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Switzerland: Selected Issues and Statistical Appendix

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SWITZERLAND

Selected Issues and Statistical Appendix

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Approved by the European I Department

February 4, 1999

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Switzerland: Basic Data

Area and population	
Total area	41,293 square kilometers
Total population (end-1997)	7.1 million
GNP per capita (1997)	$38,335

	1994	1995	1996	1997	1998 1/
		(Percentage changes at 1990 prices)			
Demand and supply					
Private consumption	1.0	0.5	0.4	1.2	1.6
Public consumption	2.0	-0.1	1.4	-0.1	0.6
Gross fixed investment	6.5	1.8	-2.7	1.4	3.2
Construction	7.1	-3.8	-6.2	-1.5	1.3
Machinery and equipment	5.8	9.7	1.6	4.9	5.4
Final domestic demand	2.5	0.7	-0.2	1.1	1.9
Inventory accumulation 2/	0.1	1.1	0.2	0.3	1.1
Total domestic demand	2.7	1.8	0.0	1.4	3.0
Exports of goods and nonfactor services	1.8	1.6	2.5	8.6	5.5
Imports of goods and nonfactor services	7.9	5.1	2.7	7.8	7.6
Foreign balance 2/	-2.0	-1.3	-0.1	0.3	-0.8
GDP	0.5	0.6	-0.0	1.7	2.1
GNP	-0.2	2.3	-0.2	2.3	2.9
		(In millions, unless otherwise indicated)			
Employment and unemployment					
Employment	3.79	3.80	3.81	3.80	3.84
(Percent change)	0.0	0.4	0.3	-0.3	1.0
Unemployed (registered)	0.17	0.15	0.17	0.19	0.14
Unemployment rate (in percent)	4.7	4.2	4.7	5.2	3.9
		(Percentage changes, unless otherwise indicated)			
Prices and incomes					
GDP deflator	1.6	1.1	0.4	0.0	0.5
Consumer price index	0.9	1.8	0.8	0.5	0.0
Nominal wage growth 3/	1.0	1.9	0.1	1.0	1.3
Unit labor costs (total economy)	0.5	1.8	0.4	-1.0	0.2
Real disposable income	-1.1	0.8	0.4	1.6	2.1
Personal saving ratio (in percent)	9.0	9.2	9.1	9.5	10.0
		(In percent of GDP)			
Public finances					
Central Government					
Financial balance 4/	-1.6	-1.5	-1.3	-1.0	-0.5
Gross debt	20.5	22.0	23.6	25.1	26.5
General Government	-1.9	-1.3	-1.6	-1.5	-1.3
Financial balance 4/	-2.8	-1.9	-1.9	-2.2	-2.4
Structural balance	-2.5	-1.5	-0.9	-1.0	-1.8
Gross debt	45.0	46.9	49.4	51.3	53.0

Switzerland: Basic Data (concluded)

	1994	1995	1996	1997	1998 1/
		(In billions of Sw F, unless otherwise indicated)			
Balance of payments					
Trade balance	2.2	1.0	1.1	-0.5	-1.2
Service balance	15.6	15.2	15.4	18.8	19.8
Factor income balance	10.7	13.9	15.6	19.7	21.3
Net private transfers	-3.2	-3.3	-3.2	-3.0	-3.4
Net official transfers	-1.5	-1.5	-1.7	-1.9	-1.9
Current account	23.9	25.3	27.1	33.2	34.6
(In percent of GDP)	6.7	7.0	7.4	8.9	9.1
Foreign direct investment	-10.2	-11.8	-11.6	-11.5	...
Outward	-14.8	-14.4	-14.3	-14.5	...
Inward	4.6	2.6	2.7	3.0	...
Portfolio investment	-24.9	-4.6	-8.6	-11.6	...
Outward	-26.1	-10.5	-24.5	-20.0	...
Inward	1.2	5.9	15.9	8.4	...
Banking sector, net	15.1	-9.3	-13.8	0.6	...
Memorandum items:					
Net investment income	17.6	20.8	22.4	26.2	28.3
(In percent of GDP)	4.9	5.7	6.2	7.1	7.4
Net external assets	357.8	350.3	455.3	442.6	477.0
(In percent of GDP)	100.1	96.4	124.8	119.3	125.2
		(Percentage changes in annual averages)			
Monetary and credit data 5/					
Monetary base	1.8	0.3	3.4	4.8	3.0
Money (M1)	5.6	6.8	11.7	10.1	7.8
Broad money (M3)	5.1	2.2	6.9	5.1	1.1
Domestic credit	1.7	1.8	3.1	1.7	0.7
		(Period averages in percent)			
Interest rates					
Three-month euro rate	4.0	3.0	1.9	1.6	1.5
Yield on government bonds	5.0	4.8	4.2	3.6	2.9
			(Levels)		
Exchange rates 6/					
Sw F per US$ (end of period)	1.31	1.15	1.35	1.46	1.38
Sw F per US$ (annual average)	1.37	1.18	1.24	1.45	1.45
SW F per DM (annual average)	0.84	0.83	0.82	0.84	0.82
Nominal effective rate (1990=100) 5/	105.2	112.8	111.1	104.3	108.1
Real effective rate (1990=100) 7/	104.7	111.5	108.4	100.3	101.5

Sources: International Monetary Fund, World Economic Outlook database; Swiss National Bank; Swiss Institute for Business Cycle Research.

1/ Staff estimates and projections.
2/ Change as percent of previous year's GDP.
3/ Nominal wage growth per employee.
4/ Excluding cash surplus of civil service pension fund as revenue; from 1997 onward, including railway loans as expenditure.
5/ For 1998, data refer to November.
6/ For 1999, data refer to January 1999.
7/ For 1998, data refer to November; based on consumer prices.

I. Alternative Models of the Swiss Business Cycle[1]

A. Introduction and Summary

1. At the beginning of the 1990s, the real GDP growth rate of the Swiss economy slowed sharply below its average growth path (Figure I-1). The following period of output stagnation (1991–96) was prolonged, and unemployment rose to postwar records. The stagnation period also proved a taxing experience for business cycle forecasters and analysts: official and private forecasts of real GDP growth almost persistently overpredicted the future GDP growth rate of the economy; and assessments of the cyclical position of the economy based on the traditional decomposition of real GDP into trend and cyclical output components produced a wide range of estimates of the economy's output gap.

2. Against this background, this chapter compares two alternative time series approaches to analyzing Switzerland's recent business cycle experience: first, the traditional "smooth-trend-plus-cycle approach," which envisages observed output growth as fluctuating around a relatively smooth potential output growth path; and, second, the more recently developed "regime change approach," which views business cycles as shifts between "high-growth" states (expansions) and "slow-growth" states (recessions) of the economy.[2] While the smooth-trend-plus-cycle approach seeks to separate trend and cycle components and views recessions and expansions as mirror images of each other, the regime change approach assumes that trend and cycle are fundamentally intertwined phenomena and allows for asymmetric durations of expansions and recessions.

3. The empirical analysis reported in this chapter suggests that a regime change model fits the stylized facts of Switzerland's recent business cycle experience better than the traditional trend-cycle model:

- Consistent with the predictions of the regime change approach, Switzerland's recent business cycle experience has been characterized by abrupt and persistent shifts in real GDP growth rates. Moreover, the frequency distribution for observed Swiss real GDP growth rates since the mid-1970s appears to have a distinct bimodal shape, with observed GDP growth rates clustering around "low-growth" and "high-growth" states.

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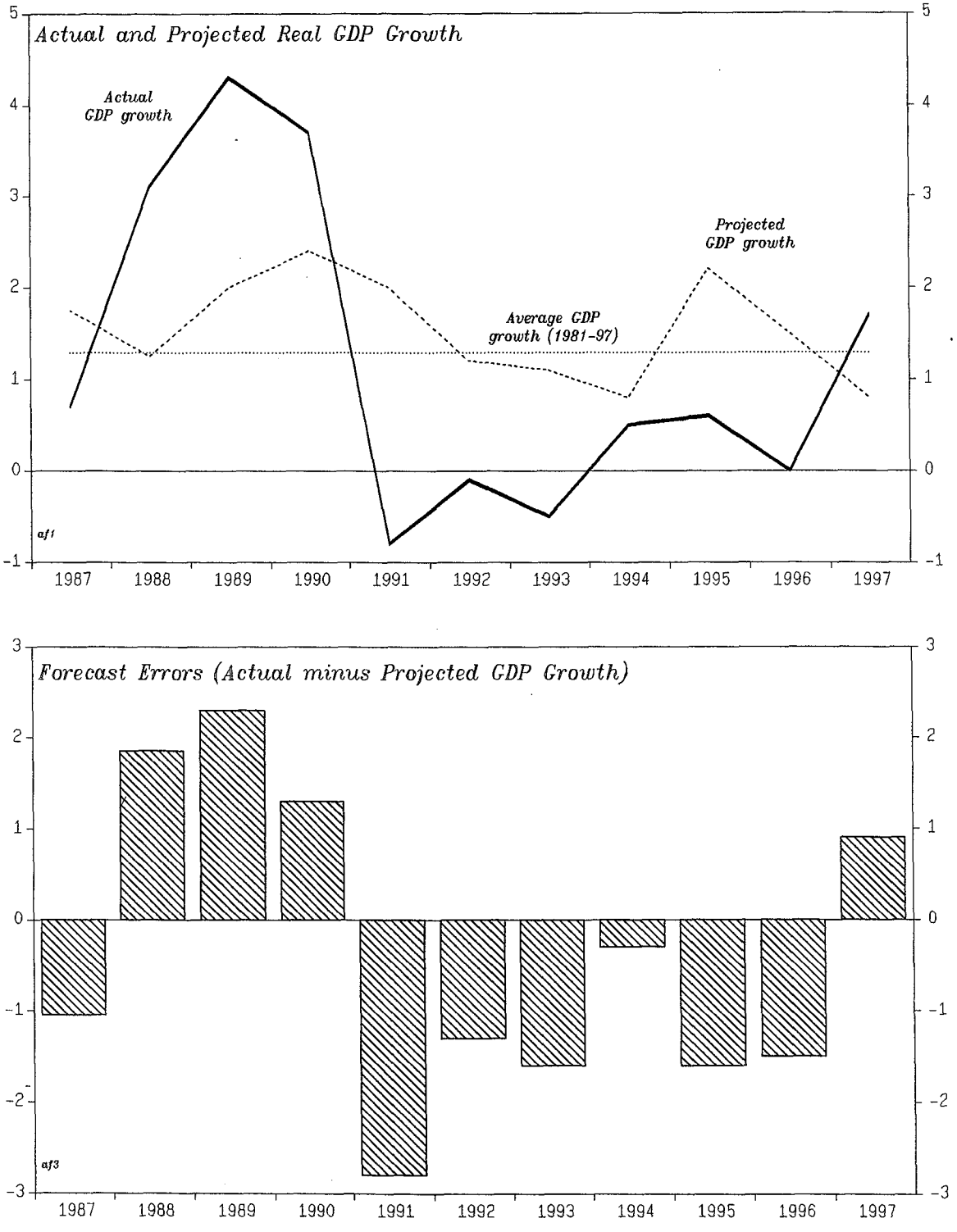
[1]Prepared by Albert Jaeger.

[2]The specific version of a regime change model applied to Swiss data in this chapter was pioneered by Hamilton (1989). However, the concept of regime switching at business cycle turning points has a long history as a defining characteristic of business cycles; see e.g. Burns and Mitchell (1946). For a recent overview of empirical business cycle research that highlights the links between the Burns-Mitchell tradition and the modern regime change approach to analyzing business cycles, see Diebold and Rudebusch (1996).

Figure I-1. Switzerland: Actual and Projected Real GDP Growth, 1987-97 (In percent)



Sources: IMF, World Economic Outlook database; and OECD Economic Outlook (various issues).

- The regime change model can account for the dismal record of macroeconomic forecasts in tracking future Swiss real GDP growth. A highly persistent pattern of forecast errors would be consistent with forecasters basing their predictions on a smooth-trend-plus-cycle model, which assumes that GDP growth has a pronounced tendency to revert back to potential growth, while output growth in fact alternates between persistent regimes of high and slow growth.

4. A regime change model of the Swiss business cycle may also provide a useful perspective for interpreting several features of Switzerland's policy behavior and framework:

- While a regime change model view of the business cycle supports the traditional medium-term orientation of Switzerland's policy framework, it also would provide a rationale for the widespread view that particularly large unfavorable exchange rate or aggregate demand shocks (e.g., brought about by a collapse in consumer confidence) could have a severe and lasting impact on the average performance of the economy, as these type of shocks could shift the economy to a protracted slow-growth state. In fact, descriptions of Switzerland's monetary policy framework often emphasize that while the SNB will aim at meeting a medium-term target for money growth, the central bank preserves the option of discretionary deviations from its medium-term money target in case of particularly large unfavorable shocks.[3] By contrast, within the confines of the smooth-trend-plus-cycle approach, most adverse shocks should only be reflected in transitory dips in the economy's output gap, and it is far less clear why these shocks should trigger discretionary policy responses.

- A regime change view of the business cycle appears also to be implicit in the recent discussions of a desirable fiscal policy rule consistent with budget balance over the medium term (at the Confederation level).[4] In particular, the authorities' specific proposals for such a rule have been couched in terms of an (implicit) three-state regime change model, where the fiscal policy response to real GDP growth variations would differ depending on whether the economy is projected to be in a "recession state" (real GDP growth < 0.5 percent), in a "normal state" (real GDP growth ≥ 0.5 percent but smaller than 1.8 percent), or in a "boom state" (real GDP growth ≥ 1.8 percent).[5]

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[3]Switzerland's monetary policy framework is analyzed in Chapter II.

[4]Switzerland's fiscal policy framework was analyzed in Chapter II of last year's IMF Staff Country Report No. 98/43.

[5]See the official consultation report on alternative fiscal policy rules under a constitutional balanced budget amendment (*Vernehmlassungsbericht zur Schuldenbremse* (1995)).

5. As regards predicting medium-term developments in output growth (and, as a likely consequence, the medium-term inflation rate), regime change models of the business cycle would suggest that forecasts are fraught with considerably more uncertainty than indicated by the smooth-trend-plus-cycle approach. The latter approach essentially implies that medium-term output forecasts can be based on the rule-of-thumb that future GDP growth is equal to the potential output growth rate plus an adjustment needed to close the output gap over the medium term. Under a regime change model, the durations of expansions and recessions can be asymmetric, and the exact timing of shifts between high- and slow-growth states appears to be difficult to predict with any confidence.

6. The chapter concludes that the economic forces that underpin the cyclical shifts between high- and low-growth regimes are at this point not well understood. Some researchers have conjectured that the persistence of cyclical expansions and recessions captured by regime change models may in part reflect "thick market" effects, i.e., economic activity is more efficient when it occurs in a concentrated fashion over time.[6] In the particular case of Switzerland, several structural characteristics of the economy including a highly elastic labor supply (related to worker migration flows), a large construction sector with long gestation periods, an elastic supply of loanable funds owing to a large and sophisticated financial sector, and the pronounced procyclical behavior of fiscal policy may all have contributed to the observed periods of persistently slow and fast GDP growth.

7. The remainder of this chapter is organized as follows: Section B reviews recent experience with forecasting and assessing the cyclical position of the Swiss economy. Section C outlines the statistical properties of the smooth-trend-plus-cycle and the regime change approaches to modeling business cycle fluctuations. Section D presents empirical evidence. Section E discusses recent theoretical ideas and economic forces that could underpin the workings of regime change models. And Section F concludes with some implications of the regime change model approach for forecasting and policy analysis.

B. Recent Business Cycle Fluctuations

8. Switzerland's recent business cycle experience has been characterized by abrupt and persistent shifts in real GDP growth. In particular, during the second half of the 1980s, real GDP growth expanded at a brisk rate (Figure I-1). This economic boom came to a sudden end in 1991, and was followed by a protracted six-year stagnation period in output. In 1997, the economy finally shifted back to a new phase of markedly stronger economic activity.

9. Macroeconomic forecasts of real GDP growth developments during this period were almost consistently off the mark, either underpredicting (during the boom period 1987–90) or

---

[6]See, e.g., Hall (1991).

overpredicting (during the stagnation period 1991–96) actual GDP growth (see Figure I-1).[7] The highly persistent pattern of forecast errors most likely reflects an assumption on the part of forecasters that real GDP growth would revert quickly back to the average growth path of the economy. The persistent sequence of forecast errors in the case of recent Swiss real GDP growth notwithstanding, systematic forecast errors around business cycle turning points appear to be a perennial feature of output growth forecasts. For example, in an assessment of the Fund's WEO forecasts, Artis (1997, pp. 22) concludes:

> "Systematic turning point error taking the form of an initial underestimate or an overestimate of output growth, followed by persistence in the same error ... is uncomfortably pervasive in the data."

10. Assessments of the cyclical position of the Swiss economy based on estimates of potential output growth and the cyclical output gap were recently also subject to uncommonly large margins of uncertainty (Figure I-2). Business cycle analysis based on the smooth-trend-plus-cycle model would suggest that a slowdown in actual GDP growth signals usually a transitory downturn of economic activity. However, postulating that potential output growth in Switzerland during the stagnation period 1991–96 amounted to 2 percent—in conformity with the experience of the second half of the 1980s and the Swiss National Bank's (SNB) medium-term base money target path for the five-year periods 1989–94 and 1994–99—would yield an implausibly large negative output gap of about 9 percent in 1998. On the other hand, allowing potential output growth to adjust flexibly to the actual GDP growth experience—as done by the Federal Finance Administration (FFA) in its Hodrick-Prescott filter-based estimates of the output gap used for the calculation of the structural budget balance—yields an output gap that was already somewhat positive in 1996. Finally, the staff's own assessment of potential GDP growth and output gap estimates—which are based on a pragmatic approach that allows some adjustment of potential to actual GDP growth during the 1990s—suggests that the output gap was about 1½ percent in 1998.[8]

C. Statistical Models

11. From a statistical point of view, output fluctuations can be modeled as the outcome of random impulses that are propagated through linear filters. In the case of a univariate model of output fluctuations, the first difference of the logarithm of real output, ($\Delta y(t)$), can be described by the general statistical model:

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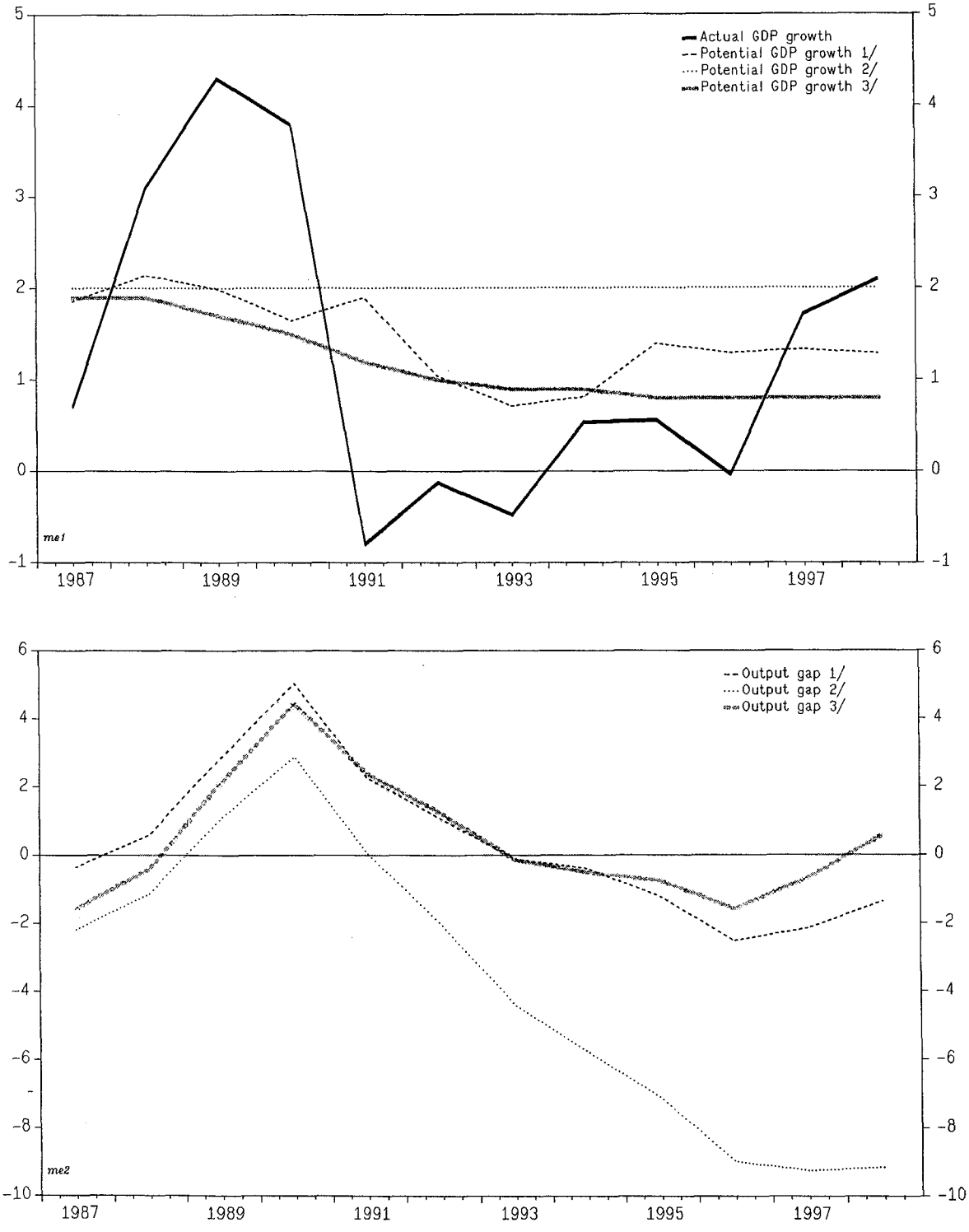
[7]Figure I-1 shows one-year ahead real GDP growth forecasts published in the December issues of the *OECD Economic Outlook*. The forecasting records of other official and private forecasters were similar to that of the OECD.

[8]Chapter I of the IMF Staff Country Report No. 97/18 for Switzerland describes the staff's approach to measuring potential output using a production function approach.

Figure I-2. Switzerland: Potential Output Growth and Output Gaps, 1987-98 (In percent)



Sources: IMF, World Economic Outlook database; and staff estimates.
1/ Staff estimates.
2/ 2 percent potential output growth; based on SNB's monetary framework.
3/ Hodrick-Prescott filter estimates of potential output growth and output gap.

(1) $\Delta y(t) = c(t) + \phi_1 \Delta y(t-1) + ... + \phi_p \Delta y(t-p) + \epsilon(t)$,

where c(t) denotes a time-dependent drift term, and $\epsilon(t)$ is a white-noise process with mean zero and constant variance.[9] It will be convenient to re-write (1) in terms of deviations of the output growth rate from an underlying mean growth rate, ($\mu(t)$):

(2) $\Delta y(t) = \mu(t) + \phi_1(\Delta y(t-1) - \mu(t)) + ... + \phi_p(\Delta y(t-p) - \mu(t)) + \epsilon(t)$,

where the underlying mean growth rate $\mu(t)$ is defined as:

(3) $\mu(t) = c(t)/(1 - \phi_1 - ... - \phi_p)$.

Two specific versions of this general statistical model can now be used to contrast the traditional smooth-trend-plus-cycle (STPC) and the regime change (RC) approaches to analyzing business cycle fluctuations.

Smooth-trend-plus-cycle (STPC) approach

12. The traditional approach assumes that the underlying mean output growth rate $\mu(t)$ (or potential output growth) evolves in a relatively smooth fashion and that actual output growth fluctuates around the smooth underlying growth path. Thus, in terms of the output level, this approach can be represented by the decomposition:

(4) $y(t) = yp(t) + GAP(t)$,

or equivalently in terms of output growth rates by:

(4)' $\Delta y(t) = \Delta yp(t) + \Delta GAP(t)$,

where $\Delta yp(t)$ ($=\mu(t)$) is potential output growth and $\Delta GAP(t)$ is the change in the cyclical output gap. Within the STPC approach, the key challenge is to identify the shocks that drive the unobserved potential and cyclical gap components, respectively. The literature has proposed a considerable number of procedures to accomplish this objective (see, e.g., Harvey (1989)). Depending on the identifying assumptions underlying the decomposition and the characteristics of the output series, the estimates of potential output growth resulting from different procedures can, however, vary substantially, as illustrated by the Swiss experience summarized in Figure I-2.

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[9]Provided that all the roots of the autoregressive (AR) polynomial ($1 - \phi_1 L - ... - \phi_p L^p$) lie outside the unit circle, the AR(p) process is stationary. In the following, this stationarity assumption will be assumed to hold. However, since the stochastic properties of the time-dependent drift term c(t) are left unrestricted, observed output growth could be nonstationary.

Regime change (RC) approach

13. By contrast to the STPC approach, regime change models of the business cycle allow the underlying mean output growth rate to shift between "slow-growth" and "fast-growth" regimes. The particular model pioneered by Hamilton (1989) assumes that output growth fluctuations can be described by an AR(p) process shifting between two states of the economy:[10]

$$(5) \qquad \Delta y(t) = \mu_{S(t)} + \phi_1(\Delta y(t-1) - \mu_{S(t-1))}) + \ldots + \phi_p(\Delta y(t-p) - \mu_{S(t-p)}) + \eta(t),$$

where S(t) is a discrete random variable that assumes the values 1 or 2 depending on whether the economy is in a slow-growth state (S(t)=1), characterized by a mean growth rate μ_1, or a fast-growth state (S(t)=2), characterized by a mean growth rate μ_2 ($\mu_2 > \mu_1$). The transition between the two growth states is presumed to be determined by a two-state Markov chain with conditional transition probabilities p_{ij}. For example, p_{11} is the probability that if the economy is in a slow-growth regime in time period t-1, it will again be in a slow-growth regime in time period t. The business cycle would be associated with the alternating shifts in S(t), while the $\eta(t)$ shocks (propagated through an AR(p) filter) would capture other fluctuations unrelated to the cycle.

14. By contrast to the STPC approach, the RC approach assumes that trend and cycle are fundamentally intertwined phenomena. Moreover, while the STPC approach assumes that expansions and recessions are essentially symmetric mirror images of each other, the RC approach allows for asymmetric durations of expansions and recessions.

D. Empirical Evidence

15. As a first pass at the evidence, Figure I-3 shows the frequency distribution of quarterly real GDP growth data for Switzerland, western Germany, and the United States during the period 1997–98.[11] Intuitively, output growth data that are generated by a RC model should cluster around two different growth rates, reflecting the slow- and fast-growth regimes of the economy. The STPC model would, by contrast, predict that output growth should cluster around the average output growth rate of the series. While this approach of examining GDP growth data is unlikely to be conclusive in view of the small sample sizes, the bi-modal appearance of the frequency plot for Swiss GDP growth suggests that at least one of the basic

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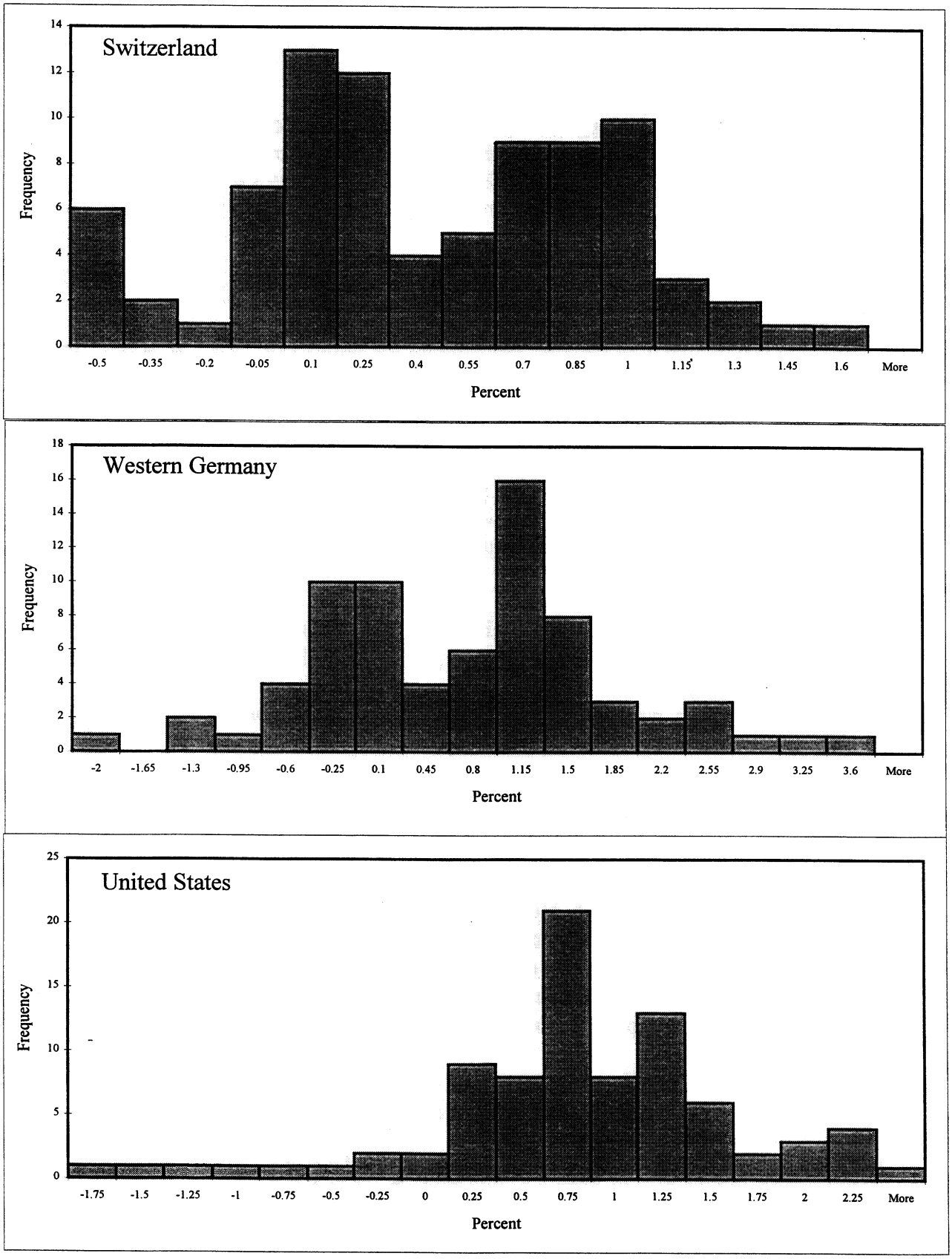
[10]Potter (1995) surveys several different types of regime change models for business cycles.

[11]The time range was restricted to 1977–98 because Swiss GDP growth data underwent a clear structural break in the mid-1970s as regards the level of the mean growth rate. It should also be noted that revised national income accounts data for Swiss real GDP are presently only available since 1980; the GDP growth data before 1980 were spliced with the revised data.

Figure I-3. Switzerland: Frequency Distribution for Real GDP Growth, 1977.Q2-1998.Q2
(Quarterly growth rates; in percent)



characteristics of regime change models—that the economy switches between two basic growth states—is consistent with the properties of Swiss output data. Similarly, GDP growth data for western Germany appear also to be well described by a bi-modal frequency distribution. Interestingly, there is hardly a trace of bimodality in U.S. GDP growth data, at least for the particular time period chosen for this comparison, although the RC model was originally developed to model business cycle fluctuations in U.S. data.[12]

16. More formal statistical evidence is provided by estimation results for the RC model applied to quarterly Swiss GDP data for the period 1977–98:[13]

$$(6)\quad \Delta y(t) = \mu_{S(t)} + \underset{(0.16)}{0.69}(\Delta y(t-1) - \mu_{S(t-1)}) - \underset{(0.21)}{0.27}(\Delta y(t-2) - \mu_{S(t-2)}) -$$

$$\underset{(0.10)}{0.10}(\Delta y(t-3) - \mu_{S(t-3)}) - \underset{(0.21)}{0.41}(\Delta y(t-4) - \mu_{S(t-4)})$$

$$\underset{(0.37)}{\mu_1 = 0.40}, \quad \underset{(0.32)}{\mu_2 = 2.33}, \quad \underset{(0.05)}{p_{11} = 0.90}, \quad \underset{(0.08)}{p_{22} = 0.85}, \text{ and } \sigma_\epsilon = 0.76.$$

This RC model appears to fit Swiss data well. According to the parameter estimates for μ_1 and μ_2, the economy shifts between a slow-growth regime with average growth of 0.40 percent and a fast-growth state with average growth of 2.3 percent, broadly in line with the frequency distribution evidence shown in Figure I-3. Figure I-4 shows the identified periods of slow growth (recessions) and the unconditional probability of being in a slow-growth state. The estimated probabilities appear to reflect well the recession and boom phases often associated with the cyclical swings of the Swiss economy and also highlight the asymmetric durations of expansions and booms underlying Switzerland's recent business cycle experience.

E. Economic Forces Driving Regime Change Models

17. Descriptive business cycle research in the spirit of Burns and Mitchell (1946) has since long emphasized the division of business cycles into separate regimes or phases. This analysis treated expansions or booms (fast-growth regimes) separately from contractions or recessions (slow-growth regimes). Perhaps reflecting statistical convenience and/or computational constraints, most formal econometric work, however, has until recently focussed on linear one-state models of the business cycle.

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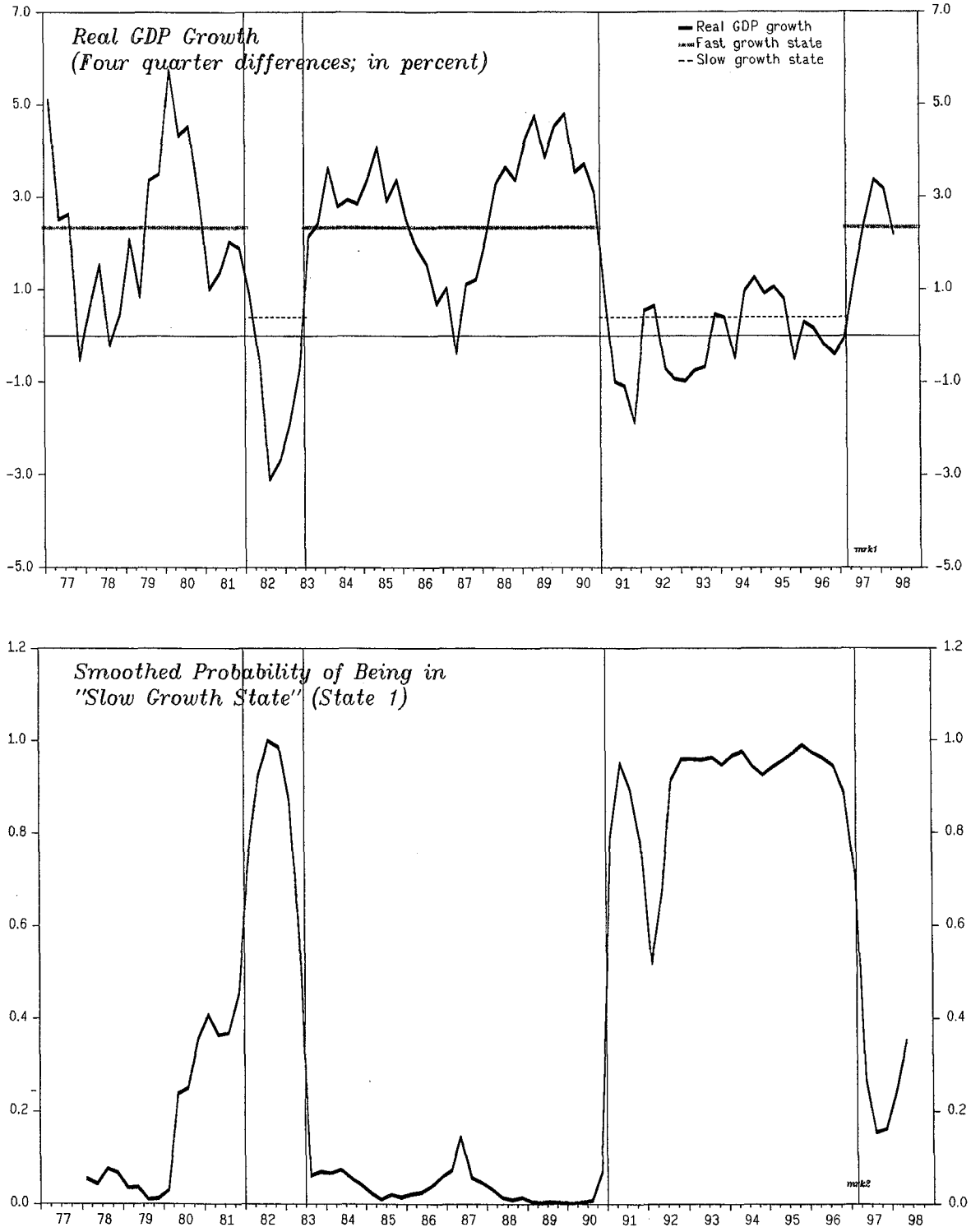
[12]The more recent difficulties of macroeconomic forecasts to track the strength of future U.S. real GDP growth appear, however, to be well accounted for by an RC model.

[13]The routine for estimating the regime change model is written in the GAUSS programming language and was obtained from http://weber.u.washington.edu/~ezivot/econ512.

Figure I-4. Switzerland: A Regime Change Model of Output Fluctuations, 1977.Q2-1998.Q2



Source: IMF, World Economic Outlook; and staff estimates.

18. At this point, the fundamental economic forces that could give rise to cyclical regime changes are not well understood. Recent theoretical research has highlighted that economic activity tends to bunch at certain time frequencies, most conspicuously at daily (day-night), weekly (five-day workweek), and seasonal time frequencies. At these time frequencies, economic activity tends to shift between high- and low-activity regimes. This research has pointed out that the observed bunching of economic activity at these time frequencies is likely to reflect thick-market effects, i.e. economic activity is more efficient when it takes place in a concentrated fashion. Following this lead, Hall (1991) has conjectured that cyclical recessions and booms may in part also reflect persistent periods of slow and high activity related to thick-market effects.[14] From this perspective, a recession would represent a period where many producers have an incentive to be relatively inactive as a result of the higher costs of producing related to lower activity of the producer's customers and suppliers. On the other hand, a boom would occur if some shock energizes many producers at the same time, and the boom becomes self-sustaining because of spillovers and complementarity effects across producers.

19. In the particular case of Switzerland, persistent shifts between slow- and high-growth states at the business cycle frequencies could also reflect factors that are more specific to Switzerland:

- First, the supply of labor in Switzerland is relatively elastic, partly reflecting worker migration flows but also large fluctuations in labor force participation rates.[15] In this setting, economic booms may have more staying power because output and investment are not as constrained by the available labor force.

- Second, the influx of foreign workers may mobilize additional demand for housing, construction projects that would typically have a relatively long gestation period. There may also be strong effects on the demand for durable consumption goods. On the other hand, this process may work in reverse and prolong recessions after the end of a boom period as the influx of workers into the labor force stops and/or foreign workers emigrate.

- Third, the supply of loanable funds in Switzerland may be particularly elastic during boom periods, reflecting Switzerland's high savings rate but also the large and sophisticated financial sector. It is less clear why this factor would help to prolong recessions, although there may be a "hangover effect" on banks' lending policies after prolonged booms.

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[14]A formal model of thick-market externalities is developed by Diamond (1982). In his model, the costs of doing business are lower at times of higher aggregate activity.

[15]See OECD (1996).

- Fourth, the pronounced procyclical behavior of fiscal policies in Switzerland may have added to the persistence of booms and recessions.[16]

F. Implications for Forecasting and Policy Analysis

20. As regards forecasting, regime change models can account for the widely observed persistence of forecast errors after business cycle turning points. As noted in the introduction, a tendency to systematically underpredict (during the 1980s boom) or overpredict (during the 1991–96 recession) has been as conspicuous feature of real GDP growth forecasts for the Swiss economy. Indeed, Hamilton's (1989) pioneering work on regime change models saw significant improvements in forecasting accuracy as one of the main promises of RC models.

21. It is noteworthy, however, that to the extent that forecasters dislike large forecast revisions, i.e. their loss function depends not only on the size of the forecast error per se but also on the size of the forecast revision per time unit, an RC model may be considered a forecasting tool that implies "excessive" forecast revisions.

22. An RC model would suggest that predicting medium-term output growth (e.g., two-three years ahead) is subject to considerable uncertainties, as the timing of regime shifts may be difficult to predict.[17] By contrast, the STPC approach suggests that medium-term output forecasts can be based on the convenient rule-of-thumb that future GDP growth is equal to potential output growth plus an adjustment required to close the output gap over the medium term (usually four-five years). By the same token, to the extent that medium-term inflation forecasts (as constructed, for example, in the context of inflation targeting frameworks) also depend on the projected cyclical state of the economy, these forecasts would likely suffer from similar limitations with regard to forecasting accuracy.

23. Finally, under a regime change model, the size of the automatic response of the fiscal system (automatic fiscal stabilizers) to the state of the economy would depend on the duration of the slow- and fast-growth regime. This would be so because the real growth rates of most public expenditures, apart from unemployment benefits, would likely adjust automatically to a protracted regime shift in the real output growth rate. For example, during a prolonged recession, the real growth rate of public wages would eventually reflect the depressed state of the economy; the same would likely apply for the cost of health care; similarly, the indexation mechanisms of PAYG pension systems would reflect the state of the economy, in particular in

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[16]Chapter II of the IMF Staff Country Report No. 98/43 provides an analysis of the cyclical behavior of fiscal policy at different government levels in Switzerland.

[17]Some recent literature has, however, concluded that business cycles exhibit duration dependence (see Diebold and Rudebusch (1996)). This means in the context of an RC model that, for example, the probability that a slow-growth regime will come to an end increases with the number of time periods spent in the slow-growth regime.

the case of (lagged) indexation to wages. The conventional calculation of the size of automatic fiscal stabilizers, however, assumes that structural spending expands at the rate of potential output independently of the duration of booms and recessions.

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II. Switzerland's Monetary Policy Framework[18]

A. Introduction and Summary

24. Since the breakdown in the 1970s of the Bretton Woods system of fixed exchange rates, monetary aggregates have played a key role in guiding Swiss monetary policy. In all but one of the last 25 years, the Swiss National Bank (SNB) has established a monetary target as the intermediate objective for monetary policy. Moreover, during this period, the Swiss monetary authorities have remained faithful to narrow monetary aggregates (M1 until 1978 and M0 since 1980) as intermediate targets, and it is only very recently that the SNB has increasingly focused on M3.

25. The SNB has, however, been pragmatic in applying its monetary targeting framework. Although the monetary targets were largely met during relatively stable periods, the SNB has allowed monetary growth to deviate considerably from the target path when other concerns were considered more important. In particular, the exchange rate has at times played a decisive role for the stance of monetary policy. This reflects the relative openness of the Swiss economy and the large international financial sector. In the late 1970s, for example, significant upward pressures on the Swiss franc led to a temporary switch in the SNB's strategy toward setting an explicit floor on the Sw F/DM exchange rate. Moreover, the SNB has often accommodated large unexpected shifts in money demand, without attempting to bring the stock of money back to its medium-term target level.

26. Swiss monetary policy has been successful in delivering a low level of inflation over the past 25 years. Indeed, Switzerland's average inflation performance is second only to that of Germany among the advanced industrial countries. Moreover, the variability of Swiss real GDP growth has not been larger than the average in comparable countries (Figure II-1). However, the relative performance of Swiss monetary policy does seem to have deteriorated since the second half of the 1980s, reflecting to a large extent increasing volatility of money demand triggered by structural changes in the financial system.

27. The future challenges to Swiss monetary policies are many. First and foremost, continued financial innovation and potential currency substitution are likely to influence money demand in an unpredictable fashion. Due to the more endogenous nature of broader monetary aggregates and their complicated relationship to interest rate developments, it is not certain that the increased use of M3 as an alternative indicator will prove an effective alternative to a monetary targeting framework based on base money. Furthermore, in the early years of the euro, portfolio preferences and the perception of risk could change rapidly. In particular, the Swiss franc may be affected by perceptions of strength or weakness of the euro or any other uncertainties regarding the economic or political prospects in the euro area. Switzerland may also continue to be subject to "safe haven" capital flows in the context of

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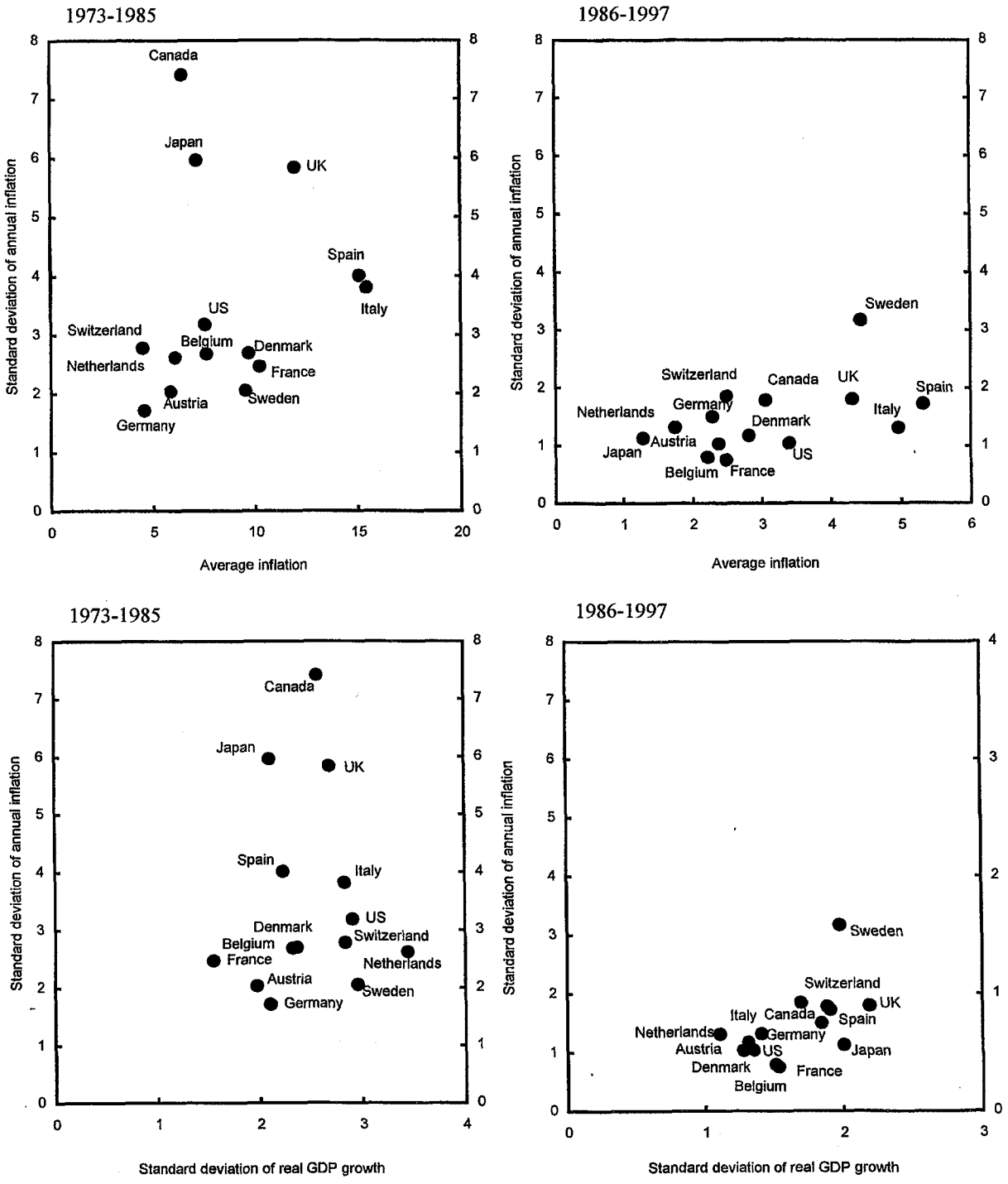
[18]Prepared by Ketil Hviding.

Figure II-1. Switzerland: Monetary Policy Performance in Industrial Countries, 1973-97



Sources: IMF, World Economic Outlook database and staff calculations.

global financial tensions. The concluding section considers the pros and cons of alternative strategies in response to exchange rate pressures or persistent instability of money demand.

B. The SNB's Monetary Framework[19]

28. The Swiss monetary policy framework has been described as "pragmatic monetarism,"[20] "disciplined discretion,"[21] or "a monetary policy rule with an escape clause."[22] All of these expressions try to capture the mixed nature of the Swiss monetary policy framework. On the one hand, monetary targets have played a central role, both as a framework for interpreting the macroeconomic stance of monetary policy and as a tool used to communicate monetary policy intentions to the public. On the other hand, the annual or medium-term target has not been regarded as an ironclad law; the SNB has on occasion allowed monetary growth to deviate by a large amount from the target path, either accommodating a shift in the demand for money or attempting to counteract deflationary pressures from a sharp appreciation of the exchange rate.

29. As already noted, in Switzerland a key limitation of following a strict monetary targeting framework is related to the disturbing effects of large exchange rate movements. Owing to the perception of Switzerland as a safe haven, and to its relatively small size, international portfolio adjustments can result in significant pressures on the exchange rate stemming from capital flows. Moreover, given Switzerland's relative openness to international trade—the share of exports in goods and services in GDP is about 40 percent—a sharp appreciation of the currency can have significantly negative, and potentially long-lasting, effects on the economy. As a consequence, there have been substantial pressures to limit such large exchange rate movements by using monetary policy.

30. The use of a monetary growth target as a key element in the SNB's monetary policy strategy dates back to the early 1970s, when the collapse of the Bretton Woods system of fixed exchange rates forced the Swiss authorities to float the Swiss franc. Inspired by the monetarist thinking of the time, the SNB announced at end-1974 a target growth rate for M1 for the following year (Table II-1). In order to achieve the medium-term inflation target of 1 percent annual inflation, the monetary overhang inherited from the fixed exchange rate period was scheduled to be lowered gradually by reducing monetary growth from 6 percent in 1976 to 2 percent per annum in the medium term. In the first three years of operation, the growth targets were missed by only small margins, and the inflation rate dropped quickly,

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[19]This section is to a large extent based on Rich (1985,1997) and Genberg and Kohli (1997).

[20]Rich and Béguelin (1985).

[21]Laubach and Posen (1997).

[22]Rich (1997).

Table II-1. Switzerland: Targeted and Realized Monetary Growth, 1975-98

(Annual percent change)

	Target variable 1/	Target (A)	Realized (B)	Deviation
Annual targets				
1975	M1	6	4.4 2/	-1.6
1976	M1	6	7.7 2/	1.7
1977	M1	5	5.5 2/	0.5
1978	M1	5	16.2 2/	11.2
1979	-	-	8.5 3/	-
1980	M0	4	-0.6 4/	-4.6
1981	M0	4	-0.5 2/	-4.5
1982	M0	3	2.6 2/	-0.4
1983	M0	3	3.6 2/	0.6
1984	M0	3	2.5 2/	-0.5
1985	M0	3	2.2 2/	-0.8
1986	M0	2	2.0 2/	0.0
1987	M0	2	2.9 2/	0.9
1988	M0	3	-3.9 2/	-6.9
1989	M0	2	-1.9 5/	-3.9
1990	M0	2	-2.6 6/	-4.6
Medium-term targets				
1990-1994	M0	1	0.2 7/	-0.8
1990			-2.6 6/	-3.6
1991			1.4 6/	0.4
1992			-1.1 6/	-2.1
1993			2.8 6/	1.8
1994			0.6 6/	-0.4
1995-1999	M0	1	3.7 8/	2.7
1995			1.4 6/	0.4
1996			5.0 6/	4.0
1997			3.1 6/	2.1
1998			5.2 6/	4.2

Sources: Rich (1997); SNB; and staff estimates.

1/ M1 Currency, and demand deposits with banks and the postal giro system, held by the nonbank public. For M1 only end-of-month data are available.

M0 Monetary base, defined as the sum of banks' deposits with the SNB and the aggregate bank no circulation. Until the end of 1988, adjusted for the end-of-month bulge in SNB credit to banks; from 1989 onwards, seasonally adjusted. Data represent monthly averages of daily figures.

2/ Arithmetic mean of monthly year-on-year growth rates.

3/ Arithmetic mean of monthly year-on-year growth of seasonably adjusted M1.

4/ Arithmetic mean of annualized monthly growth rates over November 1979 level.

5/ Arithmetic mean of annualized monthly growth rates over level in the fourth quarter of the preceding year.

6/ Growth rate in the fourth quarter over the level in the fourth quarter of the preceding year.

7/ Average of the five annual growth rates shown below.

8/ Average of the four annual growth rates shown below.

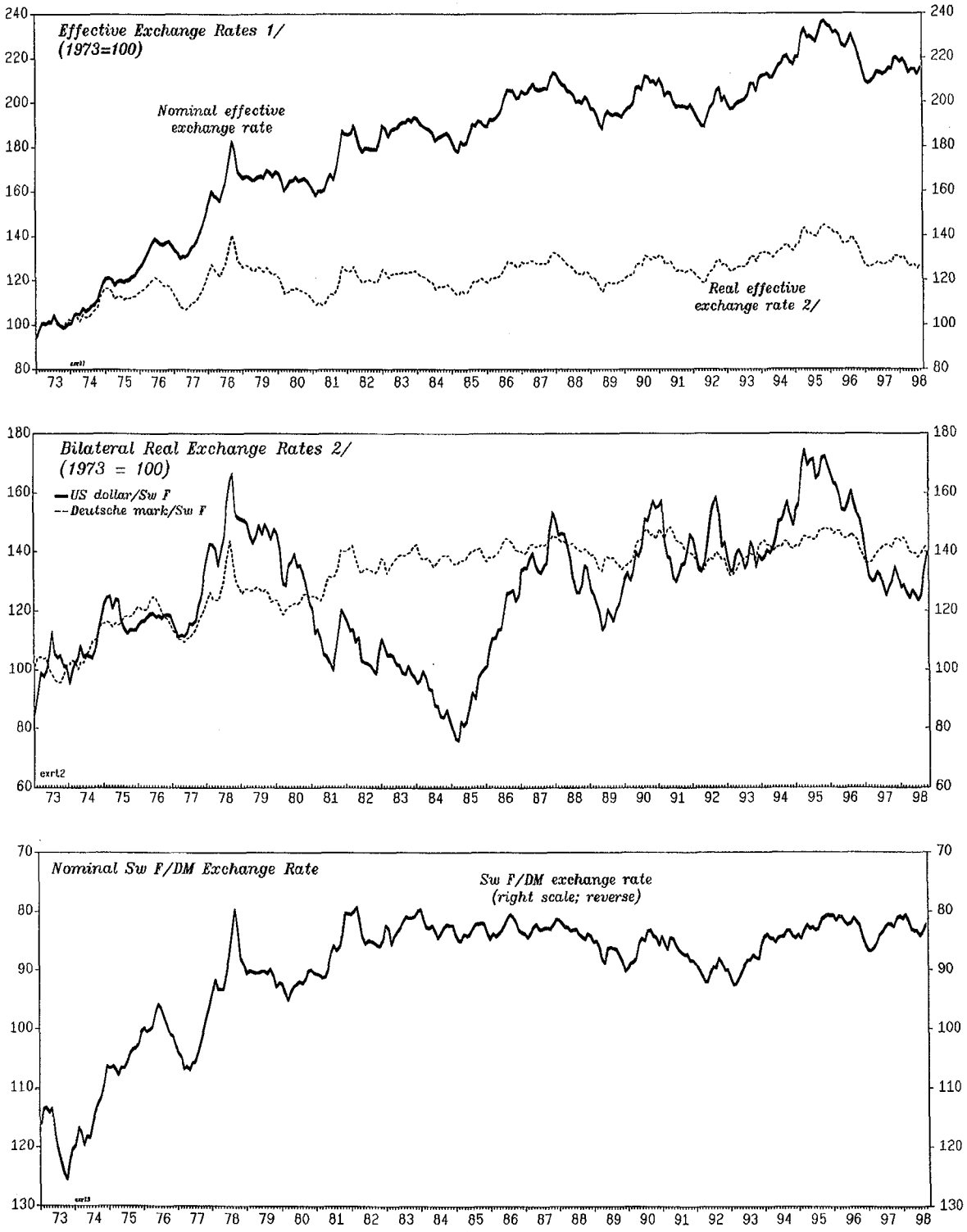
reaching about 1 percent in 1976. Thus, not only in terms of keeping monetary targets but also in terms of the ultimate objective of monetary policy, the early years of the monetary targeting framework were considered a great success.

31. In the late 1970s, pressures to abandon the monetary targeting framework became very strong after a spectacular appreciation of the Swiss franc; in trade-weighted terms the nominal effective appreciation amounted to some 80 percent (Figure II-2). To a certain extent the effect of this appreciation on competitiveness was partly offset by the relatively better Swiss inflation performance, but even in real terms (corrected for relative inflation differences) the trade-weighted value of the Swiss franc appreciated by about 40 percent, half of which took place in the latter half of 1977 and 1978. This surge in the exchange rate became a primary policy concern. In the fall of 1978, the SNB decided to suspend its monetary target strategy and introduced a temporary floor on the exchange rate's value against the deutsche mark at 0.80 Sw F/DM. Although the exchange rate target was underpinned by temporary capital controls, the SNB's interventions led to rapid monetary growth, and the target for 1978 was overshot by a large margin (see Table II-1 and Figure II-3).

32. As a result of the sharp monetary expansion and subsequent fears about its inflationary consequences, monetary targets were reintroduced in place of the exchange rate floor in late 1979. The targeted monetary aggregate was changed from M1 to the monetary base (M0), as this was believed to be more directly under the SNB's control and less influenced by relative interest rate developments. The monetary base was also much closer than M1 to the daily operations of the SNB, since M1 includes sight deposits in commercial banks, which have to be projected on the basis of information on the stock of base money, interest rates, and domestic demand. By contrast, the size of the monetary base can be controlled more directly by the central bank. As in the early years of monetary targeting, the annual growth targets stipulated a gradual reduction of annual monetary growth from 4 percent in 1980 to 2 percent from 1986 and onward. In the event, the target was significantly undershot in 1980 and 1981; in the following six years, by contrast, the deviations from the targeted growth path were only small, coupled with a gradual reduction in inflation and an expanding economy. At the same time, both the real exchange rate and the bilateral exchange rate vis-à-vis the deutsche mark were stable, thus allowing monetary policy to be conducted without an urgent need to counteract pressures on the exchange rate.

33. This second "honeymoon" of the Swiss monetary targeting framework ended abruptly in 1988 with the introduction of the Swiss Interbank Clearing (SIC) system, a new electronic interbank payment system based on "real-time gross settlement." The introduction of this system—coupled with a modification of bank cash reserve requirements—led to a sharp reduction in banks' demand for base money. The SNB was well aware of the money demand shift, but obtaining even an approximate estimate of the shift proved difficult to produce ex ante. Thus, other indicators such as the resulting effects on interest rates had to be followed in order to gauge the magnitude of the demand shift, potentially delaying the SNB's response.

Figure II-2. Switzerland: Exchange Rates, 1973-98

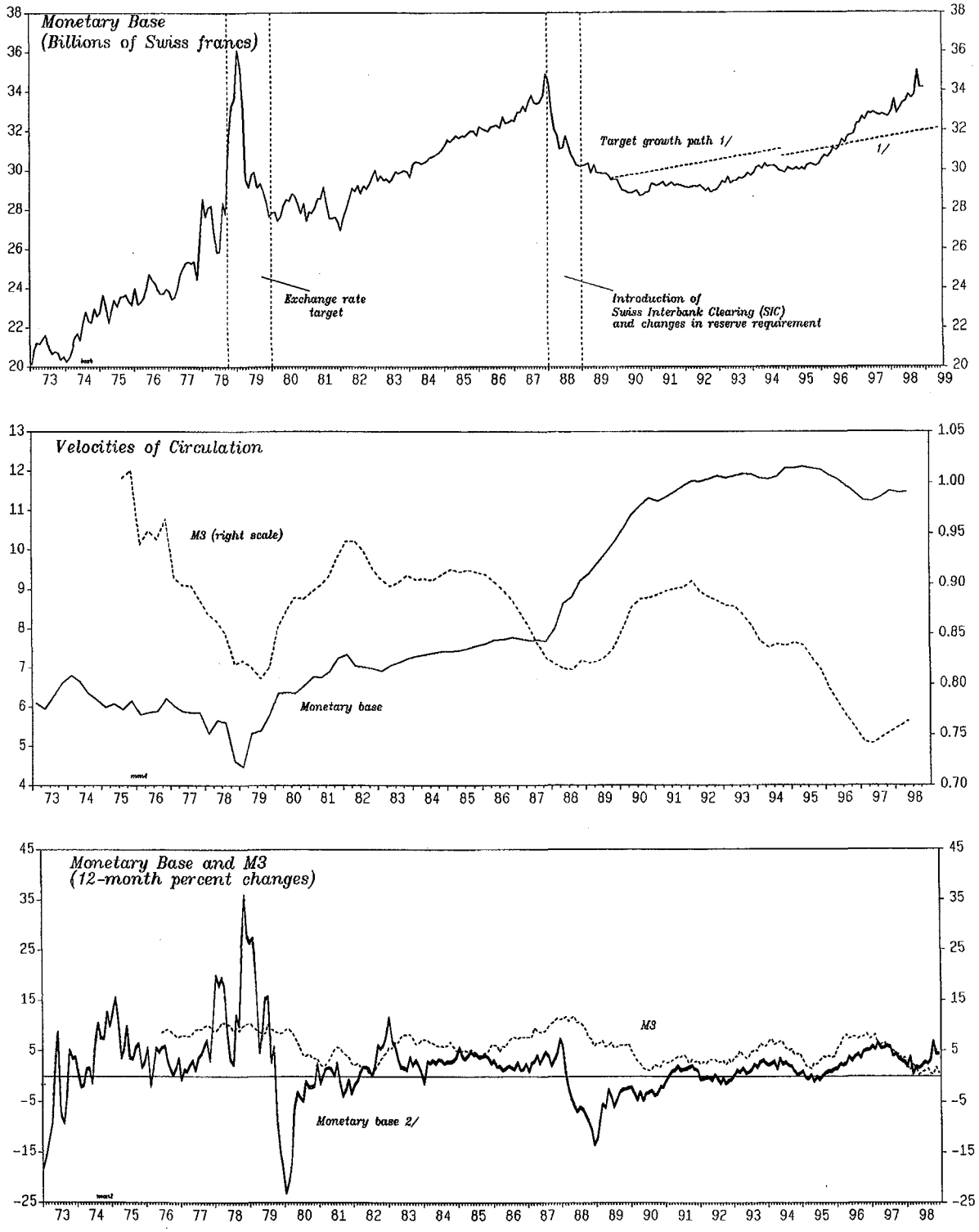


Sources: Swiss Institute for Business Cycle Research, data tape; IMF International Financial Statistics database; OECD Analytical Data Bank.

1/ All major trading partners, except Korea, Taiwan Province of China, and Hong Kong.

2/ Based on relative consumer prices.

Figure II-3. Switzerland: Monetary Aggregates



Sources: IMF, World Economic Outlook database; Swiss National Bank, Monthly Bulletin.

1/ One percent per annum from 1989, fourth quarter, and 1994, fourth quarter, respectively.

2/ Seasonally adjusted; in billions of Swiss francs.

34. This episode was followed by a period of rapid inflation. Views diverge, however, on whether this inflationary spurt was a result of the problems with measuring money demand, or whether the economic boom in the late 1980s was to blame. The role of monetary technicalities should not be overstated: inflationary pressures had been building up for some time before the demand shift, and it was commonly expected that the world economy would turn into recession in 1988. In any case, the introduction of the new clearing system came at a particularly inopportune moment in the business cycle.

35. Since the early 1990s, the demand for base money has shown considerable instability. Partly as a result of the large demand shift in 1988, the SNB switched in 1989 to five-year growth target paths for the monetary base, stressing that it would not attempt to force the monetary base to respect the target path every year. Reflecting increased financial innovations, the medium-term growth target was reduced to 1 percent (from 2 percent previously): the trend increase in velocity was assumed to increase by 2 percent per annum together with a medium-term inflation target of 1 percent and potential real GDP growth of 2 percent.

36. These medium-term target paths have functioned more as yardsticks than strict target paths: deviations from the target path have then been explained in terms of demand shifts or, alternatively, as an indication of monetary policy intentions. Medium-term target paths are quite demanding, however, since there is no annual base drift as in the case of annual growth targets; one year's overshooting should in principle be compensated by slower monetary growth in the subsequent years.

37. From the introduction of the medium-term target paths in 1988, the SNB has been faced with the need to explain large deviations from the target path. In the first 5 years, the monetary base undershot the target path substantially, reflecting, inter alia, an initial underestimation of the shift in money demand in 1988. Thus after an initial drop in the monetary base, the SNB constrained monetary growth to follow the medium-term growth path in parallel without attempting to return to the medium-term path. With the shift to monetary relaxation in 1996, the situation changed dramatically: both the level of the monetary base and its growth rate have since then significantly overshot the medium-term target. Several special factors, however, appear to explain a large share of the rapid growth in base money: in particular, the increased demand for high-denomination bank notes, the introduction of a repo market, and the merger of the two largest banks all appear to have led to unexpected increases in the demand for base money. At the same time, although it appears possible to trace the large shifts in the demand for base money to specific events, there is a large degree of uncertainty attached to both the durability and the size of these demand shifts.

38. As a result of these large and frequent demand shifts, other indicators of monetary conditions have gained increased importance in the implementation of Swiss monetary policy. In particular, in the December 1997 announcement of the monetary policy intentions for 1998, the SNB signaled an increased reliance on M3 as an alternative monetary indicator, indicating that an annual expansion of M3 in the range of 4 percent was considered to be consistent with medium-term price stability. Research at the SNB suggests that the demand for M3 has been

relatively stable: for example, Peytrignet and Stahel (1998) show that M3 is cointegrated with the level of consumer prices, real GDP, and the return on government bonds and that there were no structural breaks during 1977–96. Moreover, the SNB estimates that the mean time lag between an increase in growth of M3 and inflation is about 39 months.

39. It is inevitable, however, that in a situation of large instability in money demand, price indicators—such as short-term and long-term interest rates—acquire a greater importance in the operational implementation of monetary policy[23] (Figure II-4). The introduction of a broad monetary aggregate is unlikely to alter the trend to the use of a broader set of indicators. Although broad monetary aggregates appear to exhibit a larger degree of long-term stability than base money, broader monetary aggregates are highly sensitive to relative interest developments (the difference between the "own rate" and other interest rates) and to financial innovation. As conventionally defined, M3, for example, does not include highly liquid money market funds or other mutual funds that may be close substitutes to time deposits. In this context, it is noticeable that the recent unexpectedly slow growth of M3 (only 1 percent in 1988) has been attributed by some observers to the increased prevalence of mutual funds in Switzerland, less than one year after M3 was introduced by the SNB as "supplementary indicator".

C. Monetary Policy Feedback Rules

40. It can be concluded from the above discussion that Swiss monetary policy may not be easily characterized by a simple monetary growth rule, nor can the SNB's escape clauses be easily identified in *ex ante* terms. The monetary growth target has been frequently over or undershot by a large margin. While the SNB has carefully explained such deviations *ex post*, in terms of demand shifts or discretionary monetary policy, the exact conditions that would trigger the use of discretionary monetary policy have not been spelled out in any detail. In the case of large exchange rate movements, reference has been made to exchange rate developments that "threaten to seriously damage economic growth," without specifying the size or level of the qualifying exchange rate movements, or by how much the SNB would respond. A formal investigation confirms these impressions and indicates that the SNB's observed behavior as implied by an estimated monetary policy "reaction function" was not significantly different from that of other central banks with less formal commitments to monetary targets.

41. Based on casual observation of the behavior of the U.S. Federal Reserve System, a simple feedback rule was proposed by Taylor (1993). Taylor proposed this rule not so much as a rigid prescription for policy formulation but as a benchmark rule to be used as a starting point for monetary policy decisions, which in practice would take account of a wide set of indicators and also make allowance for "special factors." Later researchers have shown that in

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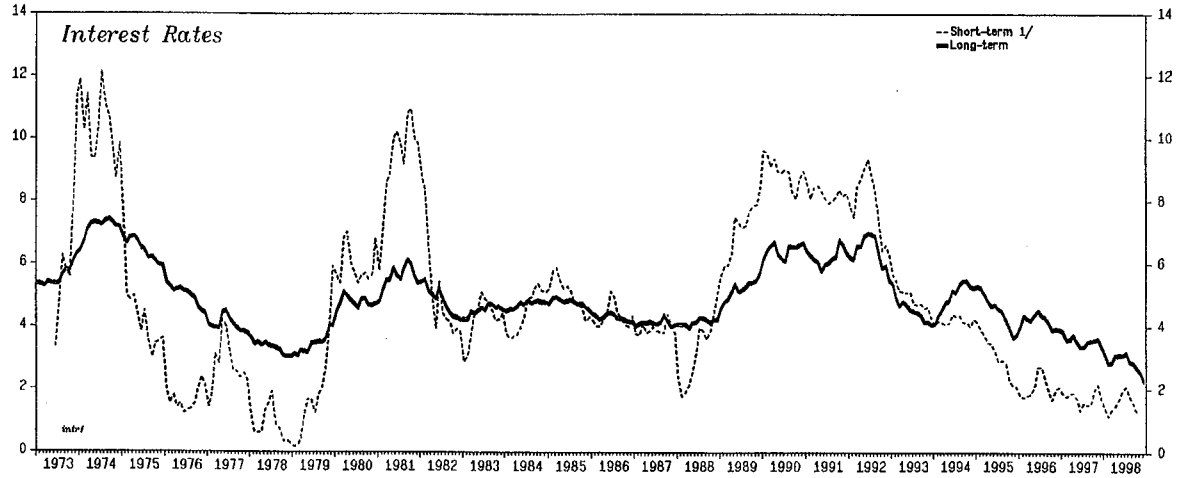
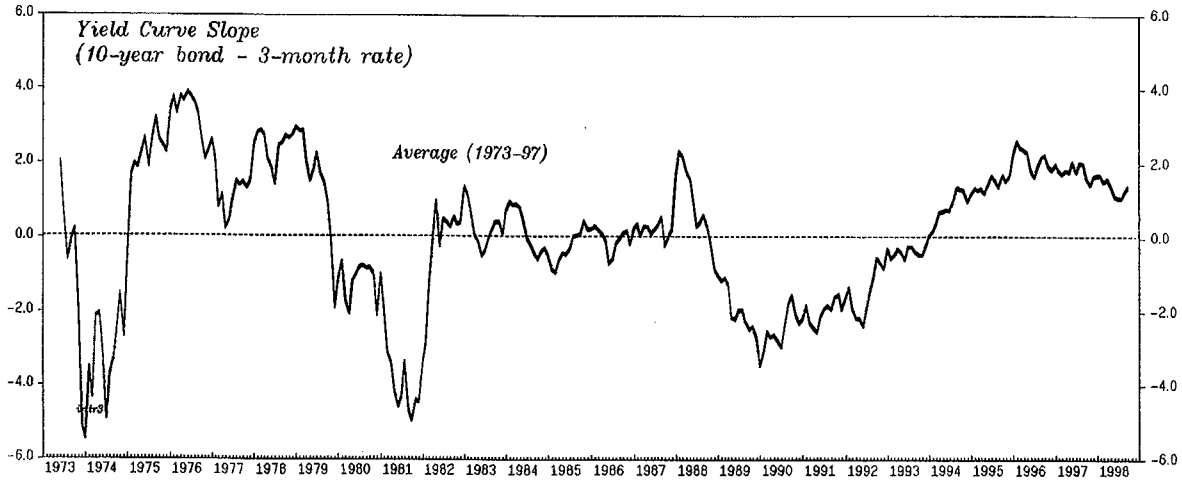
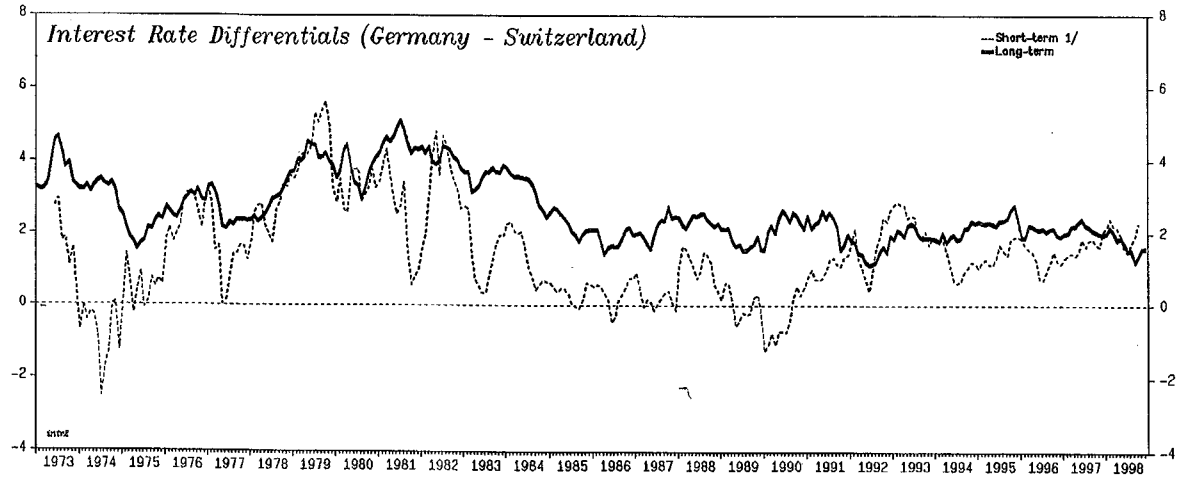
[23]See Heller (1997).

Figure II-4. Switzerland: Interest Rates, 1973-98







Sources: IMF, Surveillance database; IMF, International Financial Statistics database.
1/ Three-month euro rate.

a simple closed economy model, variants of the Taylor rule would be optimal by minimizing the weighted average of inflation and output variability (Ball, 1997 and Svensson, 1997).

42. Figure II-5 depicts the level of the nominal short-term interest rate as predicted by this rule during 1973–98. The rule simply sets the nominal short-term interest rate r_t as a function of inflation dp_t, half the output gap GAP_t, and half the deviation of inflation from targeted inflation Π_t (the "inflation gap"), and a constant term equal to the steady state real interest rate *(rr*)*:

(1) $r_t = dp_t + 0.5GAP_t + 0.5\Pi_t + rr^*$.

In Figure II-5, the steady state real interest rate was set at 1 percent (compared with 2 percent in Taylor, 1993, who applied the model to the United States).

43. Comparing the short-term interest rate as predicted by the simple Taylor rule and the actual observed interest rate produces a reasonable fit (Figure II-5). At first sight, this is particularly noteworthy since the SNB does not use the interest rate as the primary operational target in the same way as, for example, the U.S. Federal Reserve System. Furthermore, the SNB has explicitly stated that its ultimate objective is price stability and that stabilizing output is not a primary policy objective.

44. A closer look at the relationship between the Taylor rule and observed short-term interest rates, however, reveals some important differences. In both of the high interest and high inflation periods (early and late 1980s), the Taylor rule would have predicted a sharper increase in the interest rate than actually took place. Furthermore, short-term interest rates would have decreased more slowly in the early 1970s, increased earlier in the late 1970s, and remained much lower since 1974. These differences cannot be easily ignored since they have tended to persist in time (i.e., they are "serially correlated") and have been as large as 5 percent.

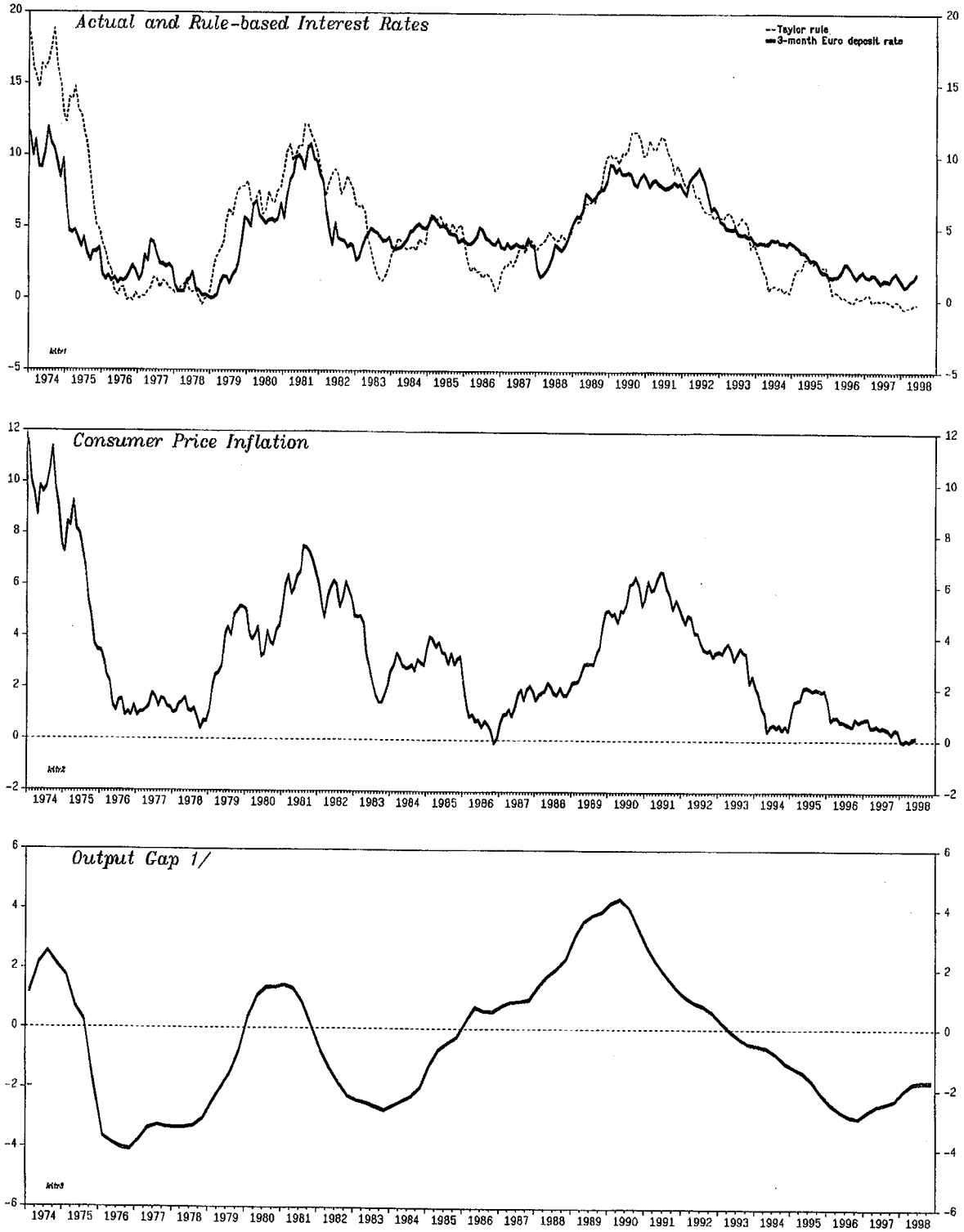
45. In order to examine the circumstances under which the simple Taylor rule is consistent with a strict monetary targeting framework, it is useful to determine whether a variant of the Taylor rule, under certain conditions, can be derived from a strict monetary targeting rule. Assuming that there exists a stable money demand function and expressing the demand for the natural logarithm of real base money as a linear function of real output and short-term interest rates, expressed as deviations from their trend levels:

(2) $(m_t - m_t^*) - (p_t - p_t^*) = \beta(y_t - y_t^*) + \gamma(r_t - dp_t) - \gamma(r_t^* - dp_t)$.

In the case of a strict linear monetary growth rule, $(m_t - m_{t*}) = 0$ and the equation becomes:

(3) $r_t = r_t^* - \beta/\gamma(y_t - y_{t*}) - 1/\gamma(p_t - p_{t*})$

Figure II-5. Switzerland: Short-Term Interest Rates and the Simple Taylor Rule, 1974-98 (In percent)



Sources: SNB, Central Statistical Office and staff estimates.
1/ Percent difference between actual real GDP and potential GDP.

According to equation (3), the short-term interest rate can be expressed as a function of the steady state nominal interest rate, the deviation of prices from its trend level (a price level target), and the output gap, with all variables being contemporaneous. Therefore, the monetary targeting rule differs from the Taylor rule by the fact that—in its strictest interpretation—it implies that the central bank responds to deviations of prices from the long-term price *level*, as opposed to its *change* (the level of the inflation rate).

46. The observed reaction function of a central bank following a monetary targeting approach may differ from (3) in several respects, however. First, shifts in the money demand function would warrant a more flexible approach to monetary targeting, using other indicators such as interest rates and the exchange rate to determine the appropriate level of interest rates. Second, the monetary authorities may correct for the effects of tax changes, direct exchange rate related price increases, and supply-side shocks. Third, pragmatic monetary targeting would also permit—in the case of large over or undershooting of monetary target—some "base drift" in the monetary target; not allowing for occasional base drifts would imply accepting periods of significant deflation possibly combined with a sharp economic slump in excess of what would be necessary to bring inflation—i.e., the rate of change of the price level—down to zero.

47. In order to investigate empirically whether the Swiss monetary policy framework can be described as following a monetary policy targeting rule or a Taylor rule representation (3) was reformulated by using the fact that the current price level p_t can be expressed as a function of last period's price level p_{t-1} and the price change from last period dp_t:

(4) $p_t = dp_t + p_{t-1}$.

Combining (3) and (4), and noting that $\Pi_t = (dp_t - dp_t^*)$ and $GAP_t = (y_t - y_t^*)$ we obtain:

(5) $r_t = r_t^* - \beta/\gamma GAP_t - 1/\gamma\ (p_{t-1} - p_{t-1}^*) - 1/\gamma\ \Pi_t$.

Thus, assuming that r_t^* is constant over the estimation period, we can estimate the following econometric model:

(6) $r_t = \alpha + \beta_1\ GAP_t + \beta_2\ (p_{t-4} - p_{t-4}^*) + \beta_3\ \Pi_t + \varepsilon_t$ and $\varepsilon_t \sim iid(0,\sigma_\varepsilon)$.

From (5) it follows that $\beta_2 = \beta_3$ in the case of a strict monetary targeting rule. Thus, the monetary targeting rule can be tested against a Taylor rule specification by testing whether such a restriction can be rejected. The price level target p_t^* was assumed to grow by 1 percent per year. The model was estimated using quarterly data over the period 1975Q1–1998Q2 by ordinary least squares (OLS). Since inflation was measured as the average of quarterly year-on-year growth rates, the price level was entered in the regression lagged one year (four periods). The three-month euro rate for Swiss franc deposits (conventionally annualized) was entered as the dependent variable.

48. The regression results can be found in Table II-2. In total, three different versions of the model were estimated; while the two first models A0 and A1 use the headline consumer price index, model A2 uses an estimate of underlying or "core" inflation produced by the SNB. The "core" price consumer price index differs from the headline index by excluding "extreme components" (defined as the 15 percent largest price increases and 15 percent largest price reductions) from the index and making an ad hoc correction for the 1995 VAT increase. Models A1 and A2 differs from the first model A0 by the inclusion of the lagged price (level) gap (p_{t-4}- p_{t-4}^*). A dummy was introduced to correct for the large shift in velocity in 1988 with the introduction of the Swiss Interbank Clearing system (SIC).

49. Model A0 is the conventional Taylor rule formulation. It is noticeable that the coefficient on the output gap is very large, while the coefficient on the inflation gap is significantly below the coefficient implied by the Taylor rule (1.5) in equation (1). The low coefficient on the inflation gap is intriguing: the result suggests that an increase in inflation is not fully met by an equal increase in nominal interest rates, potentially reflecting a high degree of inflation credibility; to the extent that inflation surprises do not translate into a change in inflation expectations, there is not necessarily a need to respond to an increase (or fall) inflation by a similar increase (or fall) in nominal interest rates, unless there are underlying inflationary (or deflationary) pressures already captured in the output gap.

50. The inclusion of the lagged price gap in model A1 does not significantly alter the estimation results: the estimated coefficient on the output gap was only slightly reduced, while the coefficient on the inflation gap remains significantly below the Taylor rule coefficient. The coefficients on the lagged price gap and the inflation gap are clearly different, however, and their equality can be formally rejected both in model A1 and in model A2. Thus, the estimation results support the hypothesis that the SNB has not been following a strict monetary targeting rule over the estimation period, even when allowing for the 1988 episode. It is also noticeable that the use of core inflation results in more plausible estimates of the Taylor rule coefficients: the estimated coefficient on the output gap was 0.2 and coefficient on the inflation gap increased to 1.1.

51. The results reported above are broadly in line with the results from a recent paper by Dueker and Fischer (1996). They characterize Swiss monetary policy as following a feedback rule where monetary growth is set as a function of projected growth of real base money and an inflation target, but with an occasional exchange-rate feedback. The model was estimated using discrete "switching parameters" with a total of four different states: high exchange-rate feedback (with low and high inflation targets); and low exchange-rate feedback (with low and high inflation targets). They find that including a price-level target in the model does not improve its goodness-of-fit; removing the exchange rate feedback, however, would significantly reduce the model's explanatory power. Only one high exchange-rate feedback period—in 1978–79 (the period when an exchange rate floor was in place)—is clearly identified by the model (see Dueker and Fischer, 1998), but the exchange rate feedback is also significant in the low inflation state.

Table II-2. Switzerland: Feedback Rule Estimations, 1975.Q1–1998.Q2

(Standard errors in parentheses)

Parameters	Model A0	Model A1	Model A2
α Constant term	3.990 (0.225)	2.954 (0.443)	1.569 (0.446)
β_1 Output gap (t)	0.708 (0.072)	0.621 (0.077)	0.206 (0.088)
β_2 Price gap (t-4) 1/	not included	2.685 (0.455)	5.475 (1.101)
β_3 Inflation gap (t) 1/	0.437 (0.076)	0.552 (0.085)	1.054 (0.101)
β_6 Dummy (1988=1)	-2.621 (0.691)	-2.343 (0.676)	-1.712 (0.549)
Adjusted R^2	0.737	0.755	0.848
DW	0.431	0.482	0.655
F-test of $\beta_2 = \beta_3$	not applicable	4.944	18.223

Source: Staff estimates.

1/ A core price index was used in model A2. The core price index was calculated by cutting out 15 percent of the largest negative and 15 percent of the largest positive changes in the consumer price index (two-sided "trimmed mean"). A correction was also made for the 1995 VAT increase.

52. It is clear that none of the feedback rules above fully captures the decision-making process of the SNB. However, it is interesting to note that the feedback rule implied by a strict monetary targeting strategy is clearly rejected. Thus, although monetary targeting has been successfully followed in some periods, the exceptions to strict monetary targeting and the presence of "base drift" have been frequent. The estimations suggest that the practice of the SNB's monetary policy formulation might then not differ too much from the more recent practice in countries pursuing formal inflation targeting. Rather, the difference lies with the "rhetoric of monetary policy" as well as the communication of the policies to the markets and the public in general.

D. Past Performance of Swiss Monetary Policy

53. Policy discussions often assess monetary policy success solely in terms of the average inflation rate and make only secondary references to the variability of inflation or output. Academic literature by contrast often assesses monetary policy performance as an explicit trade off between output and inflation variability: in these terms monetary policy may be inefficient if by changing the policy rule inflation variability can be reduced without increasing output variability (or the reverse). Given that the policy pursued is efficient, the particular combination of inflation and output variability depends on whether the central bank attaches a high degree of importance to low inflation variability or whether low output variability is more important. The mandates of the major central banks differ on this issue: while the objectives given to the newly created European Central Bank states "price stability" as its sole monetary policy objective, the mandate of the Federal Reserve Board explicitly acknowledges that stabilizing output is an important objective for monetary policy. The present mandate of the SNB states in broad terms that it should conduct a monetary policy "in the general interest of the country."[24]

54. Figure II-1 presents in two panels the three dimensional trade-off between average inflation and inflation variability (panel 1) and the variability of output and inflation (panel 2). Although countries might have different preferences on the relative importance of these dimensions, the figures provides the basis for a rough ranking of monetary policy success: countries close to the origin have clearly been successful whereas countries far away from the origin of the figures have been less successful.

55. A closer inspection of the figures reveals that Swiss monetary policy was very successful in keeping inflation low in the period 1973–1985, a period when many industrial countries experienced high and highly variable inflation. None of the other countries in the selection had lower average inflation rate in this period, although the average inflation rate in Germany was only marginally higher. This achievement may, however, to some extent have been obtained at the expense of high output variability (second panel), although three

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[24]Current proposals to bring Switzerland's "monetary constitution" in line with current practice would establish price stability as the primary objective.

countries—the United States, Sweden and the Netherlands—had higher output variability without having a lower average inflation rate. Inflation variability was about average.

56. The outstanding Swiss inflation performance in the first subperiod seems to have broken down in the second period. Although the average inflation rate was much lower than in the first period, as many as five countries including France and Belgium—had a lower average inflation rate in the second period. At the same time, Swiss inflation variability—measured by its average standard deviation—was only exceeded by Sweden. This result is clearly dominated by the short period of high inflation in the early 1990s, following the large money demand shift in 1988. In response to the increasing inflation, the SNB tightened monetary policy rapidly and succeeded in reducing the inflation rate from approximately 5 percent to close to nil in three years.

E. Future Challenges

57. Swiss monetary policy is likely to face many challenges in the future. The effects of the move to monetary union by its neighbors are far from the only challenge which is likely to face the Swiss monetary authorities. The experience of other countries suggests that the pace of financial innovation is likely to continue with undiminished strength; the introduction of liquid mutual funds is just one example that is blurring the distinction between monetary assets and investment vehicles. Although it is possible to adjust monetary growth for particular demand shifts, the large number and complexity of these demand shocks would threaten the viability of a strict monetary targeting framework. A switch to a broader and more stable monetary aggregate such as M3—which is currently used as an additional intermediate indicator—would be helpful from this perspective. The direct link to SNB's balance sheet would, however, be lost, and M3 data become only available with a lag. Furthermore, in contrast to the supply of base money, which can to a large degree be directly influenced by the monetary authorities, the supply of broad money is endogenous and tends to vary pro-cyclically.

58. Although the introduction of the euro in January 1999 has not had significant effects on the Swiss franc, the period leading up to the final replacement of national currencies by euro notes and coins in 2002 could still result in volatile demand for Swiss francs. On the one hand, the elimination of several European currencies could result in an increased demand for Swiss francs from institutional investors seeking to diversify their portfolios. On the other hand, however, increased currency substitution by Swiss firms and households, and sharply improved expectations about the stability of the euro could result in unexpected outflows of capital and downward pressures on the exchange rate. Although the Swiss franc has often experienced periods in the past where it has been exposed to the shifting sentiments of international investors, the international demand for Swiss franc assets could become more fragile in the first years after the introduction of the euro. If it were to become important, currency substitution would also add to the instability of money demand, and further undermine the monetary targeting framework.

59. A previous study conducted by the staff discussed in some detail the effects of portfolio preference shifts in favor of the Swiss franc.[25] The main conclusion of the discussion was that timely monetary policy action—with monetary expansion temporarily exceeding the monetary growth target—would be effective in reducing the short-term negative effects of an upward pressure on the currency resulting from a portfolio preference shift (both temporary and persistent). Activistic monetary policy is, nevertheless, not likely to completely prevent an initial drop in output, as the contractionary effect of the appreciation of the exchange rate more than offsets the positive stimulus from lower Swiss interest rates. It would also result in a temporary increase in consumer price inflation. A temporary exchange rate floor to counter appreciation would, according to the study, have a stabilizing effect on output, provided that the monetary authorities accommodated some of the initial appreciation of the exchange rate.

60. A radically different way to approach the problem of portfolio preference shifts would be to fix the exchange rate irrevocably to the euro. If credible, this would have the advantage of eliminating currency risk attached to trade between Switzerland and the euro zone. Such a peg would, however, result in the removal of any monetary policy independence: monetary policy would then be effectively determined in the European Central Bank (ECB) without any regard to Swiss economic conditions. Given the decentralized Swiss fiscal structure, it is unlikely that counter-cyclical fiscal policy would compensate for the loss of monetary policy autonomy.

61. Accordingly, by providing the possibility of "leaning against the wind," the present monetary policy framework could be useful in the face of any financial turbulence attached to the introduction of the euro; the negative upward pressures on the exchange rate could be partly offset by some monetary expansion. It should also be noted that even a constant monetary growth target provides some automatic counter-cyclical stimulus through the negative effect on interest rates from slower economic growth. At the same time, the SNB could, if desired, offset any Swiss-specific domestic demand shocks.

62. The introduction of an inflation targeting framework could be an alternative to both the irrevocable fixing of the exchange rate and the monetary targeting framework. In such a framework, an explicit medium-term inflation projection would need to be produced, conditional on the developments in a range of factors. To the extent that monetary aggregates have provided important information about future inflation, such aggregates would figure prominently in the framework, but other indicators could also be included. This inflation projection could in turn be used to provide an anchor for private sector inflation expectations. In many respects, such a framework would not differ much from the framework that has been used since 1980, when the annual monetary targets were replaced by a medium-term monetary growth path, but it opens the way for the formal introduction of a broader set of indicators. The inflation targeting framework is also more forward-looking, as it focuses on likely inflation over a given future horizon.

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[25]See Laxton and Prasad (1997).

63. In spite of its recent popularity, there are several problems attached to the introduction of an inflation targeting framework. Frequent over- or undershooting of the inflation target might undermine policy credibility, even if the central bank were to focus on "underlying inflation." A dramatic change in fiscal policy stance or other unexpected events, not taken into account in the "special adjustments," could affect the inflation outcome. Consequently, if a precise target range is established, the strategy could easily prove counterproductive. Finally, the exchange rate could complicate the implementation of an inflation targeting framework in much the same way as it has complicated the pursuit of the monetary targeting strategy. Large exchange rate movements are likely to have significant effects on developments in domestic prices, even when the direct effect of foreign prices is removed: the indirect effects on domestic prices could cause large over- or undershooting of the inflation target. Finally, inflation targeting requires the production of explicit inflation projections with long time horizons. In the Swiss case, this horizon may have to extend to three years due to a particular long estimated time-span from an increase in monetary growth to an increase in inflation (in most other countries the time-span is estimated to be about two years).

64. Given the instability of the demand for base money, monetary base targeting, the classic "low-cost strategy," has an uncertain future. The introduction of "alternative indicators"—such as M3 and the yield curve—and using these indicators to allow base money growth to stray away from its target path by a significant amount implies, however, the establishment of an alternative assessment of medium-term inflation pressures. Such an assessment requires—at least implicitly—the determination of the relative importance of the different indicators for a range of possible inflation outcomes. Thus, even in the absence of formal inflation targeting, a high-quality interpretation of available economic data has to be ensured. What is different, however, with an inflation targeting framework (e.g., as practiced by the UK, Canada, New Zealand, and Sweden) is the production of explicit inflation forecasts, stipulating clearly underlying assumptions as well as the uncertainties attached to the forecast. Making such contingency forecasts of inflation available to the public, policy transparency could be significantly enhanced, and the public's uncertainty about policy actions could be reduced. The experience of countries which have pursued inflation targets for some time suggests that the presentation of such a forward looking assessment of inflation pressures has been a key element in improving the policy dialogue between the public and the monetary authorities.[26]

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[26]See, for example, Svensson (1998) and Bernanke and Mishkin (1997).

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III. Challenges to the Swiss Tax System[27]

A. Introduction and Summary

65. Switzerland has a complex tax system, likened by some observers to a "jungle."[28] This chapter describes Switzerland's tax system and the key domestic factors—the internal institutional features of direct democracy and a highly decentralized government structure—that may have hampered its adaptability. It then considers how external developments seem likely to pose particular challenges for the Swiss tax system. Increasing integration into the EU and globalization have intensified pressures for comprehensive tax reform, and Switzerland has already begun to adapt elements of its tax system to EU benchmarks to prevent tax revenue losses.

66. To highlight distinct features of the Swiss tax system, Section B compares trends in the tax burden in Switzerland with those in the EU member states. As in most other industrial countries, the increase in the tax burden since the 1970s has primarily fallen on labor. However, the greater dependence on the taxation of immobile factors has been more narrowly based in Switzerland than elsewhere. In contrast to the EU states, the share of indirect taxation in total tax revenues and the rate at which consumption is taxed are significantly lower in Switzerland.

67. The complexities stemming from the decentralized tax system are particularly marked in the area of direct taxation. Section C reviews the personal and corporate tax codes in Switzerland and highlights how lack of harmonization in tax base definitions and in collection procedures across cantons and the Confederation reduces transparency. Moreover, the interaction of various provisions in the corporate tax code result in a tax system that is non-neutral with respect to the method of financing investments. In particular, at the canton level, the taxation of profits from corporations—as a progressive function of the ratio of profits to equity capital and reserves—favors investment that is financed by retained earnings or debt. The absence of personal capital gains taxation together with the "double taxation" of distributed dividends further favors the use of retained earnings.

68. Section D identifies the areas of Switzerland's tax system that are subject to, or will become increasingly sensitive to, external pressure for change. Because the internationalization of markets has had a particularly marked impact on the mobility of capital, the pressures that arise from cross-country differences in tax codes are the most immediate in the areas of capital and business income taxation, and taxes on financial transactions. The stamp duty on financial transactions is a particular example of where greater mobility—stemming from the introduction of remote access facilities to Switzerland's stock exchange—reduces

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[27]Prepared by Catriona Purfield.

[28]See Duss, Richard and Russ Bird (1979).

the ability to raise tax revenue. Further attempts at harmonizing taxation in Europe may also intensify the political pressure on Switzerland to change its system for withholding taxes on interest income.

69. The review of internal and external challenges leads to the discussion in Section E of two broad policy directions:

- First, tax policy should tackle the root of the inefficiencies in the domestic tax system—the lack of harmonization in tax base definitions and collection procedures between cantons—by reforming the direct taxation laws.

- Second, a shift from direct to indirect taxes through higher consumption and ecological taxation would raise the efficiency of the tax system. It would have the added advantage of reducing vulnerability to international competitive tax pressures.

B. International Comparisons and Recent Trends in Swiss Tax Revenues

70. When compared with the EU average, the level of taxation in Switzerland is quite low: including (excluding) social security contributions, the tax burden was 7.7 (8.5) percentage points lower than the EU average in 1996 (Figure III-1).[29] Two pressures have helped contain the shift toward a higher tax burden which has characterized the EU experience. First, taxpayers in Switzerland can express their preferences concerning the level and structure of the tax burden via the referendum and initiative processes. Switzerland's experience with the introduction of VAT—which was first proposed in 1977 and only approved in 1995 following three referenda—demonstrates how Swiss voters can successfully impact tax policy. Second,

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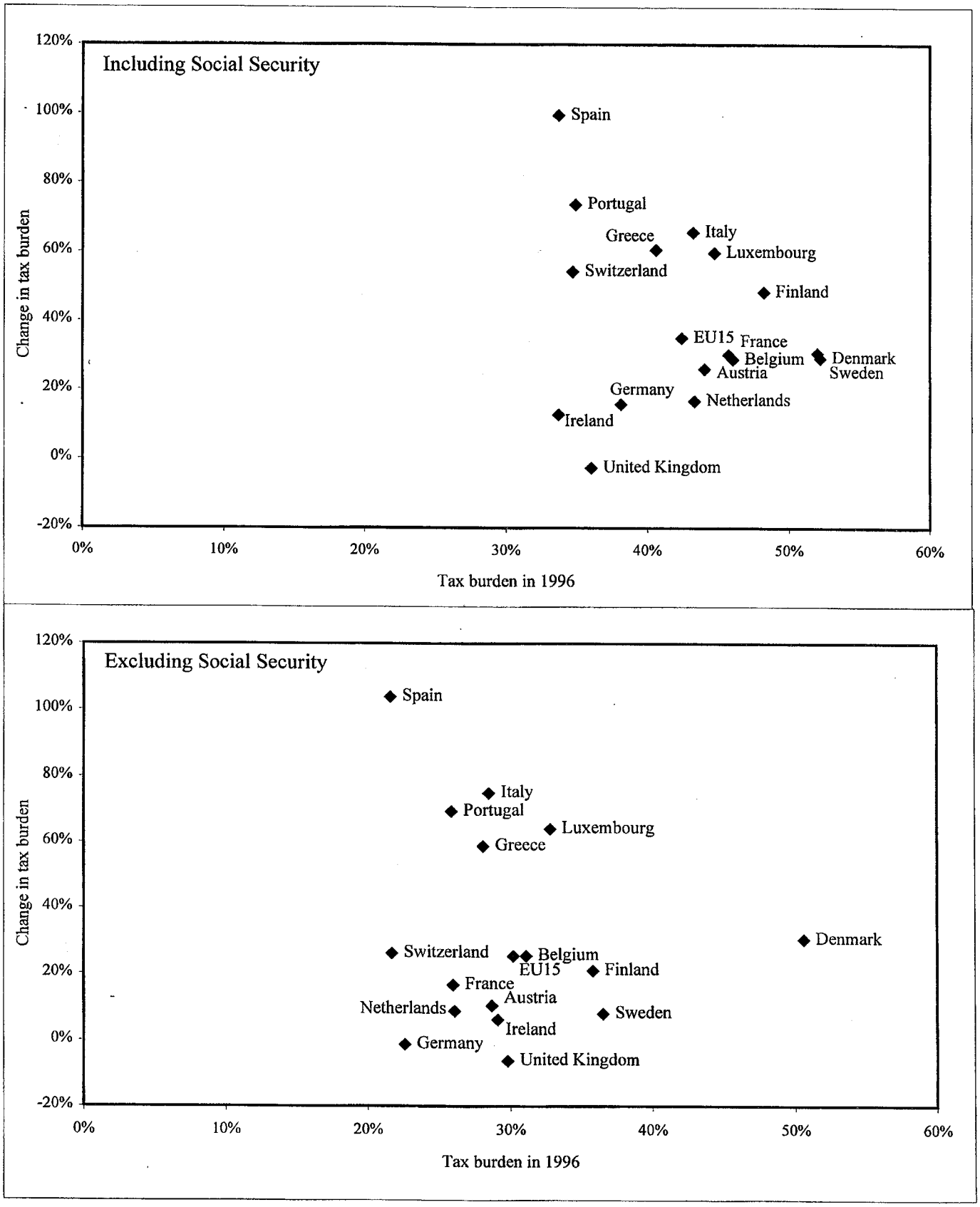
[29]In Switzerland, what is included in the social security statistics is only part of what is included in the statistics of other countries such as Germany. Contributions to the funded occupational pension system and the health care insurance funds in Switzerland are excluded from the data on general government because these funds are operated within the private sector. For example, the pension system in Switzerland comprises three pillars: first, the compulsory contributions to the state operated federal old age (AHV) and disability (IV) insurance funds; second, obligatory contributions to privatized occupation pension schemes; and third, optional contributions to private benefit schemes to facilitate personal savings for old age. To account for the exclusion of mandatory contributions to the private pillars of the social security system from the official tax statistics, developments in tax revenues are separated from developments in the overall tax burden (inclusive of contributions to the public social security system).

Figure III-1. Switzerland: Change in Tax Burden, 1970-96
(In percent)



Source: OECD Revenue Statistics, 1998.

the migration of taxpayers to other cantons with more competitive tax regimes may have constrained the ability of each canton to raise its tax income.[30]

71. The comparatively low level of taxation notwithstanding, the growth of the overall tax burden in Switzerland between 1970 and 1996 was higher than the EU average, with social security contributions and personal income taxation accounting for around 64 percent and 30 percent of that growth, respectively. The rise in the overall tax burden appears unusually high by EU standards; however, excluding social security contributions reduces the growth in taxation to within 1 percentage point of the EU average (see second panel of Figure III-1). Also, the rise in the EU tax burden was more broadly based, with consumption taxation playing a larger role. The largely unchanged tax burden on consumption in Switzerland has contributed to the dominance of direct taxes (including social security contributions) over indirect taxes in overall tax revenues (Table III-1).

72. To encapsulate how the composition of the tax burden differs between Switzerland and other countries, the methodological approach by Mendoza, Razin, and Tesar (1994) is used to assess the average tax burden on consumption, labor income, and capital income in various countries. Effective average tax rates are computed by summing all taxes paid by economic function and then dividing by the relevant tax base (consumption, labor income, and capital income) as measured in the national accounts.[31] For Switzerland, estimates of these rates confirm that the imbalance between direct and indirect taxes is mainly attributable to the low tax burden on consumption. However, substantial revenues are raised by capital-based taxes and this contributes to the larger share of direct tax revenues in Swiss tax revenues.

73. The effective tax rate on *consumption* in Switzerland has fluctuated in a narrow range around 8 percent of the pre-tax value of private consumption throughout the 1980s and 1990s (Figure III-2). In other European countries the effective tax burden on consumption is at least twice that in Switzerland. The low tax burden on consumption is mainly the result of the low standard VAT rate (7.5 percent), which is significantly below the average standard rate of VAT in the EU (19.4 percent).[32]

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[30]However, the empirical evidence for Switzerland suggests that tax-induced migrations are small (see Weber, 1992). This may reflect the fact that language differences in Switzerland combined with other psychological and social factors impose considerable costs on those who move between cantons.

[31]This methodology is described in Appendix I.

[32]At the beginning of 1999, the standard VAT rate increased by 1 percentage point from 6.5 percent to 7.5 percent. There are two reduced VAT rates. A 2.3 percent rate (2 percent until end-1998) applies to agricultural goods, for example, food and beverages; cattle, poultry and fish; seeds, living plants and cut flowers; grain, fodder, fertilizer, and other agricultural inputs. Medicine, printed matter, and communications also qualify for this lower VAT rate. A special rate of 3.5 percent (3 percent until end-1998) applies to the hotel and lodging industry.

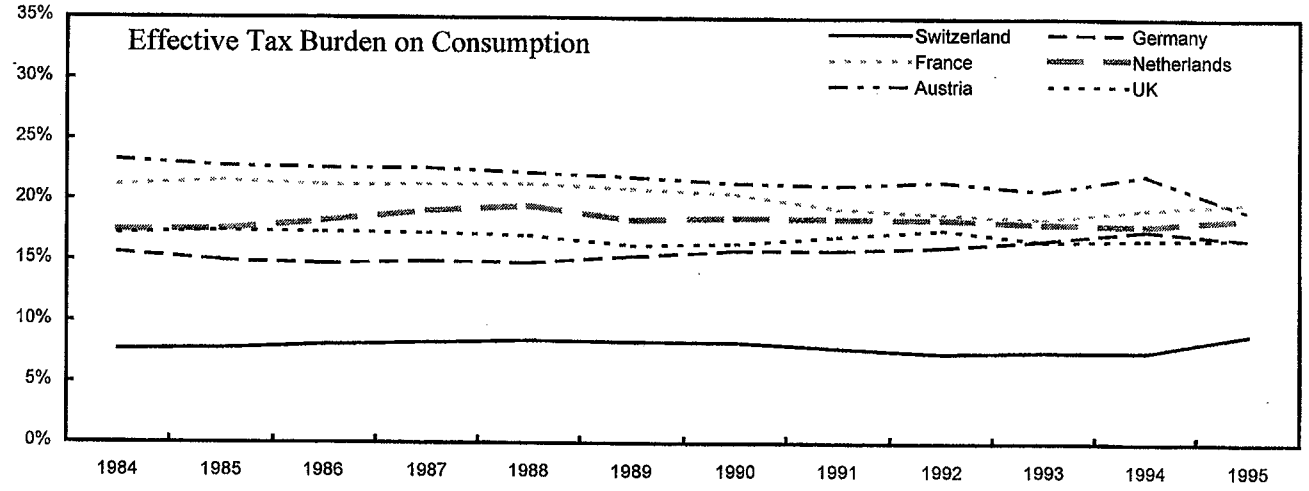
Table III-1. Switzerland: International Comparison of the Composition of Tax Revenues, 1996

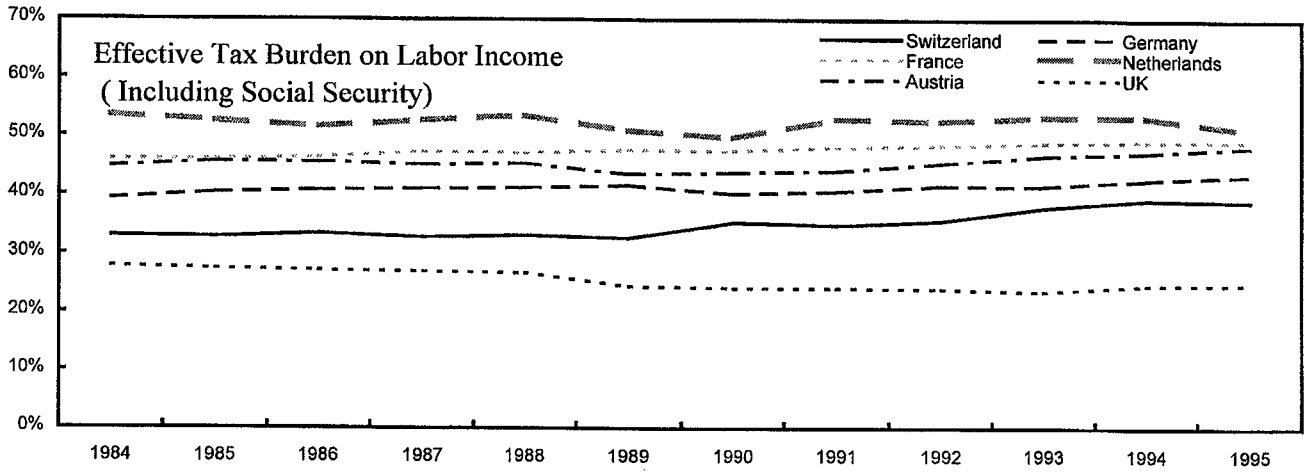
(In percent of total tax revenues)

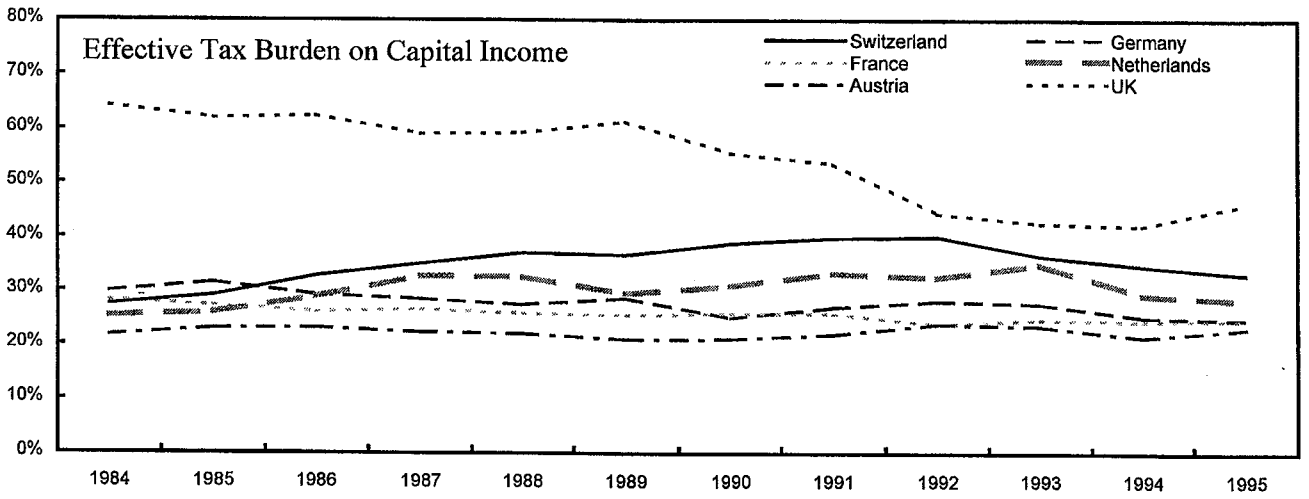
	Income and Profits	Social Security	Payroll	Property	Goods and Services	Other
Austria	27.8	34.8	6.3	1.4	28.6	1.1
Belgium	38.1	32.3	0.0	2.6	27.0	0.0
Denmark	60.2	3.1	0.4	3.3	32.7	0.2
Finland	41.7	25.8	0.0	2.2	30.1	0.2
France	18.0	43.1	2.3	5.1	27.3	4.3
Germany	28.4	40.6	0.0	3.0	27.9	0.0
Greece	22.4	30.6	0.8	3.4	42.8	0.0
Ireland	40.9	13.5	1.1	4.8	39.7	0.0
Italy	34.4	34.2	0.2	5.4	25.9	0.0
Luxembourg	38.1	26.6	0.0	7.6	27.7	0.0
Netherlands	27.0	39.6	0.0	4.4	28.6	0.4
Portugal	28.5	25.7	0.0	2.5	42.6	0.7
Spain	29.0	35.9	0.0	5.5	29.2	0.4
Sweden	41.0	29.8	2.5	3.8	22.8	0.1
United Kingdom	36.8	17.3	0.0	10.6	35.2	0.1
EU average	34.2	28.9	0.9	4.4	31.2	0.5
Switzerland	37.6	37.4	0.0	7.0	17.9	0.1

Source: OECD Revenue Statistics (1998).

Figure III-2. Switzerland: Effective Tax Burden on Consumption, Labor Income, and Capital Income, 1984-95







Sources: OECD National Accounts, 1984-95; OECD Revenue Statistics; and staff calculations.

74. As regards the taxation of *labor income* (including social security contributions), the effective average tax burden on labor income in Switzerland has displayed an upward trend in line with the experience in most other European countries. Only the United Kingdom and the Netherlands saw a decline in the tax burden on labor between the 1980s and 1990s. Despite its upward trend, the effective average tax burden on labor income in Switzerland still remains one of the lowest in Europe (Figure III-3), and the top marginal income tax rate (51.4 percent) is below the average EU top marginal rate (53.8 percent).

75. The picture with respect to capital income is the opposite to that on labor income. The effective tax burden on capital income in Switzerland is significantly higher, at around 33 percent, than in most other European countries. With the exception of Austria and the Netherlands, the growth of the capital tax burden in other countries declined between the 1980s and 1990s, while it rose in Switzerland.[33]

C. Complexities in the Swiss Tax System

76. Evaluating the burden of the Swiss tax system on the basis of the ratio of tax revenues to GDP can be misleading because the efficiency and administrative costs incurred in the collection of the tax revenue are not included. Owing to differences in the structure of tax systems, in particular with regard to tax bases and tax rates, the efficiency costs of taxation can vary significantly between countries. In Switzerland, this issue is further complicated by the decentralized structure of government: the constitution allows the federal government, the 26 cantons, and the 3,000 communes to levy their own taxes to meet their expenditure requirements. In the area of direct taxation, all three levels of government levy personal and corporate income taxes which has generated a complex tax system with high administrative costs.[34]

Personal income and wealth taxation

77. Individuals resident in Switzerland on a permanent or temporary basis are liable to pay personal income tax to each of the three levels of government through their canton of residence. A supplementary wealth tax is levied in all the cantons and communes. Each canton

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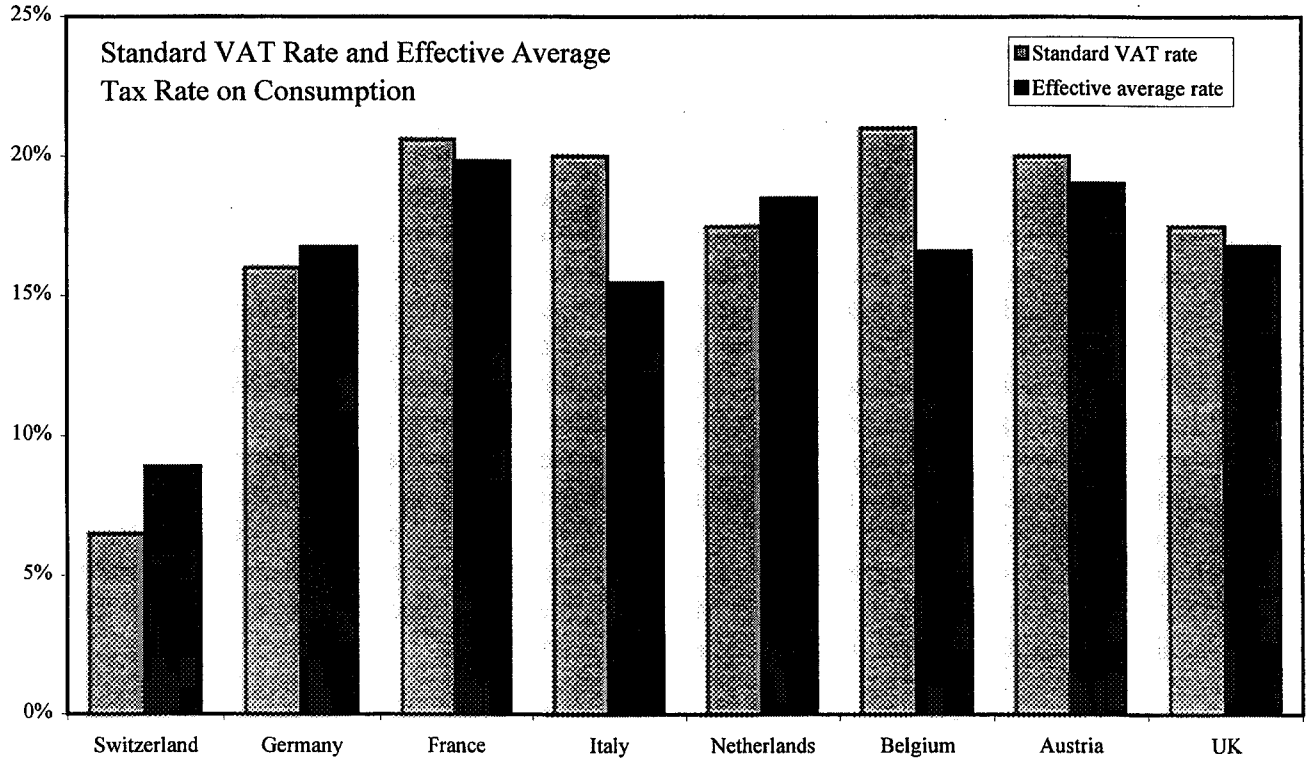
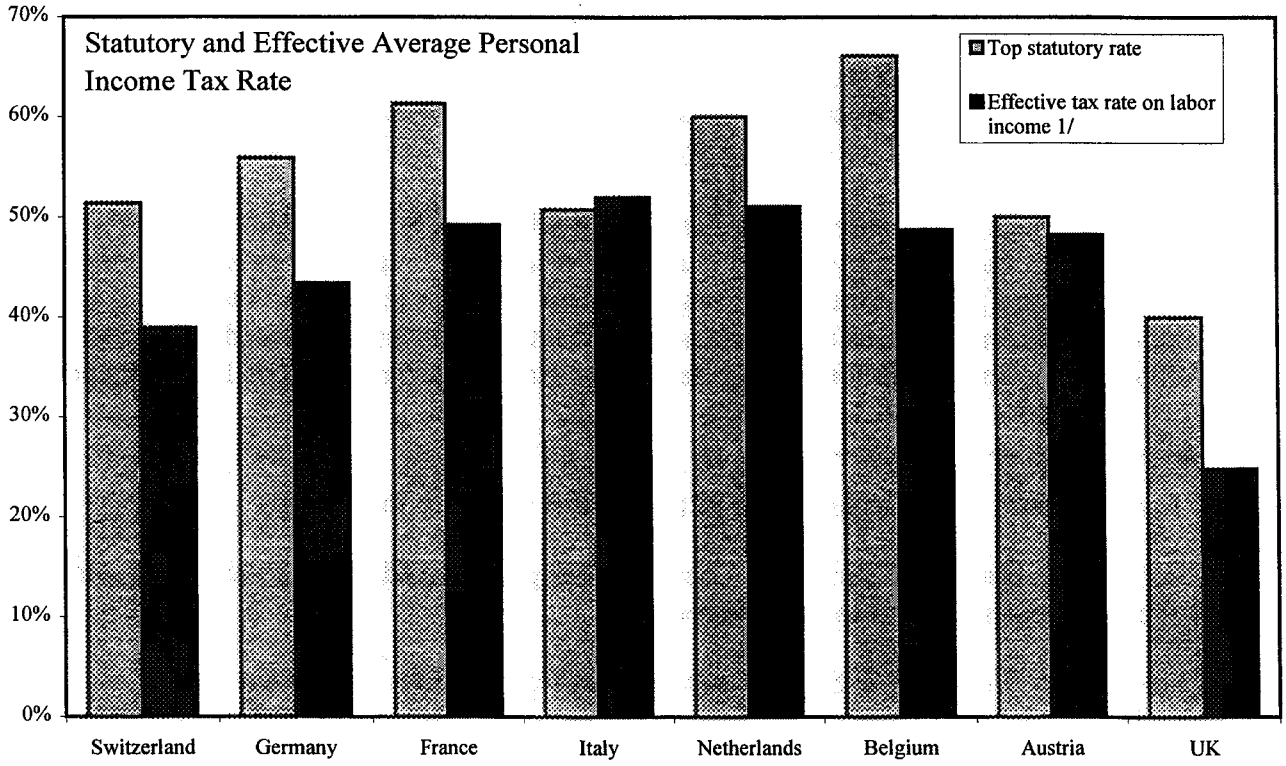
[33]However, the level and trend in the capital tax burden should be interpreted with caution because of the possible impact of transfer pricing on Swiss corporate tax revenues and the national account measure of the operating surplus.

[34]In the area of indirect taxation there is no overlap between the taxes levied by the three levels of government. However, in the area of direct taxation, sovereignty lies primarily with the cantons and secondarily with the Confederation. In 1996, the direct income taxes collected by the Confederation accounted for one quarter of the total direct tax revenues. Some direct taxes, such as the federal military service tax and withholding tax on interest income, are levied only by the Confederation.

Figure III-3. Switzerland: Statutory and Effective Average Tax Rates on Consumption and Personal Income
(In percent)





1/ With social security contributions.
Sources: The OECD Tax Data Base (1998); and staff calculations.

assesses and collects the taxes that are due to each level of government and the taxpayer must complete separate columns in the tax return form to estimate the amount due in Confederation and cantonal taxes.[35]

78. Personal income and wealth taxes are normally assessed every two years and the long lag in the collection of personal income taxes imposes important macroeconomic costs. At the federal level, income tax liability is calculated on the basis of the average income earned in the two-year period that precedes the assessment period. For example, the federal income tax to be paid in 1998 and 1999 is calculated on the basis of the average income earned in 1996 and 1997. At the canton level, collection lags for income and wealth taxes are generally longer but the canton of Basel-Stadt assesses and collect taxes on a current-year basis.[36] The lag between income tax accrual and income tax collection reduces the real value of tax revenues. For example, an average collection lag of three years and an annual inflation rate of 3.6 percent (the average Swiss inflation rate during 1970–98) reduces the real value of income tax collections by about 10 percent, equivalent to about 0.8 percent of GDP given current income tax collections of 13 percent of GDP. Moreover, the long collection lags also reduce the ability of the effectiveness of the automatic fiscal stabilizers.[37]

79. The efficiency and compliance costs of the Swiss tax system are compounded by the variation in the definition of the personal income tax base between the Confederation and the cantons. Generally, all sources of income earned by residents in Switzerland are taxable: wages, salaries, and any associated income such as bonuses; income from self-employment; unemployment benefit or sickness insurance; compensatory income such as annuities and pensions; dividends, interest, rents, and capital gains; and finally, benefits in kind such as the imputed rents from owner-occupied housing. However, some specific categories of income are treated differently for tax purposes by the Confederation and cantons.

80. Old age and disability pension benefits are fully liable for income tax at the Confederation and canton levels[38] but the tax provisions for lump-sum payouts from the second and third pillars of the social security system vary. For federal income tax purposes, lump-sum pension payments attract tax at 20 percent of the standard Confederation tax rate. Although some cantons follow the Confederation and levy income taxes on lump-sum pension

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[35]The communes collect a percentage of the tax that is paid to the cantons.

[36]In 1999, the cantons of Zürich and Thurgau are expected to adopt a current-year assessment and collection system for cantonal income taxes.

[37]See Chapter II of the IMF Staff Country Report No. 98/43 for Switzerland.

[38]This is because contributions to the first and second pillar of the social security system, as well as contributions to the tied-saving schemes of the third pillar are fully deductible for tax purposes.

payouts, other cantons prefer to tax these payments separately from income by applying either a special tax or a separate tax rate that is between 10 percent and 40 percent below the standard cantonal tax rate.

81. Personal income and wealth tax exemptions and the rules governing permissible deductions also range in generosity across the cantons. The tax laws that adjust family income for the number of dependents and double-income couples differ greatly.[39] Income exemptions to single individuals or allowances for dependents and children are not granted in all the cantons. Deductions from gross taxable income of part of the contributions paid into the fixed-term saving schemes of the third pillar of the social security system can be made in all but seven cantons, but elsewhere the maximum allowable deduction varies. For example, single (and married) individuals can subtract a maximum of Sw F 3,600 (Sw F 7,200 for married couples) from gross taxable income in the canton of Ticino but only Sw F 500 (1,000) in the canton of Basel-Stadt.

82. In addition to the above, various other differences exist in the taxation of personal income and wealth. In some cantons, bonus shares are not taxed. Poll or household taxes are levied on household income in some cantons. In most cantons, an annual property tax is levied on the market value of property, but some cantons also levy a special property gains tax. With the exception of the canton of Graubünden, the cantons and Confederation do not levy income taxes on private capital gains derived from the sale of movable property such as company shares.

83. As a result of the differences in direct taxation rules and tax rates, top marginal tax rates and the direct income tax burden vary widely. In 1998, the top marginal tax rate for federal income tax was 11.5 percent. But for the cantons, the top marginal tax rate on personal income ranged from a minimum of 2.4 percent on all taxable income in the canton of Obwalden, to 29 percent when income exceeded Sw F 1.25 million in Basel-Stadt. As illustrated in Table III-2 , the personal income tax and the total tax burden is almost doubled or halved depending on the canton of residence. Even neighboring cantons sometimes have large permanent differences in the tax burden, for example, Zürich and Zug (77 and 55.1 points), or Basel-Stadt and Basel-Land (111.2 and 88.4 points).

84. The differences in the tax burden would be expected to reflect both differences in the cost and provision of public goods and services across cantons moderated by the impact of tax competition between the cantons for individuals and firms. However, the actual divergence between the tax burden and the level of services provided by cantons illustrated in Table III-2 is striking. Divergences in the type and structure of direct income and wealth taxes across the

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[39]Swiss tax laws are based on the principle that the income and wealth of a family represents an economic unit so that the income and wealth of all family members are aggregated. For both Confederation and cantonal taxes, two different tax scales apply: a lower one for married couples living together and a higher one for other taxpayers.

Table III-2. Switzerland: Indices of Tax Burden and Public Expenditures by Canton, 1996

(Index, average = 100)

Canton	Tax Burden			Per Capita Public Expenditure
	Income/Wealth Individuals	Profits/Capital Companies	Total Tax Burden	
Zurich	77.0	103.1	82.2	136.6
Bern	118.7	95.5	117.9	120.6
Luzern	118.9	89.5	115.1	93.7
Uri	90.7	113.9	91.7	39.8
Schwyz	85.5	89.3	86.1	85.5
Obwalden	121.8	87.9	117.0	82.9
Nidwalden	69.8	86.6	73.1	61.8
Glarus	110.4	148.5	115.2	59.8
Zug	55.1	57.8	56.9	101.0
Fribourg	135.5	102.4	130.5	79.4
Solothurn	99.3	97.3	98.7	88.2
Basel-Stadt	111.2	110.2	110.5	84.0
Basel-Land	88.4	108.9	91.6	59.0
Schaffhausen	105.2	101.5	103.7	98.2
Appenzel A	107.9	110.1	108.4	86.2
Appenzel I	98.1	93.7	97.7	58.4
St. Gallen	97.7	94.5	97.7	92.4
Graubunden	88.8	144.7	102.1	111.3
Aargau	98.6	103.7	98.5	78.4
Thurgau	99.0	98.0	97.8	70.2
Ticino	90.0	123.0	96.3	91.8
Vaud	107.4	106.2	108.1	103.8
Valais	128.2	115.2	124.6	88.3
Neuchatel	124.7	139.5	125.7	118.0
Geneva	112.3	118.0	112.7	62.8
Jura	133.6	105.0	130.8	101.5

Source: Statistisches Jahrbuch der Schweiz (1998), Öffentliche Finanzen der Schweiz (1996).

cantons are likely to have resulted in larger allocative inefficiencies because some locational decisions may have been influenced by the pecuniary advantages of taxes offered in different cantons. With respect to equity, the ability of poorer and less populated cantons to compete with larger cantons offering more favorable tax regimes is questionable. And many city cantons have suffered financing difficulties as taxpayers have migrated to neighboring cantons but the burden of public services and amenity provision has continued to grow. While the increase in property prices in less taxed cantons may have compensated for differences in the tax burden, this has benefited private individuals and not the public sector. More generally, the assumption that the divergence in the tax cost of public service provision is the outcome of competition between cantons may need some qualification because language differences within Switzerland can inhibit the migration of workers between cantons.

Corporate taxation

85. Corporate income and capital taxes are levied by the Confederation, the cantons, and the communes on all joint-stock and limited liability companies that are either registered in, or effectively managed from, Switzerland. The taxes paid to the three levels of government are generally payable on a corporation's world-wide profits and capital in the canton of registration.[40] However, if a corporation has branches across a number of cantons, profits and capital are assigned pro rata across the cantons where the registered office and branches are located and each canton levies its own taxes on the proportion of profits and capital that are assigned to it. Thus a corporation receives a tax bill from each of the cantons in which it operates; Confederation taxes are paid only in the canton of registration. Unlike personal income taxes, corporate taxes are assessed on a current-year basis.

86. The proportion of profits paid in taxes varies with the definition of taxable profits and the tax rates used in each of the cantons. Generally, net taxable profit is obtained by adjusting a firm's balance sheet profits for commercially justified expenses but the permissible deductions vary. For instance, some cantons do not permit the deduction of Confederation, cantonal, and commune taxes; the period for the carry forward of the previous year's business losses is different by canton; and the treatment of depreciation and the depreciation rates on specific assets diverge. Corporate income tax schedules vary as well. In 1997, the Confederation replaced its three-step schedule of corporate tax rates based on the ratio of a company's profits to its equity with a single proportional tax of 8.5 percent, but many cantons still levy taxes on this basis. In 1998, 13 cantons levied a graduated corporate income tax that varied with the ratio of profits to equity, 5 levied a tax that was a linear function of the profit equity ratio, and the remainder levied a single proportional tax.

87. The corporate tax system imposes large administrative costs, especially on firms that operate in several cantons because they must fill out multiple non-uniform tax return forms

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[40]For foreign corporations, only that part of the profit which is generated in, and that part of its capital that is located in, Switzerland is taxable.

and deal with the complications arising from the dissimilarities in the corporate tax rules. The compliance costs are particularly burdensome for small and medium-sized enterprises (SMEs). It has been estimated that the compliance costs imposed by the tax system amount to an average of Sw F 14,000 per SME per year.[41] The OECD (1997) reported that these costs represent more than 40 percent of the estimated costs on SMEs from government regulations and amount to about 3 percent of spending on total machinery and equipment.

88. In addition, since the corporate tax liability is determined on the basis of the ratio of profits to equity, firms face large changes in the marginal tax rate that vary with the tax rate and type of tax schedule. For instance, when corporation taxes are calculated as a linear function of the ratio of profits to equity, the marginal tax rate changes dramatically as the ratio of profits to equity increases. In Figure III-4, the marginal tax rate in the canton of Zug drops from 22 percent to 11 percent (the average tax rate) when the ratio of profits to equity increases from 14 percent to 15 percent. The changes in the marginal tax rate are less sharp in the cantons which levy a graduated corporate income tax on the return to equity.

89. At a more aggregate level, the various provisions in Switzerland's tax law—the taxation of profits on the basis of the ratio of profits to equity, the full deductibility of interest payments, the taxation of distributed profits at the corporate and personal level, the taxation of share issuances, and the absence of personal capital gains taxation—have resulted in a corporate tax system that is non-neutral with respect to investment financing decisions. For instance, the taxation of profits on the basis of the ratio of profits to equity encourages investments that are financed through retained earnings or equity issues, and investment financed by retained earnings avoid the "double taxation" of dividends.

90. The impact of various tax provisions on investment decisions in Switzerland can be assessed by calculating the tax wedge for investment (the divergence between the pre- and post-tax rate of return from an investment).[42] The imposition of corporate and personal income taxes implies that a firm has to earn a higher pre-tax rate of return in order to match the prevailing rate of interest post tax.[43] Differences in the tax treatment of various types of investment—machinery, construction, and inventories—and differences in the tax treatment of various types of financing—retained earnings, new equity, and debt—affect the size of the tax wedge.

91. The upper part of Table III-3 shows the difference between the pre-tax rate of return on a corporation's marginal investment and the post-tax rate of return received by a corporate

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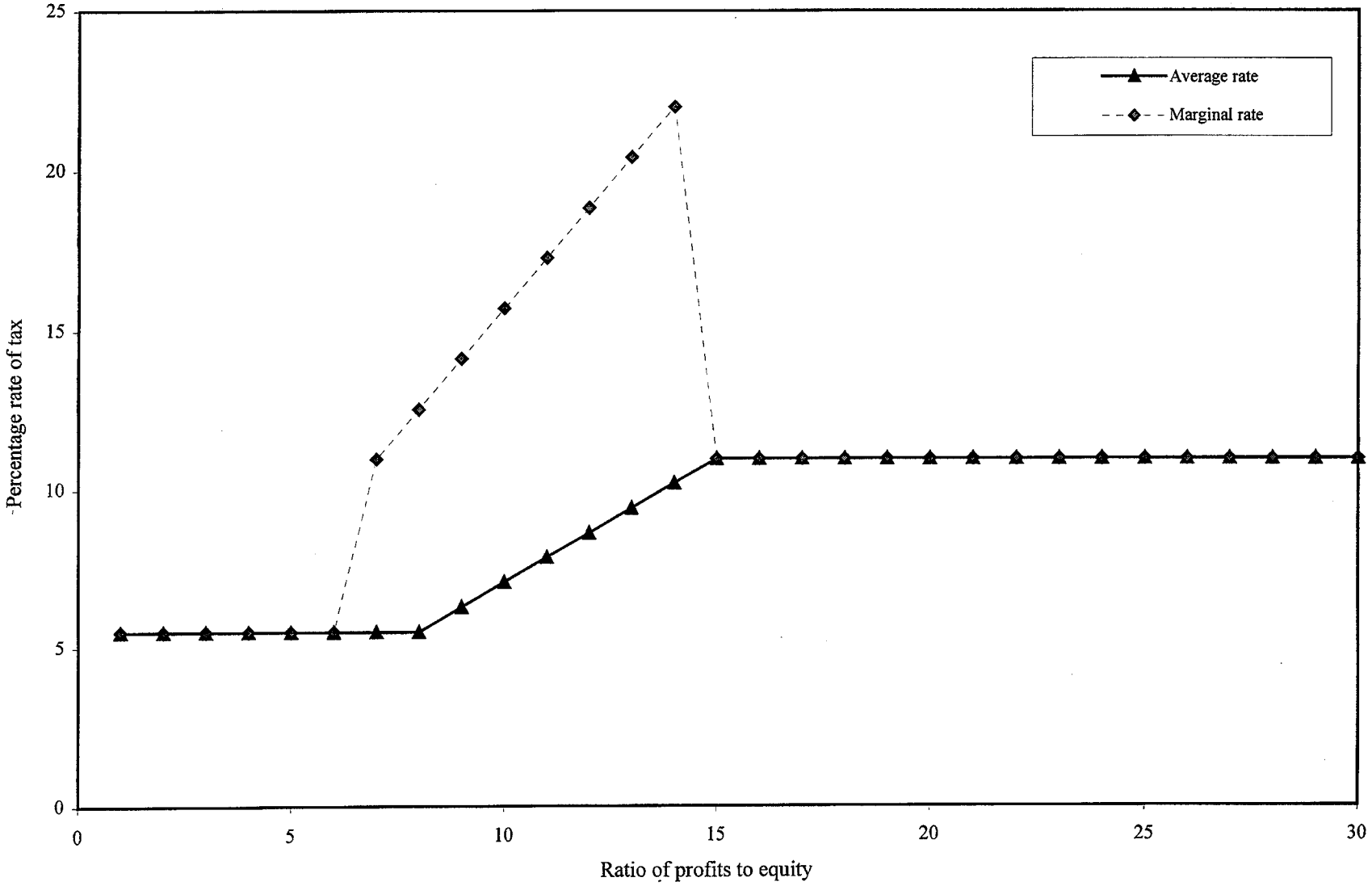
[41]See Zarin-Nejadan (1997).

[42]See King and Fullerton (1984) and Appendix II for a description of this methodology.

[43]The prevailing rate of interest is taken to be the rate of return on a government bond. As in other studies, including those of the OECD, this rate is assumed to be 5 percent.

Figure III-4. Switzerland: Company Taxation
in the Canton of Zug, 1998



Source: IMF staff calculations.

Table III-3. Switzerland: Marginal Effective Tax Wedges on Investments under the Current Tax Code 1/

Type of Investment	Mode of Financing			
	Retained Earnings	New Equity	Debt	Weighted Average
	I. Without personal income tax 2/			
Machinery	0.86	0.86	-1.12	-0.33
	(14.64)	(14.64)	(-28.75)	(-7.00)
Buildings	2.28	2.28	-0.15	0.82
	(31.34)	(31.34)	(-3.12)	(14.12)
Inventories	2.49	2.49	0.00	0.99
	(33.20)	(33.20)	(0.00)	(16.58)
Weighted average	1.78	1.78	-0.49	0.42
	(26.27)	(26.27)	(-10.76)	(7.76)
	II. With personal income tax 2/			
Machinery	0.45	5.16	1.08	0.83
	(13.77)	(64.78)	(27.77)	(22.75)
Buildings	1.26	7.05	2.04	1.73
	(31.02)	(71.53)	(42.15)	(38.16)
Inventories	1.39	7.30	2.19	1.87
	(33.20)	(72.24)	(43.90)	(40.06)
Weighted average	0.98	6.38	1.71	1.42
	(25.91)	(69.46)	(37.86)	(33.58)

Source: Staff calculations.

1/ Calculated using the 1998 inflation rate (0 percent) and a 5 percent real interest rate. Information on tax rates, deductions and allowances in Switzerland were taken from the OECD Tax Data Base (1998) which is based on the Confederation, canton and commune taxes paid in the canton of Zürich.

2/ Tax wedge is the difference, in percentage points, between required pre-tax real rate of return and after-tax real rate of return received by investor. Tax rate (shown in parentheses) is defined as the ratio of the tax wedge to the pre-tax real rate of return. For example, without personal income tax, the ratio of the average tax wedge (0.42) to the pre-corporate tax rate of return (5.42) was 7.76 percent.

investor. The lower part of the table shows the effective tax wedge facing personal investors who are in the top personal income tax rate bracket.[44] The overall average corporate tax wedge in Switzerland, excluding personal income taxes, is 0.4 percent (1.4 percent including personal taxes). This implies that the average pre-tax rate of return necessary to earn the equivalent to the post-tax rate of return on government bonds (5 percent) is 5.4 percent. However, the corporate tax wedge varies greatly by method of finance and by project; borrowing and machinery investment have comparatively low tax wedges.

92. The differential in the rate of return between assets represent a potential efficiency loss for the economy by affecting the direction of savings flows. At the corporate tax level, the full deductibility of interest payments and the stamp duty on equity issues bias investment toward debt financing. However, when personal income taxes are added to the tax wedge, the tax system favors investments financed by retained earnings. This reflects three influences: first, the taxation of profits on the basis of the return to equity; second, the "double taxation of dividends"; and third, the absence of effective personal capital gains taxation. This may in particular penalize new and expanding corporations that have limited self-financing capacity.

D. International Challenges to Taxation in Switzerland

93. The removal of controls on cross-border investments, the liberalization of foreign exchange regulations, and technological change have made financial transactions and capital income more mobile. Thus, the international challenges to tax systems resulting from closer economic integration, especially at the EU level, are most evident in these areas. In Switzerland, the stamp duty on the transfer of shares and the withholding system used to tax interest and dividend income are particularly subject to international pressures.

94. In response to competitive pressures from the EU, adjustments have already been made to the stamp duty levied by the Confederation on the issue of shares by corporations registered in Switzerland.[45] These duties, which in 1995 stood at 3 percent of the value of share issues, have been quickly adjusted downward. The most recent adjustment, on April 1, 1998, saw the issuance stamp duty reduced from 2 percent to 1 percent, the maximum

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[44]The figures reported in Table III-3 are derived using the weights reported for Switzerland by the OECD (1991): buildings, 26 percent; machinery, 40 percent; inventories, 34 percent; retained earnings, 40 percent; new equity, 0 percent; and debt, 60 percent.

[45]No issuance stamp duty is imposed on mergers, changes in legal structure, or on the transfer of shares of two or more corporations into holding companies. The corporate tax reform of 1997 reintroduced a stamp duty on certain life insurance policies. However, the stamp tax does not apply to insurance policies that form part of pension schemes.

rate that applies within the EU. A stamp duty is also levied on the nominal value of newly issued bonds and money market paper.[46]

95. Unusual, by continental European standards, is the stamp duty that is levied on the dealings in securities by securities brokers in Switzerland (banks, fund management companies, large corporations, or stock brokers).[47] The duty varies with respect to Swiss and foreign securities—domestic security transfers are subject to a 0.15 percent duty, and foreign securities, to a 0.3 percent duty. The rate applied also varies depending on the nature of the contracting partners; the duty is borne equally by the contracting partners when a broker acts as an intermediary; when a broker deals together with another contracting broker the duty is borne equally between them; when a Swiss broker deals in foreign securities with a foreign broker, the duty is halved.

96. The level of duty on securities transactions, which is high by international standards, discriminates against large transactions and against foreign transactions. Transfer stamp duties are reported to account for 40 percent of total transaction costs on volumes larger than Sw F 1 million.[48] Another indicator of the comparatively high stamp duty rate is the large share of revenues from financial and capital transaction taxes in total tax revenues (Table III-4).[49] The less favorable tax treatment of foreign securities transactions has also impacted the business strategy of Swiss banks that have participated in the share issues of foreign companies through foreign-controlled establishments. Meanwhile, domestic financial firms have lost some intermediation business with foreign partners.

97. The opening of the Swiss stock exchange to remote traders in 1999 will facilitate investment by Swiss brokers in foreign stock exchanges (and vice versa) and therefore increase the competitive tax pressures on stamp duty revenue. To ensure that the Swiss stock exchange is not at a competitive disadvantage relative to other European exchanges, the government has submitted a proposal to parliament to adopt the transfer tax on securities by exempting eurobond transactions on behalf of foreign clients and by eliminating double taxation of transactions on the new options/futures exchange (EUREX) established by the merger of Swiss and German exchanges in September 1998. Despite these changes, a transfer tax that treats large volume and foreign securities transactions unfavorably could put the

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[46]The duty is levied at a rate of 0.12 percent on debentures issued by resident debtors, 0.06 percent on bank-issued medium-term notes, and 0.06 percent on money market paper.

[47]The United Kingdom and Ireland also levy such taxes.

[48]See *Auswirkungen der Europäischen Währungsunion auf die Bundessteuern* (1998).

[49]The taxation of capital gains in other countries increases the tax burden on securities. While capital gains are not taxed in Switzerland, interest and dividend payments are subject to an internationally high withholding tax of 35 percent.

Table III-4. Switzerland: International Comparison of the Share of Financial and Capital Transaction Taxes in Total Tax Revenue, 1980–95

(In percent of total tax revenues)

	1980	1985	1990	1995
Austria	0.59	0.56	0.74	0.67
Belgium	1.50	1.19	1.91	1.63
Denmark	1.35	1.43	1.12	0.74
Finland	1.43	2.04	1.74	0.80
France	1.25	1.03	1.36	0.98
Germany	0.54	0.64	0.68	0.47
Greece	2.98	1.50	3.21	2.26
Ireland	1.44	1.05	1.72	1.62
Italy	3.50	2.29	2.11	2.36
Luxembourg	1.96	1.67	3.12	1.78
Netherlands	0.91	0.74	0.99	1.14
Portugal	1.19	1.06	1.31	1.07
Spain	3.50	2.02	2.39	2.19
Sweden	0.44	0.76	1.73	0.37
United Kingdom	0.77	0.85	0.87	0.78
EU average	1.56	1.26	1.67	1.26
Switzerland	1.78	3.14	2.66	1.74

Sources: OECD Revenue Statistics (1998); and staff calculations.

Swiss securities exchange at a disadvantage and result in a loss of tax revenue as brokers take advantage of remote access facilities.

98. As EU members attempt to ensure some effective minimum taxation of interest payments, Switzerland is likely to come under increasing political pressure to change its withholding tax system.[50] In contrast to other EU countries, withholding taxes are levied on all interest payments made to residents and nonresidents.[51] Most other countries exempt nonresidents from withholding taxes. The coexistence of these two systems means that cross-border interest and dividend payments can go untaxed. For instance, an investor can avoid withholding taxes by investing in Swiss franc assets issued by *foreign*-based debtors. Moreover, income earned from trust funds based in foreign countries is also exempt from withholding taxes. As the EU attempts to move to a system where nonresident investors are subject to withholding tax or given the option to be taxed in their country of residence, external pressure to bring Switzerland's system of withholding taxation into line with EU arrangements could be significant.

E. Directions for Tax Reforms

99. The discussion of the challenges posed both by Switzerland's decentralized tax system and by the international competitiveness of capital income taxes suggests two broad directions for tax reforms: (i) the harmonization of the tax base definitions across the cantons and the Confederation; and (ii) a shift from direct to indirect taxes. While tax base definitions have been harmonized between the cantons and communes, a material harmonization of the Confederation and canton tax base definitions has not yet occurred. Opportunities to shift from direct to indirect taxes will arise in the context of decisions on raising the VAT rate to ensure the long-term financing of the social security system, and ecological tax reform.

100. Owing to various internal pressures, a formal harmonization of the decentralized system of direct taxation has already started in Switzerland. The 1990 *Federal Law on the*

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[50]A recent EU directive on cross-border interest payments (see COM 295, 1998), proposes that a withholding tax be collected on interest payments to nonresidents by the payment agent (be it the original debtor or a financial intermediary). Nonresidents could choose to pay the withholding tax in the country of residence only if proof of the country of residence is provided. For EU members that do not impose withholding taxes, it is proposed that information on nonresident interest earnings be given to the country where the interest income recipient is resident for tax purposes.

[51]Recipients of the interest and dividend income who are resident in Switzerland can request a refund of the withholding tax as long as this income was fully declared for income and capital taxation purposes. For nonresidents, the withholding tax represents the final charge; relief is possible only if a double taxation convention exists between Switzerland and the country of residence.

Harmonization of Cantonal and Municipal Direct Tax (StHG) provides a framework within which the cantons must define their direct taxation laws, particularly with respect to the tax liability of persons and legal entities, assets, and tax periods, by 2001.[52] With the exception of the annual coefficient of taxation,[53] the law has resulted in a real and formal harmonization of the direct income tax base between the cantons and the communes. However, the 1990 *Federal Law on Direct Taxation* (DBG) has not resulted in a material harmonization of the income tax base definition at the federal and lower levels of government.[54] The cantons are still free to define their own tax scales, the amounts of allowances and deductions, tax rates, and collection systems.

101. Under the StHG, the cantons have until 2001 to decide whether to assess and collect taxes on a current-year basis or to maintain their existing system. If most cantons have changed to the current-year assessment and collection system by the end of 2001, the federal government may also implement a similar system for its direct taxes and impose the system on those cantons which had not yet changed. To encourage the cantons to change and to compensate tax-payers for the administrative costs of annual assessment, the Confederation will reduce the federal income tax rate in those cantons that change. It is expected that when the larger cantons such as Zürich convert, the rest of the cantons will follow their example.

102. Notwithstanding the expected progress in the harmonization of income tax collection lags, further steps to ensure the material harmonization in the definition of income tax bases across the cantons would be desirable from the perspectives of fiscal neutrality and efficiency. Distortions in the use and allocation of resources stemming from the tax system would be minimized if the taxation of mobile tax bases were similar across cantons while material harmonization of tax base definitions would enhance the perceptibility of the tax system and reduce administrative and compliance costs. The financial constraints facing the mountain and the city cantons could be reviewed in the context of overall reform of inter-governmental relations. As regards corporate taxation, the compliance costs for firms that operate in several cantons could be reduced if they were taxed in only one canton. Finally, the neutrality of the corporate tax system would be enhanced by the introduction of proportional corporate tax rates at the cantonal level and by some minimum tax on personal capital gains.

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[52]This law came into force on January 1, 1993. The cantons are obliged to adjust their legislation to the StHG by 2001.

[53]Most of the cantonal tax laws contain rates that show only the basic amount of tax. This amount has to be multiplied by an annual multiple to obtain the final amount of tax due. For example, the following multiples apply in the canton of Zürich: 108 percent for canton taxes, 130 percent for commune taxes, and 11 percent for parish taxes.

[54]This law came into force on January 1, 1995.

103. An adjustment in the composition of the tax burden by shifting from direct to indirect taxes could improve the efficiency of the tax system because broad-based consumption taxes generally impose fewer distortions than direct taxes. From an employment and growth perspective, broad-based consumption taxes are more favorable than direct taxes because they spread the tax burden over the whole population instead of focusing on employees and lowering the required rate of return on investment. Moreover, higher consumption taxation would reduce the pressure from international tax competition by lowering the dependence on tax revenues raised from more mobile capital and personal income. Existing proposals to finance the social security system through increases in the standard VAT rate will help expand the share of indirect taxes in total tax revenues but will still leave the standard VAT rate substantially below the EU average (Table III-5). This suggests that there is even further scope for VAT rate adjustments.

104. Without any compensatory reductions in direct taxes, further increases in the standard VAT rate to the minimum in neighboring EU countries (15 percent) would have substantial revenue implications for Switzerland. However, a number of factors could reduce these initial budgetary gains. First, changes in demand could follow the VAT rise because the rise in prices could leave consumers feeling worse off because their income would purchase less than before. Second, VAT increases could affect frontier trade by pushing the Swiss price level even higher.[55] Finally, rising VAT rates could also have macroeconomic repercussions on inflation, wages, interest rates, and exchange rates. While calculations are not available for Switzerland, it has been estimated for some EU countries that the initial impact of a VAT rate rise on the budget balance is reduced by a factor of two to three after five years.[56]

105. In line with initiatives taken in other countries, environmental taxation can be expected to play a growing role in efforts to shift the tax structure away from income taxation toward indirect taxes. Proposals already exist in Switzerland that stress the need to shift the tax burden away from wage income onto consumption and production, which have a negative effect on the environment. However, it is also important that environmental taxes be structured to give consumers correct incentives in their use of energy. In this regard, emission-based taxes (specific taxes on emissions) or indirect environmental taxes (carbon taxes on nonrenewable fossil fuels) could have positive effects on the environment, although the impact of such taxes on international competitiveness must be considered. Moreover, if effective in reducing emissions, green-taxes could undermine the tax base and generate lower tax revenues than predicted. Nevertheless, an environmental tax reform could seek to remove the

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[55]According to the WTO (1996), prices in Switzerland exceeded the EU average by almost 50 percent. The share of Swiss households carrying out cross-border purchases is reported by Benetti, Flückiger, and Ramirez (1995) to have risen from 30 percent to 42 percent between 1990 and 1994. Cross-border expenditures were estimated at Sw F 1.5 billion in 1994 (0.4 percent of GDP).

[56]See CEPS (1989).

Table III-5. Switzerland: International Comparisons of VAT Rates and VAT Revenue

	Standard Rate 1997	Reduced Rates 1997	VAT % Tax Revenues 1996	VAT % of GDP 1996
Austria	20.0	10, 12	19.1	8.4
Belgium	21.0	1, 6, 12	15.3	7.0
Denmark	25.0	n.a.	19.5	10.2
Finland	22.0	12, 17	17.8	8.6
France	20.6	2.1, 5.5	17.7	8.1
Germany	16.0	7	17.6	6.7
Greece	18.0	4, 8	23.3	9.5
Ireland	21.0	0, 2.8, 12.5	20.9	7.0
Italy	20.0	4, 10	13.0	5.6
Luxembourg	15.0	3, 6, 12	15.0	6.7
Netherlands	17.5	6	16.1	7.0
Portugal	17.0	8	22.8	8.0
Spain	16.0	4, 7	16.4	5.5
Sweden	25.0	12, 21	13.5	7.0
United Kingdom	17.5	0, 8	19.4	7.0
Unweighted EU average	19.4	n.a.	17.8	7.5
Switzerland 1/	6.5	2	9.6	3.3

Source: International Bureau of Fiscal Documentation, OECD Revenue Statistics (1998).

1/ In 1999, the standard rate of VAT is to be increased by 1 percent to 7.5 percent.

hidden subsidies to environmentally damaging activities, such as the reduced VAT rate on fertilizers, that are embedded in the present tax system.

106. In conclusion, the challenges to the tax system in Switzerland are both domestic and external in origin. Currently, both the Confederation and the cantons can change tax rates and set tax bases. This has resulted in a lack of harmonization in tax base definitions across Switzerland that has increased the efficiency and compliance costs of the tax system. In addition, the dominance of direct taxes in overall tax revenues further raises economic efficiency costs. Externally, closer EU integration and globalization have increased the pressures for comprehensive reform, especially in the area of financial transaction taxation and interest income taxation. Two broad policies could address these challenges: the further harmonization of tax base definitions across the cantons and a strengthening of indirect taxation through increased consumption and ecological taxation.

EFFECTIVE AVERAGE TAX RATES BASED ON MACROECONOMIC DATA

107. Mendoza, Razin, and Tesar compute effective average tax rates using national accounts and actual tax revenue data. These effective tax rates are consistent with the average tax rates faced by a representative agent in a general equilibrium setup. The numerators measure the difference between the before-tax and after-tax values of consumption, labor income, and capital income, approximated by the tax revenue collected from each tax. The tax bases in the denominators measure consumption, labor income, and capital income net of taxes.

Effective average tax rate on consumption

108. The effective average tax rate on consumption, τ_c, is calculated as the ratio of revenues from indirect taxation (general taxes on goods and services, t_g, and excise taxes, t_e) relative to the net of tax value of consumption as the tax base,

$$\tau_c=[(t_g+t_e)/(C+G-G_w-t_g-t_e)],$$

where the part of public consumption that is typically subject to indirect taxes excludes compensation of government employees, G_w.

Effective average tax rate on labor income

109. The effective tax rate on labor income, τ_l, is derived in two steps, under the assumption that all sources of household income are taxed at the same rate. First, the average tax rate on total household income, τ_h, is calculated as the ratio of household income tax revenue, t_h, as a percent of the sum of wage income, W, households' property and entrepreneurial income, P_h, and the operating surplus of unincorporated businesses, OS_u.

$$\tau_h=t_h/[W+P_h+OS_u]$$

Second, the effective average tax rate on labor income combines the estimated tax on wages and salaries, $\tau_h W$, with social security contributions, t_S, and other payroll taxes, t_P, and expresses it as a ratio to gross income from dependent employment (i.e., the sum of wages and salaries, W, plus employer-paid social security contributions, S_E)

$$\tau_l=[\tau_h W+t_S+t_P]/[W+S_E].$$

Effective average tax rate on capital income

110. The effective average tax rate on capital income, τ_k, is defined as the ratio of capital income taxes to the total operating surplus in the economy, OS.

$$\tau_k=[\tau_h(OS_u+P_h)+t_{corp}+t_{prop}+t_{fin}]/OS.$$

Capital income taxes in the numerator are the sum of the estimated capital income tax paid by households, $\tau_h(OS_u+P_h)$, the corporate income tax, t_{corp}, property taxes, t_{prop}, and taxes on financial transactions, t_{fin}.

MARGINAL EFFECTIVE TAX RATES ON INVESTMENT

111. The measures of marginal effective tax rates on investments follow the methodology of King-Fullerton.[57] Corporate and personal income taxes drive a wedge between the pre-tax real rate of return, p, on an investment, and the after-tax real rate of return, s. Thus, the tax wedge reflects the marginal effective tax rate on capital in that it measures the impact of tax on a marginal investment. The wedge can be thought of as the additional return needed to cover the cost of capital income taxes, and incorporates the statutory tax rate the structure of the tax system, and the definition of the tax base into one measure.

112. Consider an investment project with a depreciation rate of δ. The present value of the marginal investment project is calculated using information on the corporate tax rate, the economic depreciation rates of the assets involved, and the rate of inflation. Depreciation allowances and other tax incentives are denoted by A, and the net cost of an investment projection (1-A) is equal to the present value of the discounted future post-tax cash-flow. The pre-tax rate of return, p, is calculated as

$$p = \left[\frac{(1 - A)}{(1 - \tau)(1 + \pi)} \right] \{\rho - \pi + \delta (1 + \pi)\} - \delta$$

where τ is the corporate tax rate, ρ is the discount rate, and π is the inflation rate.

113. Suppose an investor can earn a nominal interest rate, i, on an alternative investment subject to a personal income tax rate of m. Then the post-tax rate of return, s, on the alternative investment is

$$s = \frac{1 + i(1 - m)}{1 + \pi} - 1 .$$

114. The marginal effective tax rate, t, on income from an investment project is defined as the ratio of the tax wedge (between the pre-tax rate of return on an investment, p, and the post-tax rate of return for an investor, s) and the pre-tax rate of return, p,

$$t = (p - s)/ p$$

115. In the absence of taxes, the discount rate used to discount the project's cash flow would be equal to the rate of return in the capital market, i. However, with corporate and personal taxes, the discount rate depends on how the investment project is financed. For example, for debt financing the appropriate discount rate is $p=(1-\tau)i$, because interest payments are tax deductible for the corporation. For new equity issues, the discount rate is $p=I/\phi$, where ϕ captures the different tax rates on retained earnings and distributed profits. For retained earnings, the absence of capital gains taxation implies that the discount rate is $p=(1-\tau)i$.

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[57]See OECD (1991), *Taxing Profits in a Global Economy.*

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Table A1. Switzerland: Real GDP Developments

(Percentage changes at 1990 prices) 1/

	1994	1995	1996	1997	1997				1998		
					1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.
Private consumption	1.0	0.5	0.4	1.2	-0.3	1.4	1.3	2.3	1.6	1.5	2.1
Public consumption	2.0	-0.1	1.4	-0.1	0.2	-0.3	-0.3	-0.0	-0.1	0.5	0.8
Gross fixed investment	6.5	1.8	-2.7	1.4	-2.0	0.9	1.6	4.5	6.4	3.1	2.4
Construction	7.1	-3.8	-6.2	-1.5	-4.0	-2.1	-1.5	1.0	2.3	0.4	1.6
Machinery and equipment	5.8	9.7	1.6	4.9	-0.1	4.7	6.0	8.2	10.1	6.3	3.3
Final domestic demand	2.5	0.7	-0.2	1.1	-0.5	1.0	1.1	2.5	2.3	1.8	2.0
Inventory accumulation 2/	0.1	1.1	0.2	0.3	-1.6	-0.3	-0.2	1.0	4.2	1.8	-0.5
Total domestic demand	2.7	1.8	0.0	1.4	-1.4	0.9	1.8	2.7	5.8	3.5	2.2
Exports of goods and nonfactor services	1.8	1.6	2.5	8.6	2.1	9.5	11.1	13.2	8.9	5.1	4.6
Imports of goods and nonfactor services	7.9	5.1	2.7	7.8	-1.1	8.6	9.6	11.7	15.7	8.2	5.5
Foreign balance 2/	-2.0	-1.3	-0.1	0.3	1.6	-0.2	1.2	0.5	-3.8	-1.6	-0.9
GDP	0.5	0.6	-0.0	1.7	-0.1	1.2	2.4	3.3	3.2	2.2	1.8

Source: Swiss Institute for Business Cycle Research, data tape.

1/ For quarterly data, growth rates are with respect to the same quarter of the previous year.

2/ Contribution to growth of GDP.

Table A2. Switzerland: Components of Nominal GDP

(In millions of Swiss francs, at current prices)

	1994	1995	1996	1997
Private consumption	211,182	215,921	219,248	223,206
Public consumption	54,800	54,994	56,166	55,938
Gross fixed investment	78,717	77,606	73,526	72,532
Construction	45,437	43,814	39,940	38,141
Machinery and equipment	33,280	33,792	33,586	34,391
Final domestic demand	339,040	345,825	347,245	349,728
Inventory accumulation	-3,274	398	590	2,820
Total domestic demand	341,425	348,919	349,530	354,496
Exports of goods and nonfactor services	127,003	127,523	131,527	147,480
Imports of goods and nonfactor services	111,014	112,952	116,294	130,858
Foreign balance	15,989	14,571	15,233	16,622
GDP	357,414	363,490	364,763	371,118

Source: Swiss Institute for Business Cycle Research, data tape.

Table A3. Switzerland: Components of Real GDP

(In millions of Swiss francs, at constant 1990 prices)

	1994	1995	1996	1997
Private consumption	182,932	183,876	184,698	186,962
Public consumption	49,354	49,304	50,012	49,961
Gross fixed investment	80,756	82,186	79,927	81,083
Construction	47,450	45,655	42,823	42,177
Machinery and equipment	33,306	36,531	37,104	38,905
Final domestic demand	313,042	315,366	314,637	318,006
Stockbuilding	-3,003	390	1,177	2,233
Total domestic demand	310,039	315,756	315,814	320,239
Exports of goods and nonfactor services	119,835	121,787	124,845	135,589
Imports of goods and nonfactor services	115,356	121,289	124,526	134,278
Foreign balance	-8,708	-12,635	-11,905	-10,492
GDP	314,518	316,254	316,133	321,550

Source: Swiss Institute for Business Cycle Research, data tape.

Table A4. Switzerland: Implicit Price Deflators

(Percent changes)

	1994	1995	1996	1997
Gross domestic product	1.6	1.1	0.4	0.0
Total domestic demand	-0.0	0.3	0.2	0.0
Private consumption	1.1	1.7	1.1	0.6
Public consumpion	0.4	0.5	0.7	-0.3
Gross fixed investment	-2.0	-3.1	-2.6	-2.8
Construction	-0.0	0.2	-2.8	-3.0
Machinery and equipment	-4.6	-7.4	-2.1	-2.3
Exports of goods and nonfactor services	-0.4	-1.2	0.6	3.2
Imports of goods and nonfactor services	-4.8	-3.2	0.3	4.4
Memoranda items:				
Final domestic demand	0.1	0.4	0.4	-0.3
Total demand	-0.6	0.2	0.2	1.7

Source: Swiss Institute for Business Cycle Research, data tape.

Table A5. Switzerland: Household Disposable Income and Savings

(Percent change, unless otherwise indicated)

	1994	1995	1996	1997
National income	1.8	3.0	0.8	3.3
Income from property and entrepreneurship	3.8	4.9	1.9	10.1
Gross income from dependent employment	1.1	2.4	0.4	0.7
Personal income from property and entrepreneurship	0.1	-0.0	4.9	10.1
Transfers to households	2.8	2.7	3.5	3.0
Taxes and transfers paid	3.9	2.1	3.3	2.9
Direct taxes	7.6	-2.6	2.8	2.3
Social security contributions	2.2	4.1	2.1	3.7
Transfers to government	7.2	2.8	-0.5	1.7
Transfers abroad	0.4	2.6	-0.5	1.7
Household disposable income	0.0	2.5	1.5	2.2
Saving	-17.1	5.2	0.6	5.8
Saving ratio (in percent)	9.0	9.2	9.1	9.5
Private consumption, nominal	2.1	2.2	1.5	1.8
Private consumption deflator	1.1	1.9	1.2	0.5
Private consumption, real	1.0	0.5	0.4	1.2

Source: Swiss Institute for Business Cycle Research, data tape.

Table A6. Switzerland: Labor Market

(In millions)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Population	6.67	6.72	6.75	6.84	6.91	6.97	7.02	7.06	7.08	7.10	...
Labor force	3.63	3.72	3.84	3.91	3.90	3.95	3.96	3.96	3.98	3.99	...
Employment	3.61	3.70	3.82	3.87	3.80	3.78	3.79	3.80	3.81	3.80	...
Unemployment	0.02	0.02	0.02	0.04	0.09	0.16	0.17	0.15	0.17	0.19	0.14
Unemployment rate (In percent)	0.6	0.5	0.5	1.1	2.5	4.5	4.7	4.2	4.7	5.2	...

Source: Swiss Institute for Business Cycle Research, data tape; Federal Statistical Office.

Table A7. Switzerland: Prices, Wages, and Productivity

(Percentage changes) 1/

	1995	1996	1997	1997		1998		
				3rd qtr.	4th qtr.	1st qtr.	2nd qtr.	3rd qtr.
Wholesale price index	0.0	-2.4	0.1	0.9	0.9	-0.2	-1.1	-1.9
Raw materials prices	10.1	3.3	-1.7	-3.8	-9.3	-20.7	-19.8	-22.5
Consumer price index	1.8	0.8	0.5	0.5	0.4	0.0	0.1	0.1
Goods	0.3	0.2	0.6	0.7	0.6	-0.0	0.0	-0.3
Services	3.0	1.3	0.5	0.3	0.1	0.0	0.1	0.4
Gross wage income per employed person	1.9	0.1	1.0	...	...	...	...	...
Real GDP per employed person	0.1	-0.3	2.0	2.4	3.5	1.8	0.9	0.5
Unit labor cost, economy-wide	1.8	0.4	-1.0	...	...	...	...	...
Export prices 2/	-2.0	0.3	3.9	3.2	1.7	0.0	-0.4	-0.3
Import prices 2/	-2.2	-0.3	4.7	6.7	3.4	-2.1	-4.0	-3.9

Sources: Swiss Institute for Business Cycle Research, data tape; IMF, World Economic Outlook database.

1/ For quarterly data, growth rates are with respect to the same quarter of the previous year.

2/ Deflators for goods.

Table A8. Switzerland: Federal Government Finances

(In billions of Swiss francs)

	1994	1995	1996	1997	1998 Projection	1999 Budget
Expenditure 1/	41.6	40.9	44.2	44.4	46.9	45.0
(In percent of GDP)	(11.6)	(11.2)	(12.1)	(12.0)	(12.3)	(11.7)
Current expenditure	35.9	36.3	38.8	37.8	40.5	39.7
(In percent of GDP)	(10.0)	(10.0)	(10.6)	(10.2)	(10.6)	(10.2)
Personnel	5.0	4.9	4.9	4.8	4.8	4.8
Goods 2/	5.4	5.4	5.4	5.0	5.1	5.0
Interest	3.1	3.1	2.9	3.1	3.4	3.7
Transfers	22.4	22.9	25.5	24.9	27.1	26.0
Cantons Municipalities	8.1	8.2	8.7	9.1	9.4	10.1
Social security and other	14.4	14.7	16.8	15.8	17.8	16.0
Capital expenditure 3/	5.7	4.5	5.4	6.6	7.5	6.3
Revenue	34.6	36.2	38.5	38.9	42.0	41.0
(In percent of GDP)	(9.7)	(9.9)	(10.5)	(10.5)	(11.0)	(10.8)
Taxes	31.4	32.1	35.0	34.7	36.1	37.5
Other	3.2	4.0	3.4	4.2	3.9	3.5
Fiscal balance (cash basis)	-6.9	-4.7	-5.8	-5.5	-4.9	-4.0
(In percent of GDP)	(-1.9)	(-1.3)	(-1.6)	(-1.5)	(-1.3)	(-1.0)
Railway loans	0.6	1.1	0.8	0.0	0.0	0.0
Fiscal balance (adjusted)	-7.6	-4.8	-6.6	-5.5	-4.9	-4.0
(In percent of GDP)	(-2.1)	(-1.3)	(-1.8)	(-1.5)	(-1.3)	(-1.0)
Memorandum item:						
Defense expenditure	5.9	5.9	5.9	5.4	5.5	5.2
(In percent of GDP)	(1.7)	(1.6)	(1.5)	(1.5)	(1.4)	(1.3)

Source: Federal Ministry of Finance.

1/ Up to 1996 excluding railway loans.
2/ Includes military procurement.
3/ Includes loans to unemployment insurance fund.

Table A9. Switzerland: Federal Government Tax Revenue

(In billions of Swiss francs)

	1993	1994	1995	1996	1997	1998 Projection	1999 Budget
Direct federal tax	7.9	9.0	8.2	9.0	9.7	8.9	9.8
Withholding tax	1.9	3.5	2.1	3.3	3.0	3.6	2.7
Stamp duties	2.2	2.0	1.7	2.0	2.5	2.4	3.1
Turnover tax/VAT 1/	9.4	9.4	12.4	12.1	12.5	13.2	13.8
Fuel taxes	4.0	4.3	4.3	4.4	4.1	4.6	4.7
Other	3.3	3.3	3.4	3.4	3.5	3.5	3.4
Total	28.7	31.5	32.1	34.2	35.3	36.2	37.5
(In percent of GDP)	(8.2)	(8.8)	(8.8)	(9.4)	(9.5)	(9.5)	(9.6)

Source: Federal Ministry of Finance.

1/ VAT was introduced at the beginning of 1995.

Table A10. Switzerland: Federal Government Assets and Liabilities

(End-of-period; in billions of Swiss francs)

	1992	1993	1994	1995	1996	1997
Assets	60.8	74.8	83.4	94.8	98.0	107.7
Financial assets	19.7	25.0	26.5	33.0	30.3	33.2
Administrative and other	16.5	19.0	20.3	20.2	20.5	21.9
Balancing item 1/	24.6	30.9	36.6	41.6	47.2	52.6
Liabilities	60.8	74.8	83.4	94.8	98.0	107.7
Gross financial debt	55.6	69.8	78.3	89.2	91.7	100.0
(In percent of GDP)	(16.4)	(20.3)	(22.3)	(24.6)	(25.2)	(26.9)
Current payables	3.8	5.1	6.9	11.2	3.2	4.4
Short-term debt	13.5	17.6	19.3	22.6	26.9	27.7
Medium- and long-term debt	18.3	26.1	29.8	32.0	34.8	40.6
Other 2/	20.0	20.9	22.4	23.4	26.8	27.3
Valuation adjustments	3.3	3.6	3.8	4.0	4.5	5.5
Other	1.8	1.4	1.2	1.5	1.9	2.2
Memorandum item:						
Net financial debt 3/	36.0	44.9	51.8	56.3	61.4	66.8
(In percent of GDP)	(10.6)	(13.1)	(14.7)	(15.5)	(16.9)	(18.0)

Source: Federal Ministry of Finance.

1/ Amount by which liabilities exceed all other assets.
2/ Largely deposits of federal pension fund (EVK) with the federal government.
3/ Difference between gross financial debt and financial assets.

Table A11. Switzerland: General Government Finances

	1991	1992	1993	1994	1995	1996	1997	1998 Projection	1999 Budget
					(In billions of Swiss francs)				
Federal government 1/									
Revenue	31.5	32.8	31.4	34.6	36.1	38.5	38.9	42.0	41.0
Expenditure	35.5	37.8	41.1	41.6	40.9	44.2	44.4	46.9	45.0
Balance	-4.0	-5.0	-9.7	-6.9	-4.8	-5.8	-5.5	-5.0	-4.0
Cantons									
Revenue	41.8	44.2	47.0	48.8	50.1	52.9	54.0	54.9	56.0
Expenditure	45.6	48.3	52.4	52.5	52.1	55.1	56.8	58.1	58.1
Balance	-3.8	-4.2	-5.4	-3.7	-2.0	-2.2	-2.8	-3.2	-2.1
Communes									
Revenue	31.1	33.3	35.9	37.0	37.6	38.2	39.2	39.8	40.6
Expenditure	33.2	36.0	37.1	37.9	38.4	38.7	39.2	40.4	41.1
Balance	-2.2	-2.6	-1.2	-0.9	-0.8	-0.5	0.0	-0.6	-0.5
Territorial authorities									
Revenue	86.3	91.1	94.5	100.2	103.6	107.5	109.2	109.8	110.2
Expenditure	96.3	103.0	110.8	111.7	111.1	115.9	117.5	122.6	116.8
Balance	-10.0	-11.8	-16.3	-11.5	-7.5	-8.4	-8.3	-8.8	-6.6
Social security									
Revenue	32.2	33.8	38.1	38.8	40.9	41.2	42.0	43.0	46.1
Expenditure	29.3	33.8	35.0	37.4	40.2	39.9	41.7	43.3	45.2
Balance	2.9	0.0	3.1	1.4	0.7	1.4	0.3	-0.3	0.9
General government									
Revenue	109.9	115.7	122.3	127.8	132.7	135.6	137.6	141.1	146.1
Expenditure	117.0	127.5	135.0	137.7	139.2	142.0	145.6	150.2	151.8
Balance	-7.1	-11.8	-13.3	-10.1	-6.8	-7.1	-8.0	-9.1	-5.7
Gross debt									
Federal government	43.9	55.3	66.0	73.3	79.9	86.0	93.1	101.1	105.1
Cantons	35.0	40.8	47.0	51.6	53.4	56.8	59.6	62.8	64.9
Communes	31.0	33.8	35.0	36.0	37.0	37.5	37.5	38.1	38.6
General government debt (gross)	109.9	129.8	147.9	160.9	170.4	180.3	190.2	202.0	208.6
					(In percent of GDP)				
Federal government 1/									
Revenue	9.4	9.6	9.0	9.7	9.9	10.5	10.5	11.0	10.5
Expenditure	10.6	11.0	11.8	11.6	11.2	12.1	12.0	12.3	11.6
Balance	-1.2	-1.5	-2.8	-1.9	-1.3	-1.6	-1.5	-1.3	-1.0

Table A11. Switzerland: General Government Finances (concluded)

	1991	1992	1993	1994	1995	1996	1997	1998 Projection	1999 Budget
Cantons									
Revenue	12.5	12.9	13.4	13.7	13.8	14.5	14.6	14.4	14.4
Expenditure	13.7	14.1	15.0	14.7	14.3	15.1	15.3	15.3	15.0
Balance	-1.1	-1.2	-1.5	-1.0	-0.5	-0.6	-0.8	-0.8	-0.5
Communes									
Revenue	9.3	9.7	10.3	10.3	10.3	10.5	10.6	10.5	10.5
Expenditure	10.0	10.5	10.6	10.6	10.6	10.6	10.6	10.6	10.6
Balance	-0.6	-0.8	-0.3	-0.2	-0.2	-0.1	0.0	-0.2	-0.1
Territorial authorities									
Revenue	25.9	26.6	27.0	28.0	28.5	29.5	29.4	28.8	28.3
Expenditure	28.9	30.1	31.7	31.3	30.6	31.8	31.7	32.2	30.0
Balance	-3.0	-3.5	-4.7	-3.2	-2.1	-2.3	-2.2	-2.3	-1.7
Social security									
Revenue	9.7	9.9	10.9	10.8	11.3	11.3	11.3	11.3	11.9
Expenditure	8.8	9.9	10.0	10.5	11.1	10.9	11.2	11.4	11.6
Balance	0.9	0.0	0.9	0.4	0.2	0.4	0.1	-0.1	0.2
General government									
Revenue	32.9	33.8	34.9	35.7	36.5	37.2	37.1	37.1	37.6
Expenditure	35.0	37.2	38.6	38.5	38.3	38.9	39.2	39.4	39.0
Balance	-2.1	-3.4	-3.8	-2.8	-1.9	-1.9	-2.2	-2.4	-1.5
Debt									
Federal government	13.2	16.1	18.9	20.5	22.0	23.6	25.1	26.6	27.0
Cantons	10.5	11.9	13.4	14.5	14.7	15.6	16.1	16.5	16.7
Communes	9.3	9.9	10.0	10.1	10.2	10.3	10.1	10.0	9.9
General government debt (gross)	33.2	38.3	43.2	45.6	47.0	49.4	51.3	53.0	53.7
Memorandum items:									
General government interest payments	1.6	1.9	2.0	2.1	2.2s	2.3	2.3	2.3	2.5
Pension fund surplus	0.6	0.6	0.4	0.5	0.3	0.3	0.3	...	...
Railway loans	0.3	0.2	0.0	0.2	0.3	0.2	...	...	...
Defense expenditure	1.9	1.8	1.6	1.7	1.6	1.5	1.5	1.5	1.5

Source: Federal Ministry of Finance.
1/ Excluding cash surplus of the civil servant pension fund from 1997 onwards including railway loans.

Table A12. Switzerland: Interest Rates and Equity Prices

	3-month Euromarket rates		Return on federal bonds	Swiss market index
	Sw F	DM		
1992	7.81	9.40	6.70	1,856.51
1993	4.87	7.18	4.84	2,375.74
1994	4.11	5.28	5.37	2,716.42
1995	3.01	4.45	4.69	2,833.79
1996	2.00	3.25	4.18	3,621.04
1997	1.65	3.28	3.54	5,213.74
1998	1.50	3.52	2.87	7,092.29
1995				
I	3.85	5.01	5.25	2,569.49
II	3.31	4.51	4.88	2,693.54
III	2.81	4.33	4.60	2,901.05
IV	2.08	3.94	4.05	3,171.06
1996				
I	1.71	3.38	4.19	3,370.74
II	2.14	3.28	4.35	3,608.56
III	2.27	3.21	4.25	3,669.98
IV	1.87	3.13	3.91	3,834.87
1997				
I	1.76	3.14	3.67	4,354.18
II	1.59	3.14	3.53	5,062.89
III	1.46	3.20	3.47	5,654.10
IV	1.81	3.66	3.50	5,783.77
1998				
I	1.17	3.51	2.93	6,851.34
II	1.63	3.58	3.09	7,559.92
III	1.78	3.48	2.96	7,393.12
IV	1.42	3.49	2.51	6,564.79
1997				
Jan.	1.77	3.07	3.84	4,047.91
Feb.	1.68	3.12	3.57	4,439.36
Mar.	1.84	3.22	3.61	4,575.27
Apr.	1.83	3.19	3.71	4,664.09
May	1.61	3.14	3.50	5,098.05
June	1.32	3.09	3.39	5,426.53
July	1.50	3.10	3.36	5,836.91
Aug.	1.46	3.24	3.50	5,601.52
Sep.	1.41	3.26	3.54	5,523.88
Oct.	1.79	3.54	3.56	5,714.14
Nov.	1.99	3.70	3.60	5,581.78
Dec.	1.63	3.73	3.35	6,055.39
1998				
Jan.	1.32	3.54	3.10	6,344.07
Feb.	1.03	3.49	2.85	6,909.62
Mar.	1.15	3.51	2.86	7,300.32
Apr.	1.43	3.59	3.07	7,469.79
May	1.58	3.61	3.10	7,584.48
June	1.89	3.55	3.09	7,625.49
July	2.05	3.51	3.17	8,185.14
Aug.	1.78	3.50	2.89	7,551.18
Sep.	1.50	3.45	2.84	6,443.04
Oct.	1.29	3.52	2.69	5,912.43
Nov.	1.50	3.60	2.54	6,861.29
Dec.	1.47	3.33	2.30	6,920.64

Source: Bloomberg and WEFA.

Table A13. Switzerland: Money and Credit

(Percentage changes over a year earlier)

	1992	1993	1994	1995	1996	1997	1998
Banknotes	0.1	1.5	1.9	0.7	2.4	2.8	1.9
Sight deposits with SNB	-9.9	3.9	1.0	-4.0	14.1	26.5	9.4
Monetary base	-0.9	1.7	1.8	0.3	3.4	5.0	2.8
Sight deposits	-0.3	13.2	7.9	6.3	15.6	15.0	10.0
M1	2.0	10.5	5.6	6.8	11.7	10.1	9.8
Saving deposits	3.6	21.5	14.2	3.4	12.1	3.6	0.2
M2	2.8	16.1	10.2	4.9	11.9	6.5	3.5
Time deposits	0.9	-17.5	-7.5	-5.8	-9.6	-0.8	-9.2
M3	2.1	3.9	5.1	2.2	6.9	5.1	1.2
Domestic credit 1/	2.4	3.6	3.5	2.8	-0.2	2.6	0.8
Public sector	6.6	27.5	3.9	1.5	3.8	0.1	...
Private sector	2.2	1.8	3.5	2.9	-0.6	2.9	...

Sources: Swiss Institute for Business Cycle Research, data tape; IMF, International Financial Statistics database.

1/ For 1998, January-October 1998.

Table A14. Switzerland: Exchange Rate Developments

	Sw F/$	DM/Sw F	FF/Sw F	Sw F/£	Nominal Effective Exchange Rate 1/	Real Effective Exchange Rate 2/
1991	1.4340	1.1577	3.9360	0.8158	99.1	99.5
1992	1.4062	1.1112	3.7671	0.8022	102.1	97.8
1993	1.4776	1.1191	3.8338	0.9855	106.1	100.0
1994	1.3677	1.1867	4.0608	0.8948	106.4	104.7
1995	1.1825	1.2125	4.2234	0.7494	111.8	111.5
1996	1.2360	1.2180	4.1413	0.7916	108.9	108.4
1997	1.4513	1.1947	4.0213	0.8867	103.9	100.3
1998	1.4498	1.2140	4.0703	0.8757	104.1	101.3
1995						
I	1.2434	1.1907	4.1597	0.7862	110.9	108.8
II	1.1542	1.2097	4.2607	0.7228	112.9	112.1
III	1.1814	1.2122	4.1890	0.7509	111.5	111.2
IV	1.1508	1.2372	4.2843	0.7376	112.0	113.8
1996						
I	1.1908	1.2332	4.2285	0.7777	110.6	111.7
II	1.2436	1.2242	4.1480	0.8160	108.5	108.6
III	1.2230	1.2248	4.1655	0.7869	108.9	109.0
IV	1.2867	1.1899	4.0234	0.7859	107.5	104.3
1997						
I	1.4373	1.1539	3.8939	0.8821	105.6	98.9
II	1.4454	1.1858	3.9979	0.8839	104.3	100.1
III	1.4898	1.2138	4.0862	0.9175	102.2	100.0
IV	1.4327	1.2254	4.1071	0.8634	103.3	102.3
1998						
I	1.4760	1.2325	4.1306	0.8972	102.7	102.3
II	1.4932	1.2012	4.0286	0.9033	103.7	100.0
III	1.4704	1.1994	4.0192	0.8908	104.7	100.6
IV	1.3596	1.2229	4.1026	0.8116	105.4	102.7
1997						
Jan.	1.3936	1.1512	3.8870	0.8397	106.1	99.3
Feb.	1.4535	1.1522	3.8905	0.8940	105.4	98.6
Mar.	1.4650	1.1583	3.9042	0.9126	105.4	98.8
Apr.	1.4619	1.1704	3.9418	0.8975	104.9	99.5
May	1.4322	1.1893	4.0101	0.8769	104.5	100.6
June	1.4421	1.1977	4.0419	0.8773	103.6	100.2
July	1.4817	1.2094	4.0788	0.8867	102.0	99.6
Aug.	1.5145	1.2165	4.0971	0.9447	101.8	99.7
Sep.	1.4732	1.2154	4.0828	0.9210	102.8	100.6
Oct.	1.4525	1.2094	4.0568	0.8906	103.3	100.5
Nov.	1.4073	1.2315	4.1271	0.8339	103.5	102.9
Dec.	1.4382	1.2353	4.1373	0.8657	103.2	103.4
1998						
Jan.	1.4757	1.2310	4.1225	0.9024	102.8	102.6
Feb.	1.4638	1.2394	4.1566	0.8929	102.7	102.9
Mar.	1.4886	1.2271	4.1127	0.8962	102.5	101.3
Apr.	1.5064	1.2047	4.0384	0.9010	102.9	99.6
May	1.4792	1.1997	4.0237	0.9033	104.1	100.2
June	1.4939	1.1994	4.0239	0.9056	104.1	100.2
July	1.5136	1.1878	3.9790	0.9210	104.1	99.2
Aug.	1.4950	1.1964	4.0100	0.9165	104.7	100.5
Sep.	1.4027	1.2141	4.0685	0.8348	105.3	102.2
Oct.	1.3356	1.2263	4.1142	0.7882	105.8	103.6
Nov.	1.4073	1.2315	4.1271	0.8339	103.5	101.7
Dec.	1.4382	1.2353	4.1373	0.8657	103.2	...

Source: IMF, International Financial Statistics database.
1/ Against the 21 most important trading partners.
2/ Against the 10 most important trading partners and based on relative consumer prices.

Table A15. Switzerland: Balance of Payments

(In billions of Swiss francs)

	1993	1994	1995	1996	1997
Current account balance	28.8	23.9	25.3	26.4	33.2
Merchandise trade balance	2.5	2.2	1.0	1.1	-0.5
Exports	96.8	99.4	99.9	102.2	114.2
Imports	94.4	97.2	98.8	101.1	114.7
Non factor services balance	16.8	15.6	15.2	15.4	18.8
Exports	31.7	31.7	30.9	32.5	37.2
Of which: Tourism	11.3	11.3	11.4	11.0	11.5
Imports	14.9	15.3	15.6	17.1	18.4
Of which: Tourism	8.8	8.8	8.8	9.3	10.1
Factor services balance	13.5	10.7	13.9	15.6	19.7
Capital services balance	20.7	17.5	20.8	22.4	26.2
Capital income	35.6	35.1	35.8	39.3	47.2
Capital payments	14.9	17.6	15.0	16.8	21.0
Labor services balance	-7.2	-6.9	-6.9	7.0	
Labor income	1.4	1.5	1.5	1.5	1.5
Labor payments	8.5	8.3	8.3	8.4	8.1
Net unrequited transfers	-4.1	-4.7	-5.0	-5.0	-4.9
Capital account balance	-31.2	-24.1	-14.1	-38.4	-35.5
Foreign direct investment	-13.1	-10.2	-11.8	-16.3	-14.6
Abroad	-13.0	-14.8	-14.4	-19.8	-21.0
Into Switzerland	-0.1	4.6	2.6	3.5	6.4
Portfolio investment	-26.3	-24.9	-4.6	-11.8	-15.0
Abroad	-44.8	-26.1	-10.5	-27.7	-30.4
Into Switzerland	18.5	1.2	5.9	15.9	13.1
Banking sector	2.4	15.1	-9.3	-13.8	0.6
Increase in credit claims	-3.6	-26.3	-11.2	-74.5	-74.3
Increase in credit liabilities	6.0	41.4	1.9	60.7	74.8
Net increase in fiduciary funds	14.7	-0.5	7.6	-3.0	
Enterprises	1.0	-2.0	1.5	0.0	0.3
Increase in claims	0.8	-11.9	1.2	-2.8	4.3
Increase in liabilities	0.2	9.8	0.3	2.8	-4.0
Other private sector	-6.0	-0.1	-2.0	8.1	-0.1
Other public sector	-0.1	-0.1	0.2	0.0	0.5
Changes in national bank reserves (- = increase)	-1.4	0.9	3.7	-7.8	-4.9
Revaluation of national bank reserves (- = increase)	0.8	-2.3	-3.5	4.4	1.8
Errors and omissions	-2.4	-0.2	11.2	-11.3	-2.3

Source: Swiss National Bank.

Table A16. Switzerland: Volumes and Values of Merchandise Trade 1/

	1992	1993	1994	1995	1996	1997
	(In billions of Swiss Francs unless otherwise indicated)					
Exports						
Volume (at 1990 prices)	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	4.0	1.4	3.4	2.6	2.0	7.6
Unit value index 2/	103.8	103.8	103.0	100.9	101.3	105.2
Percent change	0.9	-0.0	-0.7	-2.0	0.3	3.9
Value	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	4.9	1.4	2.7	0.5	2.3	11.8
Imports						
Volume (at 1990 prices)	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	-4.9	-0.3	8.1	4.0	2.5	8.4
Unit value index 2/	102.3	100.1	95.3	93.2	92.9	97.3
Percent change	2.4	-2.2	-4.8	-2.2	-0.3	4.7
Value	0.1	0.1	0.1	0.1	0.1	0.1
Percent change	-2.6	-2.6	3.0	1.7	2.2	13.5
Terms of trade index 3/	101.4	103.7	108.2	108.3	109.0	108.2
Percent change	-1.5	2.3	4.3	0.1	0.6	-0.7

Source: Swiss Institute for Business Cycle Research; data tape.

1/ On a national accounts basis.

2/ Value divided by volume.

3/ Export unit value divided by import unit value.

Table A17. Switzerland: Composition of Foreign Trade

(In billions of Swiss francs, current prices)

	1993	1994	1995	1996	1997
Exports, total	86.7	90.2	92.0	94.1	105.1
Agriculture	3.4	3.6	3.5	3.5	3.8
Energy	.1	.1	.1	.1	.3
Textiles	4.3	4.3	4.0	3.7	3.9
Paper	2.2	2.3	2.5	2.5	2.8
Leather, rubber, plastics	2.7	2.9	2.9	2.7	3.0
Chemicals	22.3	23.5	23.6	26.0	29.6
Minerals	.7	.7	.7	.7	.8
Metals	7.4	7.8	8.3	8.2	9.1
Machinery	24.8	26.1	27.3	28.0	30.8
Vehicles	1.8	1.7	1.9	2.4	2.5
Precision instruments, watches	15.3	15.5	14.9	14.7	1.7
Other	1.6	1.7	1.6	1.7	1.7
Imports, total	83.8	87.3	90.8	92.0	103.1
Agriculture	7.9	8.3	8.1	8.3	8.9
Energy	3.4	3.0	2.7	3.4	4.9
Textiles	8.5	8.4	7.9	7.8	8.4
Paper	3.7	3.9	4.2	4.0	4.2
Leather, rubber, plastics	3.4	3.6	3.6	3.5	3.7
Chemicals	11.9	12.5	13.0	13.5	16.8
Minerals	1.9	2.0	2.0	2.0	2.0
Metals	7.3	7.9	8.9	8.0	8.9
Machinery	18.0	19.0	20.5	20.8	23.1
Vehicles	8.4	9.2	10.6	11.2	11.3
Precision instruments, watches	5.9	5.8	5.6	5.8	6.9
Other	3.5	3.6	3.7	3.8	3.9
Exports, total	86.7	90.2	92.0	94.2	105.1
Raw materials and semi-finished products	25.0	26.5	27.0	26.7	29.7
Energy	.1	.1	.1	.1	.3
Equipment goods	30.1	31.3	33.3	34.1	37.5
Consumption goods	31.4	32.3	31.6	33.2	37.7
Imports, total	83.8	87.3	90.8	92.0	103.1
Raw materials and semi-finished products	25.7	27.4	28.7	27.1	30.5
Energy	3.4	3.0	2.7	3.4	4.9
Equipment goods	21.2	22.3	26.0	26.8	29.1
Consumption goods	33.4	34.5	33.4	34.7	38.7

Source: *Die Volkswirtschaft.*