Deflation and Deflationary Traps: The Situation in Switzerland

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JEL-Classification: E31, E58, E63
Keywords: deflationary trap, monetary policy, Switzerland, Japan

1. Introduction

The experience of Japan in the last decade has stimulated considerable debate among economists about the issues of deflation and the liquidity trap. There are, in fact, two questions that should be answered separately. Firstly, what is the likelihood of an economy falling into a *deflationary trap*, i.e., where prices are diminishing, the economy is not growing any more or even declining, and the policy interest rate has already hit the nominal zero floor without stimulating aggregate demand? Secondly, once trapped, is there really nothing the government – and in particular the central bank – can do to reflate the economy?

The response to the second question is uncontroversial: There exists no convincing theoretical argument that an aggressive fiscal and/or monetary policy will not be able to stimulate aggregate demand and pull the economy out of the trap. There is a growing consensus among economists that deflation and recession have persisted in Japan because of political constraints, rather than a lack of policy instruments (Posen, 1998; Krugman, 1998; Bernanke, 2000). Focusing on monetary policy, Section 4 of this paper will be dedicated to the policy options of a small open economy when the nominal short-term interest rate has reached the zero lower bound (ZLB) without stimulating aggregate demand.

The first question is much more disputed. For some economists, if the central bank follows a sufficiently aggressive Taylor rule, the economy should never fall

* Swiss National Bank (research group). I would like to thank U. Kohli, M. Peytrignet, T. Jordan, M. Savioz, A. Fischer, S. Reynard, C. Lack, A. Zanetti and an anonymous referee for helpful comments on earlier drafts of this paper. The views expressed here are nevertheless solely those of the author, and do not necessarily represent those of the Swiss National Bank.

into such a trap. For others, the answer is not so clear cut. The debate is exclusively theoretical, though, because the sample for serious empirical study is limited to only two observations: Japan in the 1990s and the US in the 1930s. Following this introduction, in section 2 of this paper we nonetheless attempt to use this limited information to identify a set of conditions that an economy must fulfil to fall into a deflationary trap.

In section 3 of the paper, we will compare Switzerland and Japan. Switzerland – a country characterized by a notoriously protected domestic market, a concentrated banking sector, high prices and wages, a high savings ratio, a low inflation rate and fairly modest performance in terms of real growth in the last decade – shares many features with Japan. It is thus tempting to draw parallels between the two countries and to speculate on a hypothetical deflationary risk in Switzerland. However, we will show that the conditions which presumably pushed the Japanese economy onto a deflationary path are not present in Switzerland and, therefore, the risk of falling into a deflationary trap is rather small.

2. Deflation: Should It Be a Concern?

2.1. Deflation: A definition

Per se, a mild deflation rate is neither rare nor an actual problem. The country with the strongest growth, China, is going through a period of persistently declining prices. Over the last five years, China's real GDP has grown at a robust 8 % per year, while its GDP deflator has declined roughly 10 % in the same period. Looking back at the more distant past, the US enjoyed a rapid rate of growth in the last three decades of the nineteenth century (1870–1900) yet, on average (alternating periods of inflation and deflation), prices fell.

Literally, price deflation means falling prices. In a world of perfectly flexible prices (neoclassical), deflation would be no more problematic than inflation. As with inflation, the cost of deflation would lie in the arbitrary redistribution of real wealth and in distorted and inefficient price signals. But if the world is not neoclassical – i.e. if prices are rigid, or at least sticky – deflation will result from a persistently negative output gap. Thus, what is usually meant by deflation is actually a *deflationary trap*, where prices are falling and are expected to fall in the foreseeable future, GDP is diminishing (or is growing persistently slower than its potential) and unemployment (above the natural rate) is growing, while the policy interest rate, stuck at zero, is powerless to reflate the economy. This set of circumstances should be clearly distinguished

from deflationary pressures originating from a shift in the aggregate supply curve[1] (AS) to the right (reflecting, for example, an increase in productivity or a worldwide commodity (oil) price decrease) or from harmless and temporary negative demand shocks. A *deflationary trap* results from a long-lasting deficiency in demand and is characterized by both deflationary expectations and the problem of the lower limit to nominal interest rates (the zero lower bound or ZLB), which can never be negative.

2.2. Why is a deflationary trap *so worrisome?*

As the last sub-section tried to make clear, it is not the decrease in prices[2] *per se*, which is worrisome in a deflationary trap, but the combination of the collapse of aggregate demand and the (assumed) powerlessness of monetary policy limited by the ZLB. Let's try to illustrate this view with a short example. Suppose that the economy has slowed down and reached a point where the policy interest rate, although pushed down to zero by the monetary authorities, is unable to stimulate aggregate demand sufficiently to close the output gap. In this particular situation, there is apparently nothing the central bank can do to further stimulate aggregate demand, since the nominal interest rate cannot be negative.[3] In the absence of any positive shock, prices may start to decline and deflationary expectations would appear, thereby increasing the real interest rate[4] and putting further pressure on aggregate demand. The economy is trapped[5]: It needs a lower

1 Associated *ceteris paribus* with an increase in output.

2 Some authors, especially in the financial and economic press, have nonetheless argued that deflation is special in that it leads to unusual behavior on the part of households. Were they to expect the price of durable goods to decrease in the future, households would postpone their purchases and this would add to the pressure on both aggregate demand and prices. The theoretical argument is that when prices are expected to decline, durable goods lose their attractiveness as a store of value. The consumer is then better off hoarding money, because it earns a positive real rate of interest, equal to the rate of deflation. This argument might be relevant, but arguably only for a very high rate of deflation.

3 Nobody would lend at a cost if it were possible to hold money instead.

4 The real interest rate is defined as the nominal interest rate minus the inflation rate.

5 Given that households are optimizing over time, it is not even necessary to have deflationary expectations to produce a long-lasting recession at the ZLB. Imagine that households expect real income to be lower in the foreseeable future than it is today. As the central bank is unable to decrease the real interest rate (assuming the central bank cannot influence inflation at the ZLB), the households will smooth their consumption path by decreasing their consumption (increase their savings) today. Thus, given that real interest rates cannot decrease, the consumption path must adjust. See appendix B for the Euler equation leading to this argument.

real interest rate that the central bank cannot deliver. Paul KRUGMAN (1998)[6] was the first to point out that particular potential problem using an analytical framework based on agents optimising consumption over time.

Allowing for asymmetric information in financial markets, and more particularly in credit markets, the previous mechanism could potentially, in the worst-case scenario, lead to what Irving FISHER (1933) called the debt/deflation spiral. As information in credit markets is not perfect, the cost of credit will be inversely correlated to debtors' net worth.[7] Thus, in a *deflationary trap* where, typically, corporate cashflow diminishes, asset values decrease and real debt increases, the balance sheet (or net worth) of borrowers will deteriorate. The cost of credit will then increase and some borrowers will not be able to renew their borrowing agreements at bearable costs. As they try to fire-sale their assets and cut their expenses to pay back their maturing debt, they will put pressure on both financial markets and aggregate demand. Prices will decrease further and the real value of remaining debt will increase. The economy is engaged in a debt/deflation spiral, where borrowers paradoxically increase the real value of the aggregate outstanding debt in trying to reimburse it. Admittedly, this succession of events is to be considered more the exception than the rule. However, the interaction of asset prices, borrowers' net worth and the cost of borrowing is central to understanding the key macroeconomic difference between deflation and inflation. Microeconomic considerations – namely the assumption of asymmetric information in credit markets – potentially imply detrimental real consequences of deflation, above and beyond the usual distortion associated with the redistribution of real wealth between debtors and creditors.[8]

The previous two paragraphs assume a very restrictive transmission mechanism for monetary policy – monetary policy is assumed to have an effect on the economy solely via the policy interest rate. Once trapped at the ZLB, there is supposedly nothing that the central bank can do to pull the economy out of this uncomfortable situation. But we will see later, in section 4 of this paper, that a central bank can theoretically use other tools to stimulate aggregate demand (via other channels of transmission) and reflate the economy. While there is no consensus (see sub-section 2.3 below) on the proper monetary policy rule – if there is one – for keeping the economy away from the deflationary trap, there is

6 See appendix B for details.

7 See BERNANKE and GERTLER (1989), KIYOTAKI and MOORE (1997) and BERNANKE, GERTLER and GILCHRIST (1999) for a modern account of the importance of net worth and credit constraints in explaining output fluctuations.

8 See the 2nd paragraph of subsection 2.1.

a broad general consensus on ways to get out once trapped. If the central bank is ready to consider alternative policy measures, the ZLB should not limit its capacity to inflate the economy. The difficulty is that these alternative policy measures are rather unusual and their effects difficult to forecast quantitatively. The monetary authorities might then be reluctant to use new tools in such an uncertain environment. Since section 4 of this paper is entirely dedicated to the policy options for a small open economy in a deflationary trap, we won't develop this topic further here.

2.3. How does an economy reach the zero lower bound?

Ultimately, deflation – like inflation – is a monetary phenomenon (cf. Figures 4 and 5 below). Steady-state inflation (controlling for the growth rate of potential output and the velocity of money) is determined by the growth rate of money. But which measure of money? In certain circumstances[9], the growth of M0 is not transmitted to broader aggregates. At the ZLB, for instance, if the monetary base (M0) is increased through open-market operations in short-term bonds, the broader monetary aggregates (M2 and M3) may not be affected (cf. Figure 6 below). When the short-term nominal interest rate is zero, money becomes a perfect substitute for short-term bonds. Banks and the non-bank public will substitute short-term securities with extra cash reserves. Money will be hoarded.[10] If the focus of the analysis is on inflation, we should then concentrate on broader money aggregates (M2 or M3). But the important question remains: Why does an economy end up in a deflationary trap? Is there a way to avoid this undesirable outcome? In other words, why do the growth rates of M2 or M3 slow down so much that they ultimately pave the way for negative inflation rates? There is, unfortunately, no consensus among economists on the mechanisms involved. Three schools of thought prevail, offering competing explanations.

The first claims that monetary policy is the main culprit.[11] Overly restrictive monetary policy may ultimately push the economy onto a deflationary path. According to a rather 'traditional' view of the monetary policy transmission mechanism, a sufficiently aggressive Taylor rule would always keep the economy away from the deflationary trap. If monetary policy is eased early enough, i.e., the interest rate is lowered quickly and significantly, the ZLB and the trap

9 Like a liquidity trap or the disruption of the financial and banking system.
10 See Krugman (1998) or Clouse et al. (2000).
11 See Friedman and Schwartz (1963).

that might ensue would be avoided. Japanese woes would then be due to overly restrictive monetary policy in the nineties.[12] There are empirical analyses that tend to confirm such a view. They nevertheless acknowledge that, given the fair amount of uncertainty attached to real-time data, it might be very difficult for a typically conservative central bank to get the timing right for the radical interest rate cut that is likely to be required. Moreover, these empirical results rely on an assumption of 'normality': The economy is deemed to behave 'as usual', i.e., as it would at any point in time following a rate cut. But a reasonable case can be made for not considering post-bubble Japan as 'normal'.

The second school of thought focuses on imperfections in financial markets and on the consequences for financial intermediation and aggregate demand of a drastic fall in asset values, such as occurs when a bubble bursts. The particularity of this type of shock is its potentially enduring negative consequences for balance sheets and aggregate demand. The mechanism is as follows: A dramatic fall in asset prices (stocks, land) leads to the deterioration of private agents' (firms' and households') net worth. Allowing for asymmetric information, the cost of credit – linked to the borrowers' net worth – increases and private expenses decrease. [13] The net worth of banks and financial institutions drops as well, because the proportion of non-performing loans on their balance sheets surges and the value of assets falls. As they try to repay their debts, borrowers will propel the price of equity to even lower levels by trying to fire-sale their assets, putting additional pressure on aggregate demand. If the volume of outstanding debt in the economy and the fall in asset prices are large enough, the balance sheets of both private borrowers and banks will take a hard and sustained hit as the bubble bursts, opening up the possibility of financial disintermediation. The collapse of aggregate demand could then be so enduring that not even a policy of zero interest rates would be able to stimulate it sufficiently to close the output gap. A deflationary trap might then open up, as the long-lasting deficiency in demand might ultimately give rise to deflationary expectations and rising *real* interest rates.

12 See AHEARNE et al., Board of Governors of the Federal Reserve System (2002).

13 Again, the assumption of asymmetric information in financial markets is crucial. It implies that financial intermediation in general, and bank credit in particular, is 'special'. In other words, bank credit cannot easily be substituted away. As a loan involves a principal-agent relationship, it is costly, because the lender has to incur monitoring or, more generally, agency costs. These agency costs are inversely related to the risk taken by the lender in case of default, so they are inversely related to the borrower's net worth (assets – liabilities), (see footnote 8 above).

The theoretical debate is still open as to which of these two competing views can best account for the two deflation/recession periods of modern economic history: The great depression of the 1930s and the milder one in Japan in the 1990s. In the case of Japan, a brief look at the data would seem to give credence to both explanations, as we will see below.

Finally, more recent theoretical literature[14] based on an analysis of the global dynamic properties of a *model* economy and involving self-fulfilling expectations[15] (cf. appendix A) has shown that – in particular circumstances[16] – the economy could fall into a deflationary trap, regardless of the interest rate response of the central bank. When private agents expect deflation there is nothing the monetary authorities can do in terms of interest rate response to stimulate aggregate demand and avoid the deflationary equilibrium. Expectations become self-fulfilling. Arguably, this strong conclusion is based on very restrictive assumptions on the behaviour of fiscal authorities and on the channel of transmission of monetary policy. In these models, fiscal policy is totally independent of the rate of real growth and inflation (no automatic fiscal stabilizer) and monetary policy has an influence on aggregate demand only via the interest rate (credit, the exchange rate and money itself have no part to play in the transmission mechanism). Yet the most important point of their analysis remains: A Taylor rule – irrespective of its aggressiveness – would theoretically not be a catch-all means of preventing the economy falling into a deflationary trap[17].

2.4. What are the odds? Some necessary conditions

We do not have many examples, in this century at least, of deflationary periods that allow us to draw definitive lessons from history. Actually, our sample contains only two observations: The great depression of the 1930s in the US and the 1990s in Japan. These two episodes are different in many respects. The duration and the amplitude of macroeconomic fluctuations associated with each of them cannot be compared: The great depression was both (relatively) short-lived and particularly detrimental to the real economy[18], whereas

14 See Benhabib, Schmitt-Grohé and Uribe (1999, 2000, 2001).

15 This approach involves a non-linear policy reaction function, which leads to multiple equilibria and self-fulfilling expectations (cf. appendix A).

16 A sufficiently large negative shock to aggregate demand.

17 The literature on the Taylor rules focuses on local dynamic properties only and reaches the opposite conclusion: An aggressive Taylor rule is stabilizing.

18 See Friedman and Schwartz (1963) for a detailed analysis of the Great Depression.

the Japanese recession is long-lived yet mild. Moreover, the US economy of the 1930s is sufficiently different from modern Japan to prevent us making hasty generalizations. Still, we believe that these two historical events display a certain number of similarities and are thus useful in analyzing the present situation in the world's most developed economy and – as we will see in section 3 – in Switzerland in particular.

Drawing on the discussion in the last sub-section, as well as casual observations on both the Great Depression in the US and the 1990s in Japan, we will attempt below to single out what we consider to be necessary conditions for an economy to fall into a deflationary trap. At least three of the following four criteria must be fulfilled.

Combination of an asset price crash and an indebted economy

Firstly, in both the US and Japan, deflation started with the bursting of an asset price bubble. This type of shock is neither rare nor automatically problematic for an economy. The real problem is the outstanding *debt* associated with the bubble. The bursting of an asset price bubble is genuinely dangerous to the economy as a whole if this bubble had been inflated by a surge in borrowing in the first place. In fact, the asset price bubble in both countries had been accompanied and fuelled by an unprecedented increase in private debt (household and corporate). This debt was backed by an improvement in the value of collateral (land, stocks), the price of which was itself driven up by transactions based on borrowed money. If these factors are combined, the balance sheets of both the lenders and the borrowers are hard hit when the bubble bursts. This may give rise to the credit spiral described in section 2.3, the amplitude of which would be directly linked to the volume of outstanding debt. The detrimental effects of the bursting of a bubble are also enhanced when they are not only concentrated on the stock market but also encompass other types of asset, such as land or property (as in Japan in the 1990s).

Excessively restrictive monetary policy

Secondly, since deflation – like inflation – is ultimately a monetary phenomenon, one of the most obvious candidates is an overly restrictive monetary policy. In both US and Japanese examples, monetary policy mistakes seem to play a part in explaining the deflationary outcome. In both episodes, it has been argued that monetary policy was accommodating because *nominal* interest rates were close to zero. Yet as BERNANKE (1999) pointed out, zero nominal interest rates may equally be the sign of expected deflation and monetary

contraction[19] as they are of monetary easing. It is true that in today's Japan, *real* interest rates are very low. But again, in a very depressed environment, the fact that the real interest rate is close to zero is not always a sign that the monetary authorities are doing all that they can to stimulate aggregate demand. In IS/LM parlance, when the IS curve is shifted sharply to the left (the likely consequence, in these particular cases, of the detrimental effect of the asset price crash on consumption and investment), the equilibrium real interest rate can be very low for a given static LM curve or policy stance.[20] In other words, a low interest rate shouldn't automatically be regarded as a sign of an accommodating monetary policy.[21] Furthermore, sticking to the zero nominal interest rate policy with declining prices is akin to adopting a more restrictive stance, as the real interest rate increases proportionally to the rate of deflation.

Non-anti-cyclical fiscal policy

Thirdly, the behaviour of the fiscal authorities also plays an important role. If some automatic stabilizer (tax rates, unemployment benefits, social security, et) is activated – in other words, if fiscal policy is automatically and anti-cyclically driven by the rate of inflation and the business cycle – the likelihood of deflation is significantly reduced. In both Japan in the 1990s and the US in the 1930s, these stabilizers were largely absent. Despite some *prima facie* evidence of an accommodating fiscal policy in Japan, closer examination would seem to show that much of the apparent support was simply a matter of accounting and did not stimulate aggregate demand as required (Posen, 1998).[22]

Closed economies

Fourthly, both Japan and the US are rather closed economies. A deflationary trap is less likely to occur in a small open economy with flexible exchange rates. The issue of openness and flexible exchange rate will be fully discussed in section 4 of this paper.

19 As it was the case during most of the Great Depression of the 1930s.

20 A zero interest rate might even theoretically be the result of a *restrictive* monetary policy (a shift of the LM curve to the left) and a particularly large leftward shift in the IS curve.

21 To assess policy using the interest rate, a Taylor-type interest rate feedback rule should be used.

22 Posen argues that in the 1990s, fiscal plans in Japan were not as stimulating as suggested by the fiscal authorities. Despite an increase in public debt as a percentage of GDP, in *net* terms, this ratio was the lowest in the OECD in 1998. Moreover, automatic stabilizers such as unemployment insurance are still absent in Japan.

In the next section, we will use these criteria to show that Switzerland is not Japan – despite some similarities – and that the risk of deflation/recession, while still a possibility, is accordingly much smaller. In short, Switzerland is a small open economy with fiscal stabilizers (unemployment benefits, social security). The 1990s bubble was concentrated in stock prices and was not due to a borrowing spree. Finally, Swiss monetary policy has been expansionary since the bubble burst.

3. Switzerland *vs* Japan: A Graphical Comparison

Following the bursting of the stock market bubble in 2000, the Swiss economy – hand in hand with most other developed economies – started to slow down. At the time of writing, the growth rate of real GDP is almost zero and the inflation rate has decreased steadily to around 1 %. Despite a very aggressive easing of monetary policy in the last 18 months, there are no signs yet of imminent recovery. Given that the three-month Libor hovers around 0.75 %, there is little scope for further interest rate cuts. We are increasingly hearing the words deflation and liquidity trap to describe the evolution of the Swiss economy, and parallels are being drawn with the situation in Japan.

A plausible case can be made for the Japanese economy actually finding itself in the liquidity trap (KRUGMAN, 1998; POSEN, 1998, 2000; BERNANKE, 2000; SVENSSON, 2001; BLANCHARD, 2000) and needing drastic policy measures to revive aggregate demand and expectations. However, despite some *prima facie* similarities between Switzerland and Japan, we will argue that the situation in Switzerland more closely resembles a cyclical downturn (surely accentuated by the bursting of the stock market bubble in 2000) than a protracted deflationary equilibrium.

3.1. Japan and Switzerland: Two 'post-bubble' economies?

In this first sub-section, we will show that the Swiss and Japanese asset bubbles have little in common. The Japanese bubble has been accompanied by a rise in land and property prices on an unprecedented scale. Land – the most common collateral for loans in Japan – more than quadrupled in price between 1985 and 1990. This allowed a surge in borrowing which fuelled inflated stock and land prices alike. Once the Bank of Japan stepped in to slow down an overheating economy, it pricked both bubbles, leaving the balance sheets of the Japanese

corporate and banking sectors in a disastrous state. As previously mentioned (see subsection 2.3), the size of the private debt problem partly explains the ensuing drop in aggregate demand.

This self-fulfilling financial spiral has not taken place in Switzerland. The rise in stock prices in the 1990s was not directly linked to the volume of borrowing and the price of houses. Switzerland has had two bubbles in succession: A property prices bubble in the late 1980s and a stock market bubble in the 1990s. This difference in timing is central when comparing Switzerland's situation with that of Japan'. By comparison, the rise of borrowing in Switzerland during the 1990s stock bubble was much more moderate than that during the equivalent phenomenon in Japan in the 1980s. Outstanding debt in Switzerland's private sector in 2000, when the bubble burst, was thus much smaller in comparison, and the risk of a protracted deflation/debt spiral (see section 2 above) much lower than in Japan in 1990.

The next three figures are very illustrative. As Figure 1 shows, the similarities between the Japanese (in the 1980s) and Swiss (in the 1990s)[23] stock market bubbles are striking.

However, as Figure 2 shows, the bubble was concentrated in equity prices in Switzerland in the 1990s, whereas the prices of both stocks and properties (land) were inflated at the same time in Japan in the 1980s.

Figure 3 also shows that the twin bubbles in Japan were inflated by a surge in private debt, especially between 1985 and 1990, whereas the growth in lending in Switzerland was rather more moderate between 1990 and 2000.

To sum up this first point, we observe that the financial spiral linking stocks and house prices to the rise in private debt did not take hold in Switzerland in the 1990s. In 2000, when the stock market bubble burst, the amount of outstanding private debt in Switzerland was much smaller than in Japan in 1990, and the risk to aggregate demand accordingly lower.

23 The Dow Jones, Dax and CAC 40 indices would have produced the same picture as the SMI.

Figure 1

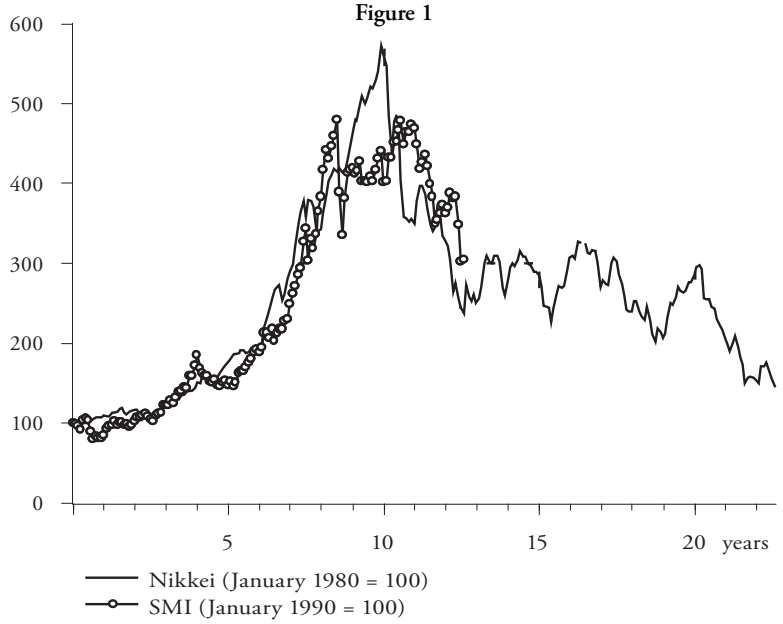


Figure 2

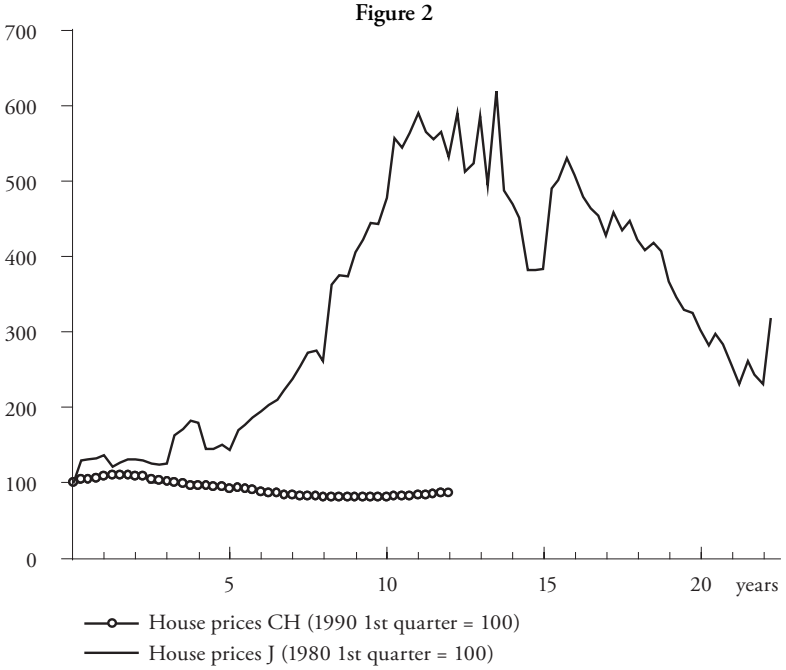
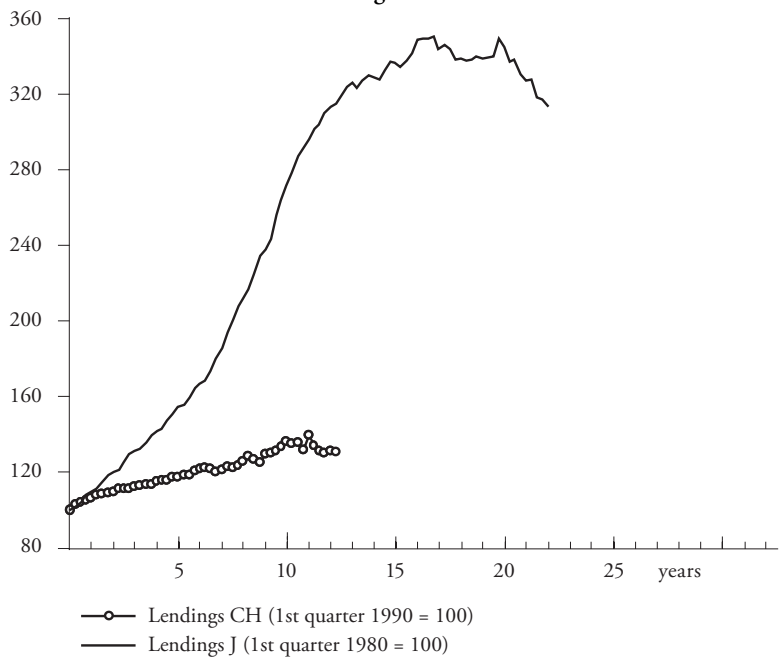


Figure 3



3.2. Deflation: A monetary phenomenon

In section 2, we claimed that deflation – like inflation – is a monetary phenomenon. In this respect, the next two charts (Figures 4 and 5) speak for themselves. They show, in Japan as in Switzerland, quite a close relationship between the growth rate of M3 and inflation two to four years later.

Let us now look more closely at the response of the monetary authorities in Japan and Switzerland to the bursting of the bubble. Since the interest rate can be misleading as an indicator of policy stance at the ZLB[24], we will look at monetary aggregates – both M0 and M3 – to make an informal assessment of monetary policy reactions. From today's perspective[25], there are clear signs that the BoJ

24 Ahearne et al. use the interest rate in a Taylor rule to assess policy in Japan. Given this paper's focus on alternative monetary policy measures involving different kind of monetary expansion – via the purchase of different types of imperfectly substitutable assets – in the fourth section, we will focus here on money, a better indicator of policy at the ZLB.

25 Hindsight being 20/20!

Figure 4

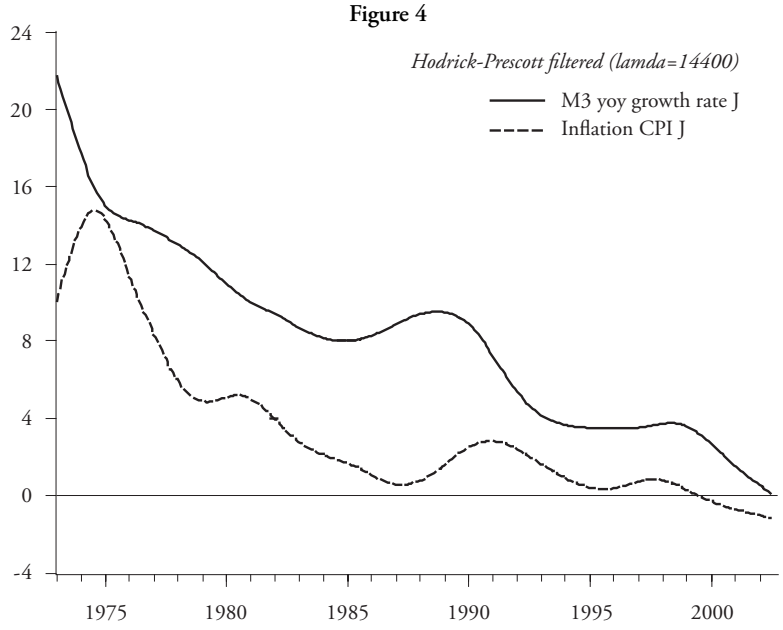
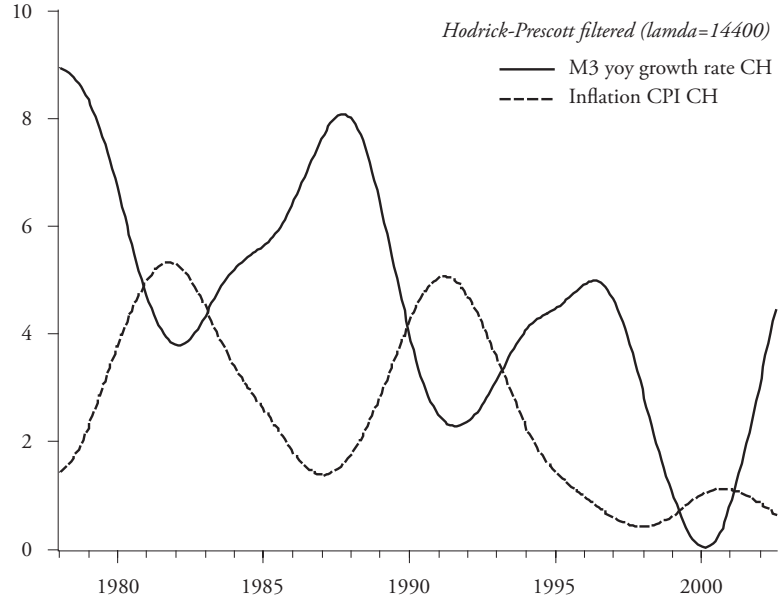
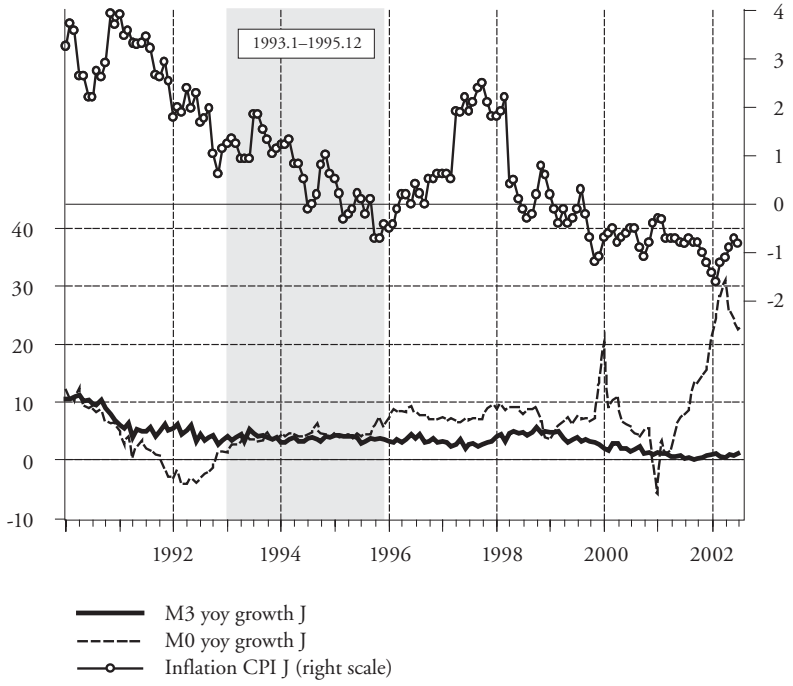


Figure 5



maintained an excessively restrictive policy for three years – from January 1993 to December 1995 – when the growth rate of GDP was already stagnating and the inflation rate was nearing 0 %. Looking at both M0 and M3, we see that – after two years (1991–1992) of very restrictive monetary policy – the BoJ increased the monetary base just enough to maintain a rather slow M3 growth rate.
Given the difficult situation on the financial markets at the time, this rather restrictive policy probably helped to push the economy into the deflationary trap. By the end of 1995, the inflation rate was already negative. The BoJ then launched its 'zero interest rate policy' and M0 started to grow more rapidly.[26] Looking at the growth rates of M0 and M3, however, it is quite obvious that the Japanese economy was already in the liquidity trap in 1996. From 1996 to

Figure 6



26 With the exception of the period between September 2000 and February 2001, when the BoJ *raised* the short-term interest rate by 25 bp!

date – and especially since the end of 2001 – the monetary base has been growing at a fast pace (at least twice as fast as M3) without pulling M3 or prices along in its wake. The BoJ has been pushing the rope for seven years now. As we will argue in section 4, such a situation calls for alternative policy measures that – to date – the BoJ hasn't seriously tried.

Let us now contrast the previous figure with the following one. Figure 7 depicts the policy response of the SNB after the bubble burst in September 2000. Looking at both M0 and M3, monetary policy was loosened rapidly and the SNB stance was still supportive at the end of 2002. Despite the decreasing inflation rate, there is no sign of a liquidity trap in Switzerland: M3 has reacted as expected to the acceleration of M0, the SNB is not pushing the rope and the monetary policy stimulus seems to be working in the usual way.

3.3. Japan vs Switzerland today: Real economy and prices

But is this true? Isn't Switzerland already on the brink of deflation? After all, the last real GDP growth figure was negative, inflation is almost nil and the short-term interest rate has decreased a long way towards zero without any palpable effect (M3 excepted) on the economy. Isn't Switzerland looking more and more like Japan every day? We suggest that, despite certain similarities, the individual situations of present-day Japan and Switzerland are very different.

The most recent data show a similarly negative rate of growth of real GDP in both countries (Figure 8). Moreover, since 1999, both GDP growth patterns have been very similar.

But this apparent similarity is misleading. Switzerland's negative growth rate is the cyclical outcome of falling exports and investments, whereas in Japan it is the consequence of a long-standing deterioration in domestic demand. As shown by trends in consumption, unemployment and prices (Figures 9 to 12), the Swiss economy has been growing at less than its potential rate only since the beginning of 2001, whereas the Japanese economy is enduring its tenth year of sub-potential growth. Figures 9 and 10 show that Japan is plagued by endemically weak aggregate demand. As a consequence of the mounting unemployment rate and the continuous deterioration in asset prices, including land, confidence has gradually been eroded, leading consumers to save an ever-larger part of their incomes. This precautionary behaviour leads to a widening (negative) output gap and an increasing deflation rate.

Swiss consumption, in contrast, though weaker than in 1999 and 2000, remains an important contributor to growth. In fact, Swiss consumers have

Figure 7

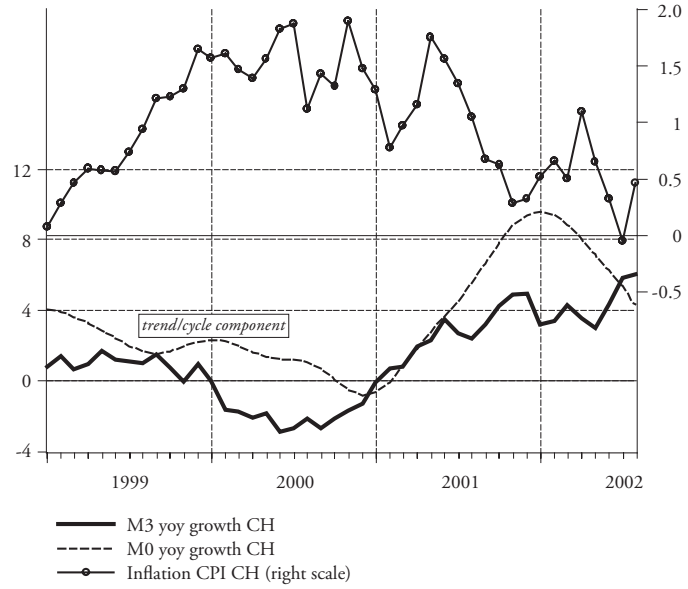


Figure 8

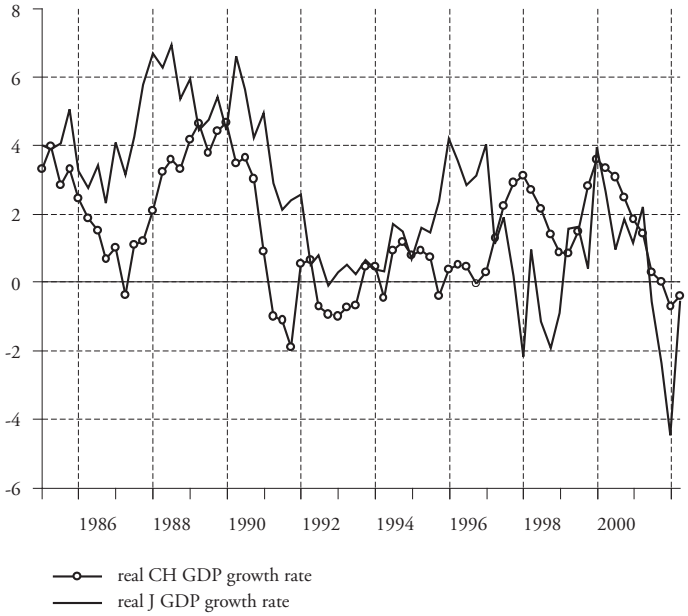


Figure 9

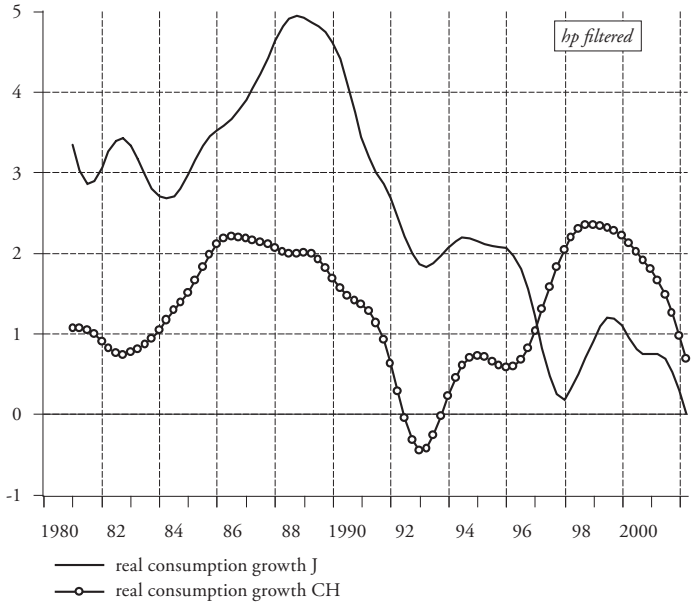
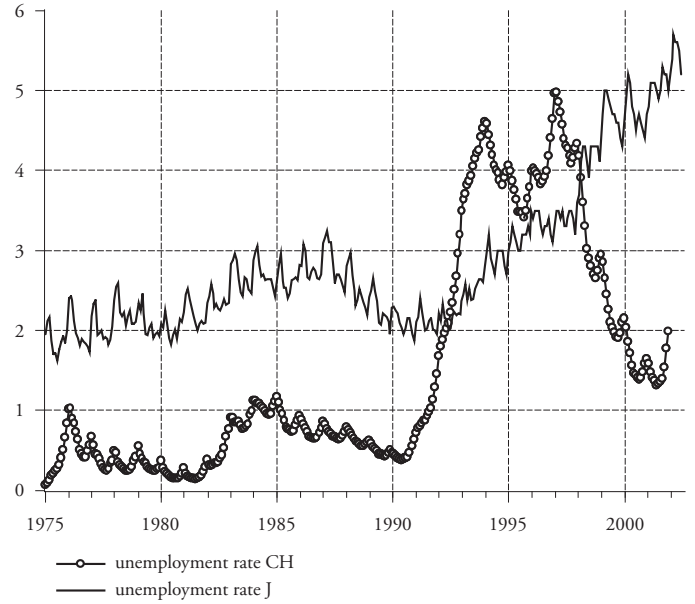


Figure 10



behaved as expected in a cyclical downturn. As shown on the next graph (Figure 9), there is no long-run trend in the rate of consumption growth in Switzerland. With an advance of roughly one percent (yoy) in the second quarter of 2002, Swiss consumption is not particularly depressed in an historical perspective. In Japan, a different phenomenon is in evidence. Since 1990, consumption has gradually slowed down almost without interruption, until it came to a halt in the second quarter of 2002. This has had a symmetrical impact on the unemployment rate (Figure 10). Since 1991, the Japanese unemployment rate has increased steadily, reaching almost 6 %[27] in 2002. In Switzerland, the unemployment rate began to increase again in 2001, but we have not observed anything like a Japanese-style trend.

Now, since the topic of this paper is deflation, let's look at prices. It is a fact that (CPI) inflation has recently lost momentum in Switzerland. But again, we should not draw hasty parallels with prices in Japan. Japan is almost a closed economy and its inflation rate (Figure 12) is influenced little by import prices. The negative inflation rate in Japan since mid-1999 is thus the consequence of a long-lasting deficiency in domestic demand.

In Switzerland – a small, open economy – import prices play an important role in determining the (CPI) inflation rate. Looking at Figure 11, we notice that Switzerland's extremely low inflation rate in 2002 is, to a large extent, the result of an unusually large, negative rate of import price inflation. The next two figures illustrate this contrast. We see that the correlation between import prices and inflation is almost zero in Japan, whereas it is clearly positive in Switzerland.

In a deflation economy, inflation expectations are also negatively affected (see section 2 above). To the extent that long-term interest rates partly reflect these expectations, the Swiss and Japanese economies are also very different. Figure 13 depicts Japanese and Swiss 10-year interest rates on government bonds. Although very close until 1994, Swiss and Japanese long-term rates have since diverged and Swiss 10-year interest rates are now 200 basis points above Japanese ones. This is a sign that – unlike in Japan – long-run inflation expectations are not yet negative in Switzerland.

To sum up, looking at the available data, we think that the situation in Switzerland currently more resembles a cyclical downturn (probably accentuated by the bursting of the stock market bubble in 2000) than a protracted deflationary equilibrium. We thus believe that there is no need as yet to resort to the alternative policy measures that we describe in the following section.

27 According to informed unofficial sources (Posen, 1998), this rate underestimates the actual rate of unemployment by a factor of 2.

Figure 11

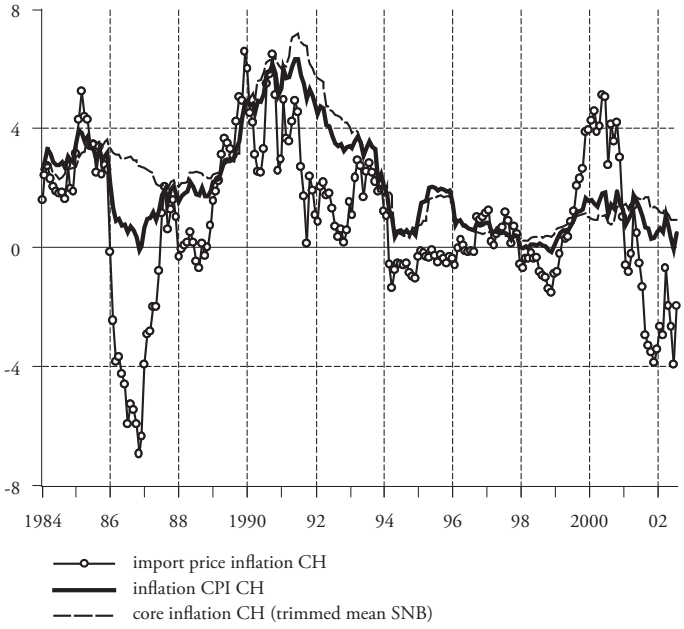


Figure 12

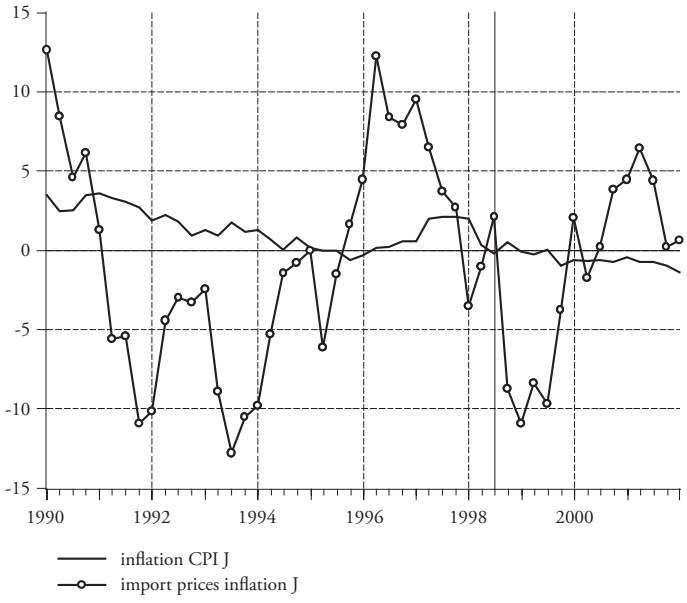
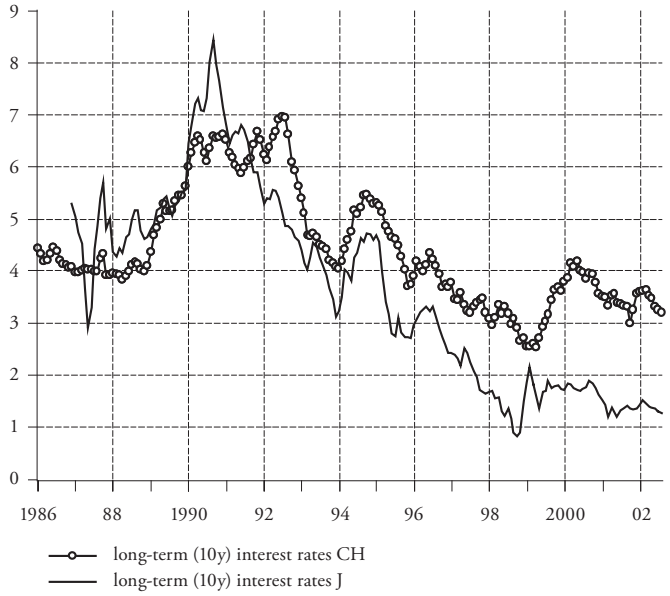


Figure 13



4. Policy[28] Options for a Small Open Economy

Is it true that, once the zero lower bound for the nominal short-term interest rate is attained, the central bank *acting alone* is powerless to stimulate aggregate demand and promote real economic recovery if necessary? More generally, should we accept – as certain observers of the Japanese recession seem to believe – that the government *as a whole* (comprising the central bank and the fiscal authorities) will be unable to pull the economy out of the trap, even if it really tries? This section will be dedicated to these two questions.

28 In this paper, we focus on monetary policy at the ZLB. Fiscal policy will be considered only in so far as it interacts with monetary policy in the policy mix described in section 4.4. The impact of fiscal policy in isolation on output and consumption has already been addressed by different authors, both neo-classical and neo-Keynesian, and these results remain valid whatever the initial nominal interest rate. To sum up, an increase in government spending has a positive impact on output for both the neo-classisists and the neo-Keynesians, albeit via a completely different mechanism, whereas a lump-sum tax-cut or transfer will have no effect because of the *Ricardian equivalence* principle. For a detailed account on the effectiveness of fiscal policy in Japan, see Posen (1998).

The answer to the second question is a clear no! If purely monetary policy measures (see sub-sections 4.1 to 4.3) fail to reflate the economy, a coordinated effort on the part of both fiscal and monetary authorities would, sooner or later, lift the economy out of the deflationary trap. This mixed approach should nevertheless be considered an emergency rescue package, because such a policy may result in a potentially destabilizing high inflation rate, the cost of which should be compared with that of a deflationary trap. We will postpone this discussion until sub-section 4.4.

The answer to the first question is more controversial. Our response will be a *cautious* no. It is true that, once the zero lower bound for the interest rate has been reached without any effect on inflation expectations or, more generally, on aggregate demand, monetary authorities enter uncharted territories. But it does not mean that monetary policy should be considered helpless. Such a conclusion would assume a very restrictive transmission mechanism for monetary policy, implying a single channel – interest rates. Theoretically at least, there are three other channels – exchange rates, the pure monetarist (real balance) or money channel and the credit channel that have been broadly documented in monetary literature.

Each of these three channels has a potential role to play in the transmission of monetary policy impulses to the economy. With the exception of the (pure) money channel, which works[29] via a real balance effect independently of the short-term interest rate, the other two (credit and exchange rates) are usually regarded as amplifying mechanisms. Their role is to magnify the effect on the real economy and on prices of a variation in the short-term interest rate. Thus, even when other mechanisms of transmission are contemplated, the question remains: Can a central bank stimulate the economy without decreasing the interest rate?

As we will see, the answer is yes. Each of the three aforementioned channels remains theoretically valid. But to stimulate aggregate demand at the ZLB, the central bank must temporarily alter its operating procedure, i.e. it must make short-term changes to both the instruments and the operating targets of monetary policy. Hence, to exploit the (pure) money or credit channels, a central bank would have to resort to a *quantitative* operating procedure. The instrument of monetary policy – usually open-market operations in very short-term bonds – would have to be replaced by open market operations in longer term[30] securities,

29 See appendix C and the section 4.3 below on quantitative operating procedures for a more detailed description.

30 See appendix C for a detailed explanation, especially the difference at the ZLB between open-markets operations in long-term and short-term bonds (securities).

and the operating target would then become the monetary base or lending volumes instead of the short-term interest rate. To exploit the exchange rate channel, the monetary authorities would have to resort to open market operations in a foreign currency, and they would have to replace the short-term interest rate with a nominal exchange rate. The potency of these alternative channels when the ZLB has been reached, i.e. when there can be no further movement in the nominal interest rate, will be discussed in sections 4.2 and 4.3 below.

Usually, in theoretical models, it is assumed that monetary policy is transmitted through interest rates to the real economy. But which interest rate? While the short-term interest rate surely plays a role in short-run bank refinancing, it is also clear that many borrowing agreements are based on longer term (mortgage) interest rates. Before we turn to the discussion of alternative tools and channels, we will thus look, in section 4.1, at the most natural extension of the usual interest rate target: The long-term interest rate operating target. At the ZLB, a typical central bank should be able to target longer maturity directly.

4.1. Using longer term interest rates

When short-term (policy) interest rates have reached the ZLB, a central bank still has not *used all the ammunition in its arsenal,* provided longer term interest rates on public debt are still significantly above zero. The monetary authorities can in principle influence the slope of the yield curve by buying longer term treasury securities on the secondary market. If investors are risk averse, the decrease in their portfolio of the relative proportions of long and short-term securities will decrease the risk premium, and thus also the yield on long-term securities (see Tobin, 1982, and Meltzer, 1999, on the *portfolio balance effect*).[31]

Now, what is really crucial in the transmission of monetary policy impulses to the real economy is the extent to which the decrease in long-term treasury bond yields will feed through to long-term private-sector rates for corporate debt. Note that when the interest rate on treasury bonds is lowered, investors experience a capital gain on their holdings of treasury securities. In attempting to rebalance their portfolios, they will tend to reduce the return on corporate debt. But how much the return on corporate debt will decline depends on the extent to which this private debt is a close substitute for other assets on the global financial

31 The Federal Reserve fixed the yields of Treasury securities during WWII and up to the Treasury-Federal Reserve Accord of 1951 by being prepared to buy all Treasury securities offered at interest rates above a target level. Actual transactions in long-term bonds may not be necessary if markets believe the central bank is ready to deliver on the policy it has announced.

markets. As CLOUSE et al. (2000) put it, "[…] *the greater the degree of such substitution, the greater the odds that global arbitrage would limit the decline in private rates.* […] *The degree to which any such decline in treasury rates would feed through to the cost of credit to private borrowers is difficult to determine".*

Although the efficacy of this measure is not guaranteed, the risk of trying it is nil. It should thus be considered as the first possible alternative to the usual controlling of the short-term interest rate.

4.2. Exchange rate operating target

In the case of a small open economy, we and others (MC CALLUM, 2000; MUSSA, 2000; BERNANKE, 2000; SVENSSON, 2001) believe that the switch to an exchange rate operating target would be a valuable and feasible emergency policy measure in the event of a deflationary trap. This is all the more so if the economy is small and open. These authors basically propose – albeit in different guises – that the short-term interest rate operating target be replaced temporarily by the nominal exchange rate. By depreciating the nominal and (given sticky prices) real exchange rate, the central bank could stimulate both external and domestic demand.[32] On the one hand, a significant reduction in the exchange rate would increase the competitiveness of exports. On the other hand, the associated increase in import prices would stimulate demand for import substitutes (both goods and services) and directly affect inflation via the increase in the price of imported (intermediate and final) goods and services. This direct impact on inflation would affect inflation expectations and ultimately lower long-term real interest rates until they reached the level necessary to increase consumption and investment and decrease savings, thereby progressively closing the output gap.[33] Theoretically, even if its principal trading partners are in a deflationary trap, a small open economy retains a good chance of not falling into it *long-term*, provided its import and export volumes remain positive[34] and its exchange rate can be devalued significantly.[35]

32 SVENSSON (2001) argues that the initial depreciation should push the real exchange rate below its long-run equilibrium in order to engineer expectations of future real appreciation, which, with a pegged nominal exchange rate, would involve a positive inflation rate – higher than the inflation rate of the pegged currency.

33 See appendix D for a more detailed description of the exchange rate transmission mechanisms in Svensson's model, and SVENSSON (2001) for a more detailed explanation of the mechanism involved and a theoretical model based on optimizing agents.

34 Note that if this condition is not fulfilled, the small open economy becomes undistinguishable from a closed one.

This *nominal exchange rate* strategy is not akin to adopting a fixed exchange rate. The exchange rate is used here in the same way as the interest rate was used before it reached the ZLB. At each monetary policy meeting, the monetary authorities would choose a particular level for the nominal exchange rate and maintain it until the next policy decision.[36] The public would then anticipate further nominal devaluations of the exchange rate should prices not respond as expected. It is important – in order to foster positive inflation expectations – that the central bank makes clear that this strategy will be pursued until sustainable growth resumes and the inflation rate corresponds to the target level. There must be no doubt that the central bank will only then return to its original operating procedure.

Two main criticisms have been levelled in the literature against an exchange rate policy along these lines. We will argue that they are not of practical relevance for a small open economy. The first is related to the political feasibility of a strategy based on a *beggar-thy-neighbour* type of policy. Even if it has been empirically shown that, in the medium to long-run, currency depreciations have only a minor effect on current account balances, the political reaction to such a policy might be relatively hostile if it is undertaken by a large economy, such as the USA, Europe or Japan. The unilateral devaluation of the yen, for example, could lead to competitive devaluations in every Asian country, or worse in the United States. But this is a large country problem. The unilateral devaluation of the Australian dollar, for instance, would probably not give rise to any opposition. As a matter of fact, the devaluation of the Canadian dollar against the US dollar (–17 % since 1995) has gone almost unnoticed.

The second criticism is more fundamental and concerns the potency of exchange rate interventions at unchanged interest rates (Christiano, 2000). The argument is as follows: At the ZLB, every exchange rate intervention is comparable to sterilized intervention because the nominal interest rate does not move – it cannot fall below zero.[37] Hence, as the short-term interest rate does not

35 A good example is Canada. Its currency has lost 17 % against the US dollar since 1995, allowing its real economy to grow at a consistently high rate, while the US economy (its main trading partner) has been slowing down continuously since 2000.

36 Svensson (2001) advocates a crawling peg based on the difference between foreign inflation and target domestic inflation, whereas Mc Callum (2000) proposes a Taylor rule type of policy with the change in nominal exchange rate on the left hand side of the equation.

37 Although – as is the case with unsterilized intervention – the relative proportions of short-term domestic securities and money are being altered by the open-market operation, the change is irrelevant here since money and short term bonds are perfectly substitutable at the ZLB.

move following the purchase of foreign exchange (again, here it has reached the ZLB), exchange rate intervention is deemed to be ineffective, as a vast body of literature on sterilized[38] interventions has shown. We will illustrate that, while this argument is perfectly valid in general, it does not apply to this particular case.

The point can best be seen from the UIP relationship. When the ZLB is attained, the UIP relationship[39]

$$1 + i = \left(1 + i^*\right)\frac{s^e}{s} \tag{1}$$

can be rewritten as

$$1 = \frac{s^e}{s}, \text{ (if we assume } i^* \text{ also constant at zero)} \tag{2}$$

Hence, unless the central bank can credibly affect expectations of the future exchange rate s^e, exchange rate intervention at a zero interest rate would not have any (lasting) effect on spot exchange rates. When it comes to *defending* an overvalued exchange rate, this argument is perfectly legitimate and has a very clear practical implication: Given the limited volume of foreign exchange reserves that a central bank typically holds in its balance sheet, it would not be able to commit to an overvalued exchange rate and credibly defend it against the market without increasing its interest rate. Speculative attacks against sterling or the Italian lira in 1992 have indeed shown the limits of central banks' sterilized interventions.

When it comes to *devaluating* a currency, however, we are entering very different territory. There is theoretically no limit to the amount of foreign reserves that a central bank can *buy*. All it has to do is to *print* the amount of domestic currency necessary to buy the foreign assets at the chosen nominal exchange rate. A commitment to devalue a currency is thus always credible and the central bank simultaneously affects s and s^e (which becomes s^T – the target exchange rate) in (2). Moreover, the amount of foreign currency that the central bank will have to purchase to reach the target exchange rate will hopefully be small if there is no conflict between its commitment and its goal: If the policy move is credible.

38 The opposite claim that sterilized intervention could move the exchange rate relies essentially on portfolio balance effects implying that foreign currency-denominated assets are imperfect substitutes for domestic ones and that variation in their relative supply would affect the foreign exchange risk premium and thus the exchange rate. The problem is that a great deal of intervention is likely to be needed to affect the spot exchange rate when expectations of future exchange rates are kept constant.

Thus the clearer the communication, and the more transparent the policy move, the easier it will be to push the exchange rate to the desired level. Ultimately, the mere announcement of a change in the exchange rate operating target might be enough to bring it to the desired level.

4.3. Quantitative operating targets

An alternative – often mentioned in the literature to the exchange rate policy at the ZLB is "simply" to increase liquidity in the economy. Two different but simultaneous and self-reinforcing channels would be at the centre of the transmission mechanism: The *credit* channel and the *direct money* channel. Theoretically, both channels are independently effective, but it is their interaction that might potentially lead to a significant impact on money creation at the ZLB.[40] The money channel works via a real balance effect or a more general portfolio balance effect, while the credit channel relies on a decrease in the premium (the *agency* cost) that a borrower has to pay on its loan when its net worth (its balance sheet) improves (see subsections 2.2, 2.3 and appendix C for a description of the credit channel).

The whole transmission mechanism hinges on the degree of substitutability between money and its counterpart in open market operations. As already mentioned, at the ZLB, money becomes a near perfect substitute for short-term securities. Open market operations in short term bonds are thus unlikely to spur the necessary *(portfolio rebalancing)* purchases of other assets or goods. Bondholders (both banks and the non-bank public) would simply substitute money holdings for short-term securities.[41] This would not only circumvent the *direct money* channel but also the *credit* channel, because at the ZLB the improvement in borrowers' net worth depends primarily on asset prices.

39 Here, we voluntary abstract from any endogenous (linked to a potential portfolio balance effect) risk premium: The mere accumulation of foreign assets would not have any effect on the exchange rate. The foreign exchange premium is then exogenous and by assumption equal to zero. By focusing on this radical assumption, we aim to reinforce the argument.

40 Meltzer (1999) and Nelson (1999) actually found empirical support for the direct effect of real money on aggregate demand; some preliminary empirical evidence on the existence of a credit channel in Switzerland can be found in Natal (2002), chapter 3 (Phd dissertation IUHEI).

41 See Clouse et al. (2000), Goodfriend (2000), Svensson (2001) and Bernanke (2000).

To stimulate aggregate demand via the *money* and *credit* channels at the ZLB, open market operations must be conducted in long-term securities[42] – assets that are presumably not perfect substitutes[43] for money (GOODFRIEND, 2000). Again, in this case, the transmission mechanism would involve both a *direct money* channel, where the increase of real money holdings would lead – via a rebalance of agents' portfolios – to an increase in demand for and prices of all other assets (and durable goods for the monetarist) in the economy, and a *credit* channel favoured by improved balance-sheets and the associated fall in the cost of credit to debtors (a fall in the external financing premium or agency costs).[44] Increases in M0 growth would translate into higher growth rates of M2 and M3: The central bank wouldn't just be pushing the rope.

Nevertheless, the theory says nothing about the amount of liquidity (probably large) that has to be created to stimulate aggregate demand significantly. The central bank might then find itself short of eligible assets to buy before its actions begin to have an effect on aggregate demand. The exchange rate operating target approach does not suffer from the same caveat: The pool of international eligible assets is virtually infinite.

4.4. The policy mix

All the policies previously considered involved the monetary authorities pursuing a clear inflation target in the medium run by conducting – in isolation – various kinds of open market operations in assets that are not perfect substitutes for money at the ZLB, i.e., long-term securities and foreign currency-denominated assets. Once in a deflationary trap, some stronger medicine might nevertheless be needed, i.e. a stronger stimulus than the one the central bank can deliver alone.

42 It has often been argued in Japan that the purchase of long-term bonds would represent a potential capital loss for the Bank of Japan if inflation and thus interest rates were to pick up before the bond matured. As pointed out by Bernanke, among others, this is not a valid objection since the capital loss by the central bank would be offset by an equivalent gain for the fiscal authorities. The operation is then neutral in terms of the consolidated government budget.

43 Some authors have even suggested that the central bank should buy long-term private securities or even lend directly to the private sector. This might nevertheless place the monetary authorities in a (politically) very difficult situation when it comes to granting or refusing credit to a particular party.

44 See appendix C for a detailed description of the mechanisms involved.

In the introduction to this section we suggested that, as a last resort, a concerted effort on the part of the fiscal and monetary authorities would sooner or later pull the economy out of the trap.[45] Why a concerted effort? Remember that money, unlike other government liabilities, pays zero interest and has an infinite maturity. Hence, the consolidated government sector (comprising the central bank and the treasury) can create all the purchasing power it wants without cost. This is not the case for fiscal authorities alone. Every debt issuance will have to be financed sooner or later. *Ricardian equivalence* types of reasoning could then hamper the effectiveness of a *purely fiscal* rescue plan. A lump sum bond-financed tax cut, for example, could be saved by private agents if they fear an equivalent tax hike in the future to finance the newly issued debt. But on the other hand, if the agents can be persuaded that the newly issued debt bears no cost because it has been simultaneously bought (monetized) by the central bank, they will not feel the need[46] to save a corresponding amount. With the increase in high-powered money (via the monetization of *newly*[47] issued public debt) prices must ultimately rise.

Does a policy mix necessarily imply explicit coordination between the central bank and the treasury? After all, the central bank does not need to report to the treasury when it buys treasury bonds and monetizes public debt, both existing and new issues. We nevertheless see three advantages to coordinating strategy. Firstly, it will help to persuade the treasury to take the necessary bold steps in terms of expenses and tax cuts, given that it will be clear that they bear no budgetary consequences.[48] Secondly, it will make the commitment of the central bank to inflate the economy more credible to the general public and it will boost inflation expectations. Thirdly, the credibility of the central bank will be enhanced

45 If the price level were truly independent of money issuance – as it is implied by the putative deflationary trap equilibrium – the government (fiscal and monetary authorities) could use all the money it creates to buy a theoretically infinite volume of goods and services without any effect on prices. In a long-run equilibrium, such a claim is absurd for it implies that private economic agents would be ready to renounce consumption in exchange for money. Ultimately, the value of money must decrease, which means that prices must increase. This argument is borrowed from Ben Bernanke (1999).

46 By monetizing every new issuance of government debt, the central bank increases the nominal wealth (money+bonds) of the representative agent. Ultimately, aggregate demand and prices will then increase.

47 Central banks may be forbidden by law to acquire newly issued public debt. Such measures will then be efficient only when the legal restriction is lifted by parliament.

48 In Japan, the fiscal authorities – while increasing public debt – have never stopped reminding the general public of the future tax consequences of their actions.

as its action will be seen by the public as a voluntary and temporary move rather than the passive accommodation of a fiscal rescue plan.

It is perfectly understandable that an independent central bank will look only very reluctantly at a policy option that amounts to monetizing the government's every new debt issue. In the 1960s and 1970s, fiscal/monetary policy mixes had disastrous inflationary consequences. There is nevertheless a big difference between a regime of fiscal dominance – where the central bank slavishly accommodates any new fiscal deficit, meaning that the rate of inflation would be determined by the fiscal authorities – and a concerted, transparent and one-off policy campaign, with the clear objective of fighting a protracted recession/deflation. The credibility of the central bank should not then be endangered – quite the reverse – if it is clear to the public that the ultimate objective of price stability (defined as a small but positive inflation rate) has not changed.

We can think of many ways to stimulate aggregate demand through money-financed fiscal deficits, be it by expanding government consumption, transfers and investment or by reducing taxes. In the theoretical literature on deflation, much emphasis has been placed on what looks *prima facie* like a *pure* monetary policy option but which, in practice, is a true fiscal-monetary policy mix: The "helicopter drop" of newly printed money. Legally, a central bank cannot simply *print* money. The "money rain" or "helicopter drop" of money is then nothing more than a money-financed lump-sum tax rebate. Would it work? As for every tax cut in a pessimistic environment, a typical economic agent might save the government's gift. But again, this is a question of degree. As the typical household would probably save a money-financed tax rebate of USD 1000 what about USD 10,000 or even USD 100,000?

To sum up, the main risk of such a strategy is not that it might not work, but that it might work too well: The central bank could lose control of medium-term inflation. The behaviour of households may be highly non-linear, and it may be very difficult to predict the effects of such a money transfer. As mentioned in the introduction to this section, such a strategy has potentially destabilizing consequences, and should be considered only as an emergency measure in the face of a protracted deflationary trap. The costs of the policy mix strategy should be compared with the costs in terms of unemployment and lost income of a (Japanese-style) protracted deflation/recession. Moreover, there are moral hazard consideration to take into account. In purchasing large amounts of public debt, monetary authorities risk creating an embarrassing precedent in their relationships with the fiscal authorities.

5. Conclusion

Following the bursting of the stock market bubble in 2000, the Swiss economy has slowed down continuously despite a rather aggressive monetary policy. Today, it seems that the SNB has almost run out of ammunition. The three-month Libor, its operating target, is close to zero (0.75 %) and the results of the easing campaign have yet to be seen. To date, the economy hasn't shown any tangible sign of recovery.

Is Switzerland slipping into a deflationary trap? This is very difficult to assess given the observational equivalence, in the early stages, of a *normal* recession with a low inflation rate and a deflationary trap in the making. However, in this paper we have claimed that, unless a set of necessary conditions is fulfilled, the likelihood of falling into a deflationary trap, while not nil, is very small. Comparing Switzerland with Japan, we have shown in the form of graphs that the situation in Switzerland more closely resembles a cyclical downturn (probably accentuated by the creation and subsequent bursting of the asset price bubble at the end of the 1990s) than a Japanese-style protracted deflation/recession.

Suppose, however, that Switzerland really falls into a deflationary trap. Is there nothing that the monetary authorities can do to reflate the economy? It must be acknowledged that, once trapped, the economy enters uncharted territories, and the central bank's inability to use its traditional methods may complicate the policymaking process. Theoretically, however, there are many conceivable ways for the monetary authorities to stimulate the economy when the interest rate is stuck at the zero lower bound. In the last section of this paper we discussed some alternative policies. For a small open economy, the exchange rate operating target policy seems to us the most promising.

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Appendix A

Falling into a ZLB trap in the BSU model

A very recent strand of literature (BENHABIB, SCHMITT-GROHÉ, and URIBE, 2000, 2001, 2002) (BSU) postulates that the ZLB should be considered as a possible steady-state equilibrium in a model economy. In the BSU model, the equilibrium around the target inflation rate that characterized earlier monetary models (with linear Taylor rules) is no longer unique once the monetary authorities explicitly take the zero lower bound (ZLB) for interest rates into account when formulating the interest rate rule[49]. With this nominal floor for short-term interest rates, the monetary authorities' interest rate rule is no longer linear, so *global* dynamic considerations begin to surface.

Remember that a characteristic feature of any rational expectation (RE) monetary model with an aggressive ($\delta > 1$) Taylor rule, i.e. where the central bank (CB) responds more than proportionally to deviation between the inflation rate and its target, is the instability[50] of the *(local)* equilibrium. However, given that the Taylor rule is typically a linear reaction function, this unstable equilibrium would be unique, because both hyperdeflationary and hyperinflationary paths (bubble paths) would be ruled out by the transversality conditions of the model[51] (OBSFELD and ROGOFF, 1998). Thus, analysis of the dynamic properties of the model is limited to a linear approximation around the targeted inflation rate (π^T).

BSU argue that once the non-linearity (owing to the ZLB) of the CB reaction function is acknowledged, a second equilibrium for the economy at a lower (possibly negative) inflation rate (π^L) arises and this equilibrium is of the stable type (cf. Figure 1 below). Thus, starting from the targeted inflation rate (π^T) equilibrium, a non-fundamental shock[52] could potentially bring the economy to the lower deflationary equilibrium at a zero nominal interest rate. All that

49 If the zero lower bound on nominal interest rates is considered, the policy reaction function can no longer be linear. In the model we present (taken from WALSH, 2003 forthcoming), the policy reaction function is piecewise log linear.

50 *Saddle-path* stability.

51 Typically, equilibrium paths starting at any $\pi_t < \pi^T$ violate the assumption of the rationality of economic agents: With real money balances going to infinity – *prices* going towards zero – the transversality condition for the representative agent's optimization problem would eventually be violated since it means that the representative agent would forego consumption opportunities over its lifetime.

52 Also called a *sunspot*; like an exogenous expectation shock.

is needed for this to happen is that the agents expect the steady state to be the deflationary one (π^L).

Let us make it clear that we do not see this result as a particularly compelling one for a real-life economy – especially not for a small open economy like Switzerland – and we are not interpreting this new literature to mean that that the deflationary trap must be considered as a likely or even realistic outcome for an economy hit by one or more negative shock(s) to expectations.[53] We believe that the most important message of this new literature lies elsewhere. The authors show that relying on an aggressive mechanical policy reaction function (Taylor rule) would not be sufficient, *under all circumstances*, to keep an economy away from a deflationary steady-state equilibrium. Although the latter result depends on the special features of a rather restrictive model of a closed economy[54] in which the interest rate is the only transmission channel for monetary policy, fiscal policy is unresponsive to the rate of inflation (i.e., there are no built-in automatic stabilizers), the treasury does not respond counter-cyclically and the sole instrument of monetary policy is the short-term interest rate, we nevertheless think that BSU's work highlights the perils of blindly following Taylor rules.

In this paper we will illustrate the mechanics of the BSU model[55] by using a basic cash-in-advance (CIA) model[56], with no uncertainty and perfect foresight, as postulated by Svensson (1985). Although this model is not very realistic, it conveys the main message: Taylor rules are not always enough to keep the economy away from a ZLB trap.

The objective of the representative agent is to choose a path for consumption and money holdings to maximize[57]

$$\sum_{t=0}^{\infty} \beta^t u(c_t) \tag{1}$$

subject to a series of cash-in-advance and budget constraints.

53 Our reading of this literature is that even the authors would not push their results that far.

54 Which nevertheless bears some resemblance with the situation in Japan.

55 Here, only the most simple (flexible price) version of their model is shown. Allowing for sticky prices, for instance, leads to a more complicated model with more complicated dynamics, but the basic insights would remain the same: A Taylor rule would not insulate the economy from the deflationary equilibrium.

56 For our purposes, under certain conditions, a simple "money in the utility" function would have given exactly the same outcome, i.e. the same Euler condition for consumption.

57 where $0 < \beta < 1$ and the period utility function $u(.)$ is bounded, continuously differentiable, strictly increasing and strictly concave.

If the goods market opens first, the CIA constraint in real terms will be

$$c_t \leq \frac{m_{t-1}}{\Pi_t} + \tau_t \tag{2}$$

and the representative agent's budget constraint in real terms will be

$$w_t \equiv f\left(k_{t-1}\right) + (1-\delta)k_{t-1} + \tau_t + \frac{m_{t-1} + I_{t-1}b_{t-1}}{\Pi_t} \geq c_t + m_t + b_t + k_t \tag{3}$$

Using the following value function in a dynamic program

$$V\left(w_t,\ m_{t-1}\right) =$$
$$\max_{c_t,\ k_t,\ b_t,\ m_t} \left\{ u\left(c_t\right) + \beta V\left(w_{t+1},\ m_t\right) + \lambda_t\left(w_t - c_t - m_t - b_t - k_t\right) + \mu_t\left(\frac{m_{t-1}}{\Pi_t} + \tau_t - c_t\right) \right\}$$

we can derive the first order necessary conditions for the agent's choice of consumption, capital, bond and money holdings

$$u_c\left(c_t\right) - \lambda_t - \mu_t = 0 \tag{4}$$

$$\beta\left[f_k\left(k_t\right) + 1 - \delta\right]\ V_w\left(w_{t+1},\ m_t\right) - \lambda_t = 0 \tag{5}$$

$$\beta R_t V_w\left(w_{t+1},\ m_t\right) - \lambda_t = 0 \tag{6}$$

$$\beta\left[R_t - \frac{i_t}{\Pi_{t+1}}\right]\ V_w\left(w_{t+1},\ m_t\right) + \beta V_m\left[w_{t+1},\ m_t\right] - \lambda_t = 0 \tag{7}$$

From the envelope theorem

$$V_w\left(w_t,\ m_{t-1}\right) = \lambda_t \tag{8}$$

$$V_m\left(w_t,\ m_{t-1}\right) = \left(\frac{1}{\Pi_t}\right)\mu_t \tag{9}$$

Following Walsh (2003)[58], we can now use this model to show that, even if the central bank uses an active *(Taylor principle)* type of monetary policy, the economy could end up in a deflationary *(ZLB trap)* monetary equilibrium. This is rather a novel result as it contradicts the literature on Taylor rules that emphasizes the stabilization properties of active monetary policy rules.

Using (6) and (8), we can write the Euler equation for λ_t, the marginal utility of wealth, as

$$\lambda_t = \beta R_t \lambda_{t+1} \tag{10}$$

Combining (10) with (4)[59] we can write

$$\frac{u_c(c_t)}{I_t} = \beta R_t \frac{u_c(c_{t+1})}{I_{t+1}} \tag{11}$$

As $I_{t+1} = R_t \Pi_{t+1}$, by definition of the nominal interest rate, we substitute it in (11) to produce the equilibrium condition

$$\frac{P_t(1+i_t)}{P_{t+1}} \equiv \frac{I_t}{\Pi_{t+1}} = \frac{u_c(c_t)}{\beta u_c(c_{t+1})} \equiv z_t \tag{12}$$

Taking logs of both sides and substituting $r_t^* \equiv \log(z_t)$ – the equilibrium real interest rate – the equilibrium relationship (12) can be approximately rewritten as

$$i_t = \pi_{t+1} + r^* \tag{13}$$

where z_t is taken to be constant in equilibrium (because the real equilibrium is independent of monetary factors).

Now, suppose the central bank is following an interest rate rule such as

$$\begin{aligned} i_t &= \delta(\pi_t - \pi^T) + r^* + \pi^T \\ i_t &\geq 0 \end{aligned} \tag{14}$$

58 BSU use a continuous time M.I.U. model, but obtain similar results.

59 It can be shown (Walsh, 2003) that $u_c(c_t) = (1+i_t)\lambda_t = I_t \lambda_t$.

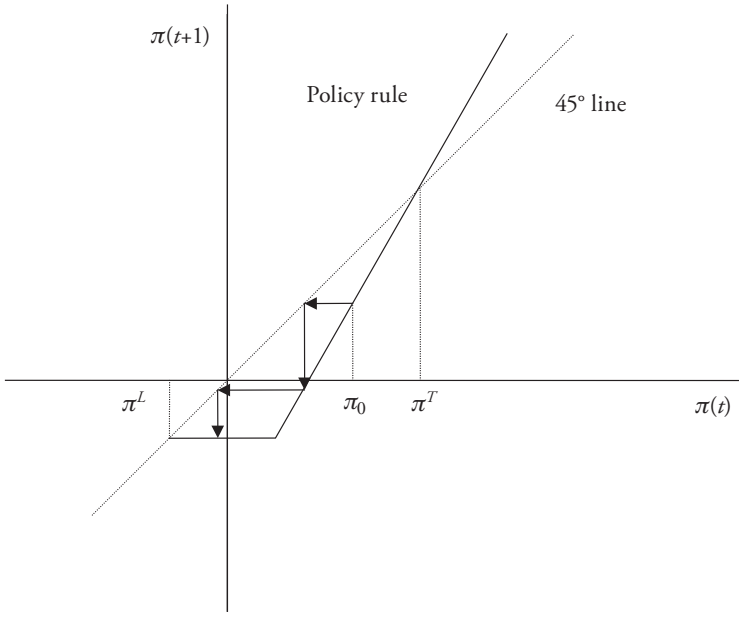
The *Taylor principle* ensures that the policy nominal interest rate responds more than one-for-one to changes in inflation, i.e. $\delta > 1$ when $i_t > 1$ and $\delta = 0$ for $i_t = 0$. In this simple example, the reaction function is piecewise log linear, but other non-linear functions which asymptote at $i_t = 0$ can also be envisaged.

Combining equation (13) and (14), we get a difference equation for the equilibrium process of the rate of inflation

$$\pi_{t+1} = \delta\left(\pi_t - \pi^T\right) + \pi^T \tag{15}$$

which is unstable for $\delta > 1$.

Figure 1:
Falling into a ZLB trap in the BSU model



The dynamic behaviour of the model is illustrated by Figure 1 above. According to equation (15) and given the discussion at the beginning of this annex, we can state that the equilibrium is unstable at π^T. BSU (2001, 2002) argue that the Taylor rule literature ignores the zero bound on nominal interest rates and that, when this bound is recognized, another (stable) stationary equilibrium

emerges: π^L. Analysing the dynamics of the model could then give rise to deflationary paths originating from an initial inflation rate below π^T. If agents expect deflation, they will get it. These equilibrium paths – involving self-fulfilling expectations – cannot be ruled out by the transversality argument because the rate of deflation is now bounded by a floor provided by the zero bound on nominal interest rates.

The flexible price mechanism is as follows: When inflation starts left of π^T on Figure 1, the central bank lowers the nominal interest rate in an attempt to stimulate the economy. Instead of having the desired effect, however, this policy reaction simply generates expectations of lower inflation, causing actual inflation to decline further towards a deflationary equilibrium. In this simple model, expected future inflation depends on current inflation through the assumed policy rule. Once the nominal interest rate reaches the zero bound, the economy reaches a long run deflationary equilibrium.

Appendix B

Getting out of the liquidity trap: KRUGMAN (1998)

Using an endowment (where consumption equals output) two-period version of the previous model, KRUGMAN (1998) argues that to pull an economy out of the liquidity trap, the only available policy is to create expectations of future inflation. When the nominal interest rate reaches the zero nominal bound, the cash-in-advance constraint is no longer binding ($\mu_t = 0$) and we can substitute (4) and (8) in (6) to get a (typical) Euler equation for consumption

$$u_c(c_t) = \beta R_t u_c(c_{t+1}) \tag{16}$$

which can be rewritten in nominal terms as

$$u_c(c_t) = \beta \frac{I_t}{\Pi_{t+1}} u_c(c_{t+1})$$

If the representative agent expects that tomorrow's consumption will be significantly lower than today's consumption – with a concave utility function $u_c(c_t) < u_c(c_{t+1})$ – a negative real interest rate (or $R_t \equiv 1 + r_t < 1$) might be required to clear the goods market. In this flexible-price economy model, prices in time t will drop (below the long-run price level $P_{t+1} = P^*$ that the central bank

is supposed to target in the long-run), creating expectations of inflation. This fall in the price level occurs regardless of the current money supply, because any excess money will be hoarded rather than added to spending in a liquidity trap. Note that in this flexible price world, the liquidity trap has no real adverse consequences: Prices fall immediately to engineer inflation expectations and the negative real interest rate ($r_t < 0$)[60] needed to clear the goods market without any drop in today's consumption.

However, by adding some rigidity to his two-period model, namely by assuming that the price P_t is predetermined, Krugman shows that when the representative agent expects output to be low (under potential output) next period and/or P_t is expected to decrease, the economy can find itself trapped in a zero nominal interest rate situation, where any monetary easing will be insufficient to lift present consumption out of its trap level. Again, equation (16) shows that to convince people to consume more at t when $u_c\left(c_t\right) < u_c\left(c_{t+1}\right)$, the central bank must deliver a negative real interest rate ($r_t < 0$). With predetermined P_t, the necessary inflation expectations have to be policy-induced: The central bank must create inflation expectations. According to Krugman, simply announcing a positive inflation target and a commitment on the part of the central bank to reaching it (by increasing liquidity) would be sufficient to engineer the required expectations of inflation. He nevertheless recognizes that the creation of inflation expectations might, in reality, require more than a mere announcement by the monetary authorities. He thus proposes a fiscal and monetary policy mix as an alternative policy to anchor inflation expectations.

60 In a productive economy (as opposed to the simple endowment economy that is displayed here) in which productive investments take place, the marginal product of capital, which corresponds in equilibrium to the real interest rate, can be low, but it can hardly be negative. Nevertheless, taking into account the equity premium of around 6% (historical US average) the economy could find itself in a liquidity trap even if the rate of return on physical capital is as high as 5%. In this case, we would need a rate on no-risk securities of -1% to bring the goods market into equilibrium without a decrease in today's consumption.

Appendix C

Getting out of a liquidity trap: A monetarist view (Goodfriend, 2000)

i) Some definitions

Goodfriend (2000) advocates the use of quantitative monetary easing through open market operations as a means of stimulating aggregate demand, even if the short-term interest rate is already zero. To be effective, though, the increase in the monetary base must be conducted via open-market operations in *long-term* bonds, or more generally in long-term securities.

Central to his reasoning are the concepts of *broad* liquidity and the *external finance premium*. "[…] *Broad* liquidity is the service yield provided by assets according to how easily they can be turned into cash, either by sale or by serving as collateral for external financing". The *external finance premium* (Bernanke and Gertler, 1995) is the wedge between the cost of funds raised externally (through the issuance of imperfectly collateralized debt) and internal funds (i.e. undistributed profits). In a world of imperfect information, this wedge arises because of the typical principal-agent problem between borrowers and lenders. It reflects the lenders' expected costs of evaluation, monitoring and default on the loan. The external finance premium is inversely related to the net worth of the borrower – as measured by the balance sheet's health of the firm (or the household) – and to the *broad* liquidity properties of the collateral. Obviously, the asset with the best *broad* liquidity property is money, but given Goodfriend's definition, even land has some liquidity properties, because it can be used as collateral for a loan.

He distinguishes between open market operations in *short-term* and *long-term* bonds. Only the latter would improve liquidity (*broadly* defined) in the economy at a zero interest rate and would be effective in stimulating aggregate demand. When the interest rate on short-term securities is zero, they become perfectly substitutable for money (they both have an interest rate of zero and virtually no price or default risk). Then, when the central bank engages in open market operations in short-term bonds, it merely contemplates substituting the latter by the newly created money. There would be *no* improvement in the total liquidity of the economy. On the contrary, augmenting the monetary base through open market operations in *long-term* securities would increase liquidity – *broadly* defined. As Goodfriend puts it, at a zero (or very low) interest rate "[…] bondholders would be exposed to an elevated risk of capital loss owing to the uncertainty about the timing and magnitude of the rise in interest rate that would accompany an

economic recovery. Consequently, long bonds would get a greater than usual haircut off market value when used as collateral for external finance." Obviously, the *broad* liquidity service of money (or of a short-term bond) is greater than that of land (or other types of equities) or long-term securities. Replacing long-term bonds by money in borrowers' portfolios should then increase liquidity *broadly* defined and decrease the *external finance premium* (which depends on the broad liquidity properties of collateral).

ii) The transmission mechanism

Increasing liquidity in the economy would then favour two kinds of intertwined quantitative channels of monetary transmission: The *rebalancing of portfolios* and the *credit channel*. The first channel draws heavily on the monetarist view. Money is kept in portfolios for the liquidity service it yields. By increasing the monetary base in exchange for long bonds, the central bank would *increase* total liquidity but *decrease* the implicit marginal liquidity service of monetary assets. As a result, holders of money would try to rebalance their portfolios by buying less liquid assets (consumer durables, land, physical capital, etc.). This would tend to push up their prices and decrease their expected return until the latter is brought in line with the lower implicit marginal liquidity service of money. The higher price of assets with respect to their cost of production would push households to spend a greater proportion of their incomes (wealth effect) and firms to invest more. This increase in demand would then increase the value of assets further, stimulating aggregate demand and decreasing the output gap.

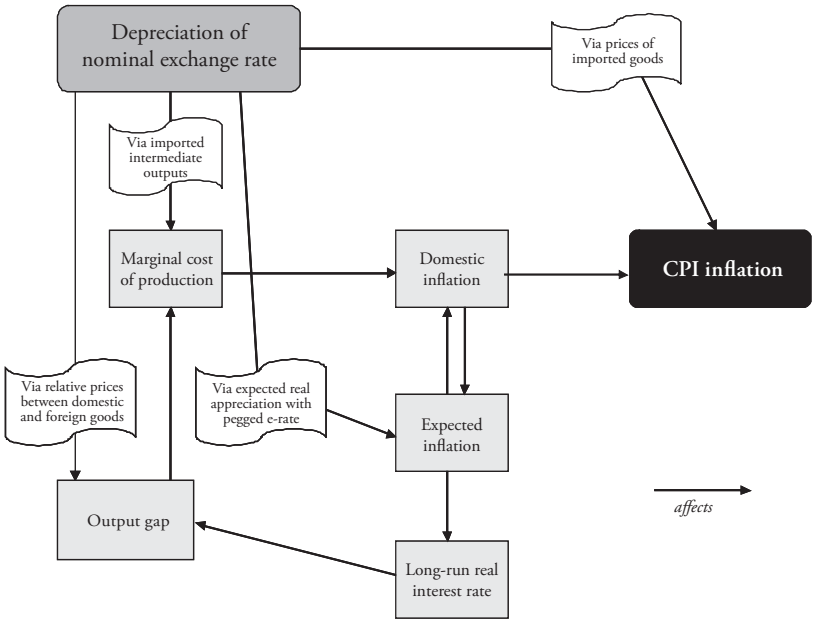
The second channel – the credit channel (BERNANKE and GERTLER, 1995) – focuses on the role of the external finance premium for credit. Following open market operations in long bonds, the *external finance premium* decreases because of both the increase in monetary assets and the increase in other asset prices (cf. preceding portfolio rebalancing argument) which improve net worth, i.e. balance sheet health. The cost of borrowing against future income then decreases and spending increases.

Appendix D

Transmission mechanism in Svensson's model (2001)

The following chart depicts the transmission mechanism that is implied by Svensson's model for a small open economy.

Figure 2:
Transmission mechanism in Svensson's model



In Svensson's model, a small open economy can always get out of a liquidity trap by devaluing and pegging its nominal exchange rate according to the following rule.

$$\bar{s}_t = \bar{s}_{t0} + \left(\hat{\pi}_t - \pi^*\right)\left(t - t_0\right) \tag{17}$$

where $\bar{s}_{t0} > s$, the targeted nominal exchange rate in time 0 is higher (meaning a weaker home currency in terms of foreign currency) than the long-run nominal exchange rate; $\hat{\pi}_t$ is the target inflation rate (depending on the gap between target and actual long-run price levels) and π^* is the foreign inflation rate.

SUMMARY

In this paper we attempt to identify a set of criteria that an economy has to fulfil to fall into a *deflationary trap*. We argue that these conditions are not met to a sufficient degree by Switzerland and, accordingly, the risk of falling into such a trap is rather small. If an economy finds itself trapped, however, we suggest that the central bank still has alternative tools to reflate it, even if its policy interest rate has already reached the zero floor (the zero lower bound). In a small open economy, temporarily switching to an exchange rate operating target seems to be the most efficient approach. But other strategies including, in last resort, collaboration with the fiscal authorities, are also theoretically available.

ZUSAMMENFASSUNG

Ziel des Papiers ist es Kriterien zu identifizieren, die in einer Volkswirtschaft zu Deflation führen. Unsere Resultate zeigen, dass diese Bedingungen im Fall der Schweiz nicht ausreichen, um ein Deflationsrisiko darzustellen. Befindet sich ein Land in einer Deflation, sind wir der Meinung, dass die Zentralbank auch dann Mittel zu deren Bekämpfung in der Hand hat, wenn die Leitzinsen als ihr Hauptinstrument bereits bei Null liegen (Nominalzinsuntergrenze). Der erfolgversprechendste Ansatz hierfür scheint in einer kleinen offenen Volkswirtschaft in einem temporären Übergang zu einem Wechselkursziel zu liegen. Als letzter Ausweg stehen weitere Alternativen zumindest theoretisch zur Verfügung. Zu diesen zählt die Zusammenarbeit mit den Fiskalbehörden.

RÉSUMÉ

Pour tomber dans un piège déflationniste, une économie doit remplir certains critères. Ce papier tente de les identifier et de montrer que ces conditions ne sont pas réunies en Suisse. Nous rappelons également que, le cas échéant, la Banque centrale n'est pas complètement démunie lorsqu'il s'agit de stimuler l'économie et que son principal instrument - le taux d'intérêt à court terme - a atteint sa limite naturelle de zéro. Dans une petite économie ouverte, l'institut d'émission peut, par exemple, changer d'objectif opérationnel et viser le taux de change en lieu et place du taux d'intérêt. Si c'est l'approche qui nous paraît la plus efficace, ce n'est cependant pas la seule. D'autres stratégies sont possibles et peuvent impliquer, en dernier recours, une collaboration avec les autorités fiscales.