation to wither away or for capacity to adjust downward. Liquidity trap episodes are also episodes of below-trend inflation, as it is large demand dislocations that put the economy in liquidity trap territory to begin with. The lower trend inflation is and the larger the demand dislocations are, the more likely is it that prices start falling.

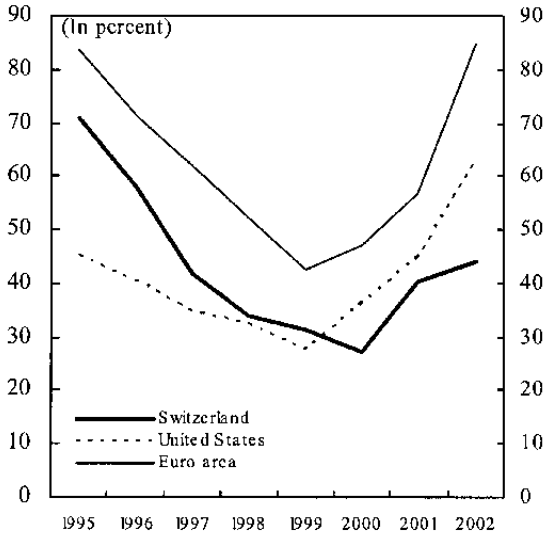
54. **A larger concern arises if sustained deflation meets weak balance sheets.** Once deflation becomes entrenched in agents' expectations real interest rates rise, prompting deferrals of consumption and investment, thus further weakening aggregate demand. Perhaps more importantly, due to nominal debt contracts, deflation raises the real debt burden of corporate borrowers, weakening their balance sheets, devaluing their collateral, and pushing them increasingly into bankruptcy. This could in turn weaken financial institutions thus hampering financial intermediation and a revival of investment.

55. **For Switzerland at the current juncture, low trend inflation suggests a modest risk of prices beginning to fall, although financial vulnerability indicators do not appear overly worrisome.**[25] Although the financial sector is feeling the strain of the downturn in

[25] A recent cross-country analysis by IMF staff also puts the risk of deflation in Switzerland as moderate (IMF, 2003).

global demand and asset prices, aggregate financial vulnerability indicators are, at this stage, at comfortable levels. However, some indicators are clearly lagging. Information on the state of corporate balance sheets is more sketchy, but gearing ratios appear less of a concern than elsewhere (Figure II-5). Moreover, debt of the non-financial corporate sector grew very moderately in the late 1990s and has now declined to levels lower than anytime since the mid-1990s.

Figure II-5. Selected Countries: Debt-Equity Ratios of Non-Financial Corporations, 1995-2002



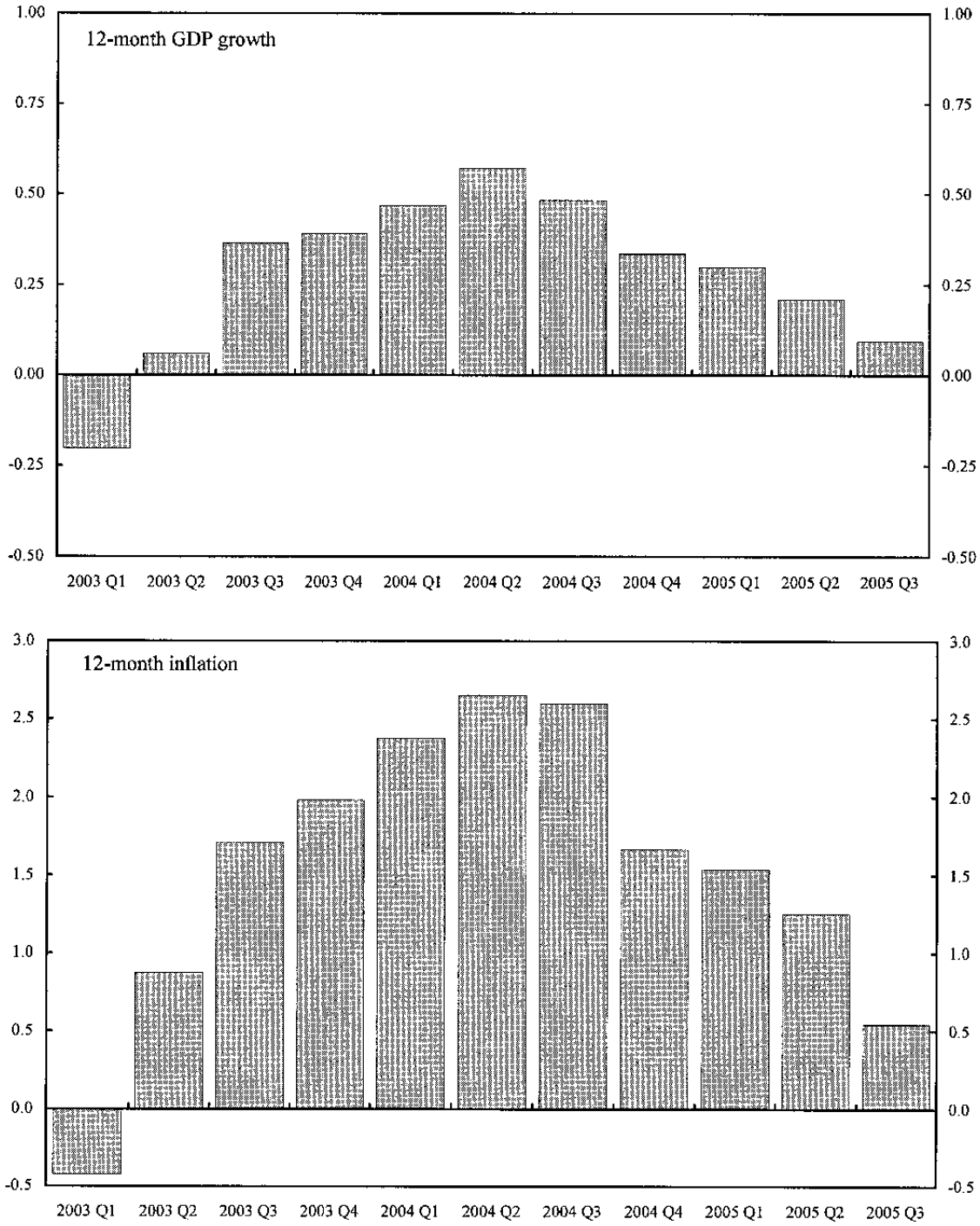
Sources: IMF "Corporate Balance Sheet Restructuring and Investment in the Euro Area"; and IMF staff calculations for a proxy in the case of Switzerland.

56. **Nonetheless, with short-term interest rates having declined to some ¼ percent, conventional monetary policy has run its course.** What monetary policy options could be considered, if activity does not pick up soon, to avert an overly prolonged period of weak economic activity?

57. **When to resort to non-standard monetary policy options is a difficult call to make.** It is well established that Switzerland's macroeconomic aggregates react with rather long lags to monetary policy changes (Jordan and Peytrignet, 2001 and IMF, 2001). Lags with respect to real GDP are between 4 to 8 quarters and the impact on prices peaks between 6 and 12 quarters after the impulse. Consequently, much of the impact of interest rate cuts that took place between autumn 2000 and spring 2003 has probably not come to full fruition. Based on the parameters of the SNB's structural VAR projections, one would conclude that a considerable impulse may still be in the pipeline: GDP could receive a boost of some ½ percent in the second semester of 2003 and inflation could be lifted by up to 2½ percentage points toward the end of the year (Figure II-6). However, nominal effective exchange rate appreciation of 7.3 percent since January 2001 will be acting as a significant counter weight. More generally, the intrinsic uncertainties surrounding VAR projections and

the long reaction lags mean that excessive trust in pipeline impulses carries the risk of missing the boat. Policy makers thus need to steer a course between either running the risk of engaging unnecessarily in non-conventional monetary policy or running the risk of failing to forestall a deep slump.

Figure II-6. Switzerland: Estimated Pipeline Effects of Past Interest Rate Cuts, 2003-2005



Source: IMF staff calculations based on parameters of SNB structural VAR projections (Jordan et al., 2002).

58. **If past monetary stimulus proves insufficient, the SNB would still have an array of non-conventional monetary policy options at its disposal**. They include foreign exchange market intervention, quantitative easing through repos further out along the yield curve, and ways to directly raise inflation expectations. The consensus is that central banks can ultimately always engineer sufficient inflation by virtue of their control of the printing press (Bernanke, 2002). Buiter (2003) argues that, at least in concert with fiscal policy, deflation is curable and that sustained, unwanted deflation is therefore evidence of policy failure. Others are more skeptical emphasizing that monetary injections tend to be absorbed without real effects in a liquidity trap (Krugman 1998) and therefore advocate supplementary measures to raise inflation expectations (Svensson, 2000). Yet others are concerned about the operational difficulties of non-conventional policies. Writes Mishkin (2001, p. 206) "...central banks do have the ability to lift the economy out of recession by pursuing expansionary policy and creating more liquidity, but it becomes much less clear how far they need to go. This rightfully makes central bankers uncomfortable."

59. **Quantitative easing would not be the first choice among non-conventional policy options**. First, there are doubts as to whether it would really stimulate the economy. Once interest rates have fallen to zero, agents become indifferent between holding bonds and cash. Any expansion of the central bank's money supply simply triggers an offsetting change in agents' portfolios away from bonds into cash without further consequences. Real effects could emerge only if such operations increased agents' inflation expectations, and thus lowered real interest rates, but this is by no means assured. Indeed, developments in Japan attest to the very real possibility of ineffective quantitative easing. Although the growth of base money was doubled as of the mid-1990s, growth of broader monetary aggregates failed to pick up and prices began falling (Ahearne et al., 2002). Second, repos further out along the yield curve would give rise to political economy concerns. True, even if conventional monetary policy has run its course in the sense that short-term interest rates have been driven to zero, longer-term rates would likely still be positive. Repos in longer maturities would have real effects but might require central banks to purchase substantial shares of government and corporate debt. This would put the central bank in the awkward position of becoming a major financier of the government and selected corporations. Third, if quantitative easing is effective it would be difficult to calibrate the appropriate doses, given the limited experience with such operations.

60. **Given Switzerland's deep foreign exchange market, unsterilized intervention appears the most natural form of non-conventional policy option**. In essence, foreign exchange intervention is just another form of quantitative easing and therefore subject to similar effectiveness concerns. As pointed out by Krugman (1999a), international capital mobility ties the exchange rate to the interest rate differential with international capital markets and the expected long-run exchange rate. Hence, once monetary policy loses its ability to influence interest rates it also loses its ability to move the exchange rate unless it can affect a shift in the expected long-run exchange rate. The latter might not come about by intervention alone but it could be forced by a temporary exchange rate peg backed by potentially unlimited foreign exchange interventions (Svensson, 2000). Indeed, in 1978, the SNB adopted such a policy in response to strong upward pressure on the Swiss franc and

established a temporary ceiling on the exchange rate vis-à-vis the DM (Kugler and Rich, 2001). It succeeded in breaking appreciation pressures but at the price of a large expansion of monetary aggregates and a subsequent surge in inflation, although the simultaneous second oil-price shock was also partly to blame.[26] Once again, this episode underscores the operational difficulties of non-conventional monetary policies.

61. **Simulations using the IMF's MULTIMOD also confirm that exchange rate intervention is superior to quantitative easing.** Although the exercise was conduced to evaluate policy responses to appreciation pressures that might emerge in the context of the introduction of the euro, its results carry over to the question of how to limit the output loss in a environment where nominal interest rates are bounded (Laxton and Prasad, 1997). It suggests that a temporary exchange rate peg entails a smaller output loss as well as a lower subsequent surge in inflation than a pure expansion of the money supply. Moreover, it concludes that the simulations illustrate the additional risks posed by the constraints on monetary policy in an environment with low levels of domestic inflation and interest rates.

62. **The unsettled debate about the effectiveness of non-conventional monetary policy and the related operational uncertainties argue for setting a sufficiently high inflation target to avoid having to take recourse to them.** At one end of the debate is the text book version of the liquidity trap where any quantitative easing fails to have real effects, no matter how large and no matter in what form. At the other end of the debate is the practitioners' view that large purchases of foreign exchange and securities would surely depreciate the exchange rate and drive down long-term interest rates, and thus stimulate real activity. With the truth somewhere in between there are great uncertainties about how much quantitative easing is required for exerting the intended stimulus without jeopardizing price stability. Better to avoid running into zero interest rate constraints in the first place.

E. Conclusion

63. The SNB's success in achieving very low inflation is not without risks. The low-inflation record should be carefully protected but monetary policy that aims for very low average inflation is also liable to run frequently into the zero interest rate constraint, especially with an exchange rate subject to safe-haven gyrations. While non-conventional monetary policy measures could in principle come to the rescue, there are large uncertainties about their exact workings and policy makers are therefore understandably reluctant to resort to them. This argues for trying to avoid running into the zero interest rate constraint to begin with by aiming for higher average inflation. Somewhat higher inflation does not require fine tuning inflation at any particular point in time, which would surely overstretch the capabilities of monetary policy, but simply slightly looser monetary policies throughout.

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[26] In 1981, the year after oil prices reached their peak some 175 percent above levels in 1978, Swiss inflation hit 6½ percent, about the same as in Germany but still less than in the United States.

64. Aiming for somewhat higher average inflation is not a recipe for escaping from the current zero interest rate floor. With interest rates currently at practically zero, conventional monetary policy is already as loose as it can be. This fact would not be altered by a change to average inflation goals. Rather the lesson is more forward looking: once the current episode is overcome and monetary policy is back in familiar territory one should think twice about squeezing out the last bit of inflation.

The Theory of the Liquidity Trap

65. The IS-LM framework is sufficiently rich to discuss the liquidity trap and the related issues of negative real interest rates and deflation. Despite being a staple of introductory macroeconomic courses and sometimes considered overly ad-hoc, Krugman (1999a) demonstrates that first-principle underpinnings for the IS-LM framework can readily be provided: the negative association between income and real interest rates traced out by the IS-curve can be viewed as the result of intertemporal maximization on the part of consumers; the positive association between income and nominal interest rates traced out by the LM-curve can be viewed as the result of a cash-in-advance constraint, including the liquidity trap section where interest rates on bonds are so low that agents hold money even if they do not need it for transaction purposes.

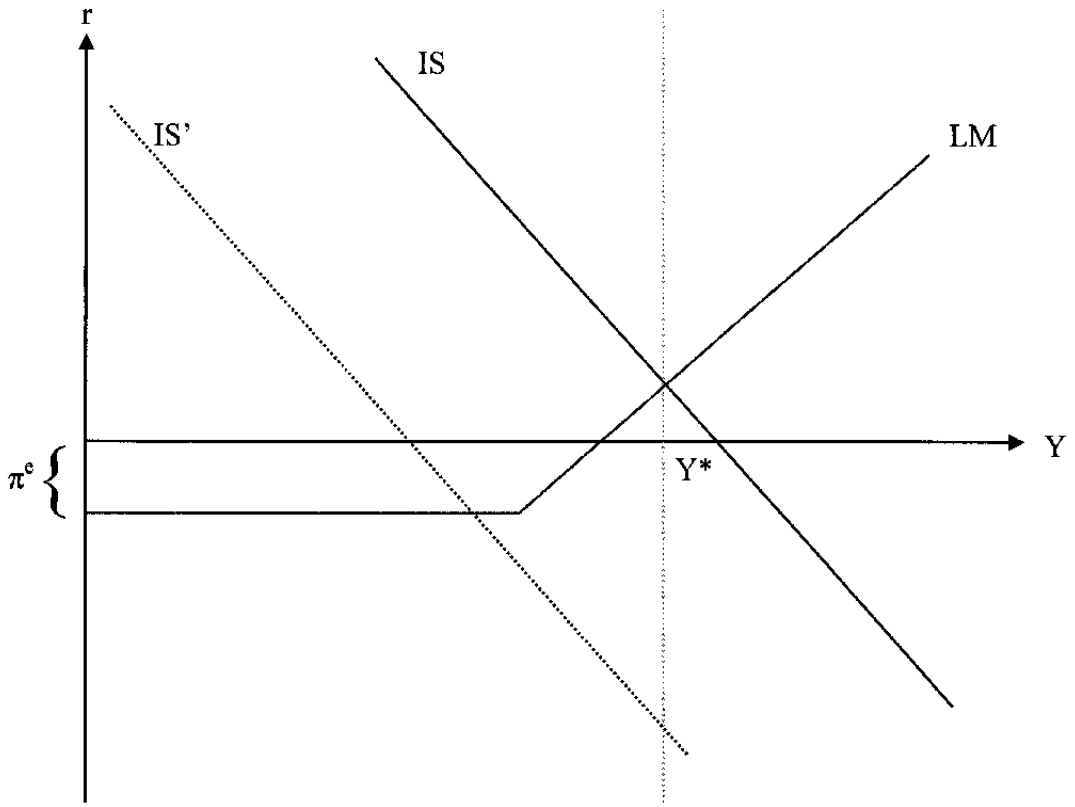
66. **Sufficiently large negative demand shocks can put the economy into liquidity-trap territory**. Figure II-7 shows the usual IS-LM diagram. Both curves are draw as a function of real interest rates (r). Changes in expected inflation (π^e) thus do not shift the IS-curve, as investment and savings decisions depend on real rates rather than nominal interest rates. However, they do shift the LM-curve as money demand is sensitive to nominal rather than real interest rates. Negative demand shocks shift the IS-curve inward, e.g., as the result of the desire to rebuild savings following an unexpected fall of asset prices, depressed investment demand due to past overinvestment, or a deteriorating growth outlook due to demographic aging. Following such a shock the curves cross at less than full-employment output (Y*). If sufficiently large they intersect in the flat part of the LM-curve, as indicated in Figure II-7. Interest rates are then so close to zero that agents are indifferent between holding money or bonds; monetary injections in the form of open-market operations are simply absorbed through a reallocation of agents' portfolios toward money at the expense of bonds without further consequences. Empirically, one would expect to see in such a situation an expansion of narrow and broader monetary aggregates, without commensurate reductions in interest rates.

67. **If the economy is in a liquidity trap, full-employment real interest rates are typically negative**. As is immediately clear from Figure II-7, for investment to match savings at full-employment output real interest rates have to be negative if the IS-curve crosses through the flat section of the LM-curve. In other words, expected inflation has to exceed nominal interest rates if real interest rates are to bring investment and savings back into balance and restore full-employment output following a disruption to demand that has put the economy in a liquidity-trap situation. Graphically, π^e has to increase sufficiently to shift the LM-curve down enough to intersect the IS'-curve at Y*.

68. **The need for negative real interest rates is a less awkward proposition than it might seem**. One might be tempted to argue that investment projects with a positive yield are always around and that therefore zero real interest rates are always sufficient to stimulate demand back to full-employment output. But this view is at odds with the experience in Japan and during the great depression and it can also be refuted on theoretical grounds: with

spare capacity and/or with asset prices expected to decline, investment projects with a zero rate of return might not be available after all.

Figure II-7: IS-LM Framework



69. **Instances where the full-employment real rate remains positive despite the economy being in a liquidity trap are possible but unlikely to be very relevant.** If agents expect sufficiently large deflation, the economy could end up in a liquidity trap although real interest rates at full employment remain positive. In terms of Figure II-7, this could happen if the IS-curve shifted inward only by a little but deflation expectations shifted the LM-curve up enough so that the intersection occurs in its flat part. This is the scenario that Krugman (1999b) has in mind when arguing that there might be a window of opportunity for monetary policy to prevent a deflationary spiral: the initial small demand shock gives rise to an output gap but does not put the economy in a liquidity trap. At this point, expansionary policy could still stimulate the economy back to full employment. However, if this opportunity is not

seized, the persistent output gap might give rise to deflation, shifting up the LM curve and rendering monetary policy impotent.

70. **Economies with low equilibrium real interest rates and inflation on the one hand and large exposure to demand shocks on the other hand are particularly prone to liquidity traps**. As is clear from Figure II-7, even relatively small disruptions can put the economy in liquidity-trap territory if the full-employment real interest rate and expected inflation are low. Assessing a country's susceptibility for liquidity traps therefore is much about evaluating the size of demand shocks relative to the typical level of real interest rates and inflation. Countries are at risk, for instance, if they exhibit large exposure to volatile external and financial markets combined with a track record of very low inflation and a high propensity to save that keeps real rates down.

71. **Liquidity traps provide a fertile breeding ground for deflation and deflation tends to aggravate liquidity traps**. While a liquidity trap does not necessarily set off deflation, it does involve insufficient demand so that inflation is lower than it typically is. This could spell deflation in a country where inflation is typically low to begin with and demand insufficiency is pronounced. Vice versa, deflation does not necessarily put the economy in a liquidity trap, but deflation tends to lower the expected rate of inflation thus making a liquidity trap more likely.

72. **Deflation is a matter of concern because it can set in motion a contractionary spiral**. This is widely believed to have happened during the great depression in the 1930s and, in a milder form, in today's Japan. Both episodes marked periods of pronounced economic underperformance.[27] Once deflation gets entrenched into expectations, real interest rates rise depressing private consumption and investment demand. Moreover, deflation increases the real burden of debt of companies and households thus deteriorating their balance sheets. This curtails their access to financing and their willingness to invest or consume; it could even push them into bankruptcy thus weakening the financial sector and its ability to lend. Both effects widen the output gap further and intensify the downward pressure on prices.

73. **Ironically, deflation arises as a result of downwardly sticky prices**. As Krugman (1997) points out, in a world of perfect price flexibility, following a negative demand shock prices would fall instantaneously by enough to generate the inflation expectation that is needed to restore full-employment output today. However, with sticky prices this does not happen fast and radically enough. An output gap emerges which puts downward pressure on

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[27] Historically, there have also been episodes where economies grew at a healthy pace despite deflation. In the late 19th century, new technologies increased competition and expanded production capacities which stimulated growth and reduced prices (IMF, 1999 and BIS, 1999).

prices. Prices begin to decline slowly. Rather than generating the needed inflationary expectations this gives rise to deflationary expectations.

74. **Against this background, it is not clear whether wage flexibility increases or decreases the risk of deflation.** On the one hand, perfect price and wage flexibility would eliminate the possibility of a contractionary deflation spiral to begin with. It appears reasonable to conjecture that almost the same can be achieved with nearly perfectly flexible prices and wages. On the other hand, it is often argued that downwardly rigid wages provide a useful safeguard against falling prices. With nominal wages unable to decline, firms' ability to lower prices is narrowly circumscribed. This dampens deflation and deflationary expectations. Moreover, in a setting where output is constrained by demand the usual benefits of wage declines do not apply.

References

Ahearne, Alan, Joseph Gagnon, Jane Haltmaier, and Steve Kamin, 2002, "Preventing Deflation: Lessons from Japan's Experience in the 1990s," International Finance Discussion Papers, Number 729, Board of Governors of the Federal Reserve System.

Barro, Robert, 1995, "Inflation and Economic Growth," *Bank of England Bulletin 35* (May), pp. 1-11.

Bernanke, Ben, 2002, "Deflation: Making Sure "It" Doesn't Happen Here," Remarks before the National Economists Club, Washington, DC, November 21, 2002, http://www.federalreserve.gov/boarddocs/speeches/2002/20021121/default.htm.

Buiter, Willem, 2003, "Deflation: Prevention and Cure," NBER Working Paper No. W9623.

BIS, 1999, "Monetary Policy in the Advanced Industrial Countries," 69th Annual Report, Bank for International Settlements, Basel, http://www.bis.org/publ/ar99e4.pdf.

Feldstein, Martin, 1997, "The Costs and Benefits of Going from Low Inflation to Price Stability," in: *Reducing Inflation: Motivation and Strategy*, ed. Romer and Romer, pp. 123-56.

———, 1999, "*The Costs and Benefits of Price Stability*," University of Chicago Press for NBER.

Fischer, Stanley, 1993, "The Role of Macroeconomic Factors in Growth," *Journal of Monetary Economics*, 32, pp.485-512.

Gehrig, Bruno, 2003, "Geforderte Geldpolitik – Überlegungen zum Konzept und zur aktuellen Entwicklung," Gastvorlesung an der Universität St. Gallen, http://www.snb.ch/d/publikationen/publi.html?file=referate/ref_030124_bge.html.

Jordan, Thomas and Michel Peytrignet, 2001, "Die Inflationsprognose der Schweizerischen Nationalbank," *Quartalsheft 2/2001*, pp. 54-61, Schweizerische Nationalbank, Zürich, http://www.snb.ch/d/publikationen/publi.html?file=geld/text_geld.html.

———, Peter Kugler, Carlos Lenz, and Marcel Savioz, 2002, "Inflationsprognosen mit vektorautoregressiven Modellen," *Quartalsheft 1/2002*, pp. 40-66, Schweizerische Nationalbank, Zürich, http://www.snb.ch/d/publikationen/publi.html?file=geld/text_geld.html.

IMF, 1999, "Safeguarding Macroeconomic Stability at Low Inflation," World Economic Outlook, October 1999, International Monetary Fund, Washington, DC, http://www.imf.org/external/pubs/ft/weo/1999/02/1099ch4.pdf.

———, 2001, "Switzerland—Selected Issues," Country Report No. 01/75, International Monetary Fund, Washington, DC, http://www.imf.org/external/pubs/ft/scr/2001/cr0175.pdf.

———, 2002a, "Monetary and Exchange Rate Policies of the Euro Area—Selected Issues," Country Report No. 02/236, International Monetary Fund, Washington, DC, http://www.imf.org/external/pubs/ft/scr/2002/cr02236.pdf.

———, 2002b, "Switzerland—Selected Issues," Country Report No. 02/107, International Monetary Fund, Washington, DC, http://www.imf.org/external/pubs/ft/scr/2002/cr02107.pdf.

———, 2003, "Deflation: Determinants, Risks, and Policy Response", International Monetary Fund, Washington, DC, forthcoming.

Kugler, Peter and Georg Rich, 2001, "Monetary Policy Under Low Interest Rates: The Experience of Switzerland in the Late 1970s," presented at the 32nd meeting of the "Ausschuss für Geldtheorie und Geldpolitik – Verein für Socialpolitik," Frankfurt am Main, February 2001.

Krugman, Paul, 1998, "It's Baaack: Japan's Slump and the Return of the Liquidity Trap," Brookings Papers on Economic Activity, 2:1998, pp.137-205.

———, 1999a, "Thinking About the Liquidity Trap," http://web.mit.edu/krugman/www/trioshrt.html.

———, 1999b, "Deflationary Spirals," http://web.mit.edu/krugman/www/spiral.html.

Laxton, Douglas and Eswar Prasad, 1997, "Possible Effects of European Monetary Union on Switzerland: A Case Study of Policy Dilemmas Caused by Low Inflation and the Nominal Interest Rate Floor," IMF Working Paper WP/97/23, International Monetary Fund, Washington, DC, http://www.imf.org/external/pubs/ft/wp/wp9723.pdf.

Mishkin, Frederic, 2001, "Issues in Inflation Targeting," in: *Price Stability and the Long-Run Target for Monetary Policy*, Bank of Canada, pp. 203-222. http://www.bankofcanada.ca/publications/working.papers/2000/mishkin.pdf.

Summers, Lawrence, 1991, "How Should Long-term Monetary Policy Be Determined?," *Journal of Money, Credit, and Banking*, Vol 23, No. 3, pp. 625-631.

Svensson, Lars, 2000, "The Zero Bound in an Open Economy: A Foolproof Way of Escaping From a Liquidity Trap," NBER Working Paper, no. 7957, National Bureau of Economic Research, Cambridge, MA.

Sarel, Michael, 1996, "Nonlinear Effects of Inflation on Economic Growth," *IMF Staff Papers 43*, pp. 199-215.

Taylor, John B., 1993, "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference on Public Policy*, No. 29, pp. 195-214.