

# The Zero Lower Bound on Nominal Interest Rates and Monetary Policy Effectiveness: A Survey

BY

C.A. ULLERSMA\*

Research Memorandum 0203

OCFEB  
Room H6-20  
Erasmus University Rotterdam  
P.O. Box 1738  
3000 DR Rotterdam  
The Netherlands  
Telephone +31 10 408 2430  
Telefax +31 10 408 9173  
E-mail [info@ocfeb.nl](mailto:info@ocfeb.nl)  
Website [www.ocfeb.nl](http://www.ocfeb.nl)

**Keywords:** Monetary policy, Zero lower bound, Liquidity trap

---

\* Monetary and Economic Policy Department, De Nederlandsche Bank, PO Box 98, 1000 AB Amsterdam, the Netherlands, and OCFEB Research Centre for Economic Policy (Erasmus University Rotterdam); Phone: +31205242332; Fax: +31205242506; E-mail: C.A.Ullersma@dnb.nl.

The views expressed are the author's and do not necessarily reflect the position of De Nederlandsche Bank. I would like to thank Jan Marc Berk, Job Swank, two anonymous referees and participants of the 76th Annual Conference of the Western Economic Association International on July 4-8 2001 in San Francisco for valuable comments. Martin Admiraal provided expert research assistance. The usual disclaimer applies.



## Table of contents

Summary .....	5
1. Introduction.....	7
2. The Consensus Model .....	11
3. Different Views on the Zero Lower Bound: An Appraisal .....	17
3.1 Krugman's view .....	17
3.2 Meltzer's Monetarist view .....	19
3.3 Buiter's and Goodfriend's view: Abolition of the zero bound .....	21
3.4 Svensson's eclectic view with an important role for exchange rate policies .	22
4. Concluding Remarks.....	23
References .....	28



## **Summary**

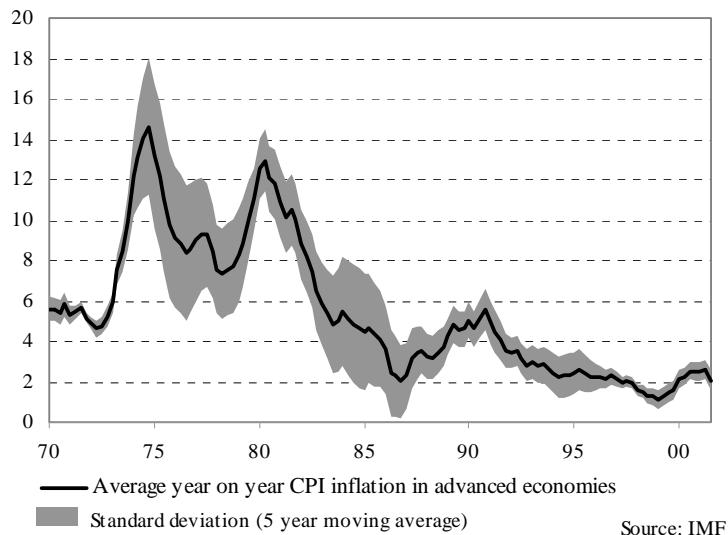
This paper surveys the literature on monetary policy at the zero lower bound on nominal interest rates. Certain crucial insights regarding expectations have been neglected in recent research in this field. Taking this into account, the interactions between demand, confidence and supply shocks appear crucial for hitting the zero lower bound and escaping from it. Restoring confidence can play a vital role in solving the zero lower bound problem, thereby avoiding a liquidity trap.



## 1. Introduction

In the 1980s and 1990s, inflation in the industrialised world has fallen from the high levels reached in the 1970s and early 1980s, when inflation waves occurred following the breakdown of the Bretton Woods system and two large oil price shocks. According to IMF statistics, average year-on-year CPI-inflation in OECD countries declined from 12% in 1980 to 5.0% in 1990, and 1.4% in 1999 (Figure 1). The variability of inflation in terms of standard deviations has also decreased over these years. A new era seems to have emerged with low and more or less stable inflation rates in the major capitalist economies (Clarida et al. (1998), Viñals (2001)).<sup>1</sup> This situation is comfortable from the point of view of monetary policy, the overriding objective of which is price stability. In the words of Greenspan (1989), price stability is defined to mean “that expected changes in the average price level are small enough and gradual enough that they do not materially enter business and household financial decisions”.

**Figure 1 Consumer price inflation in advanced economies**

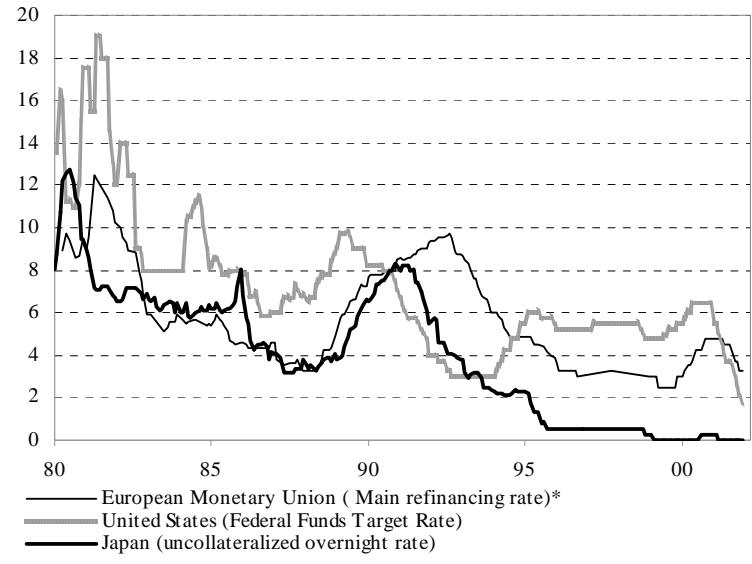


Source: IMF

<sup>1</sup> In 1995, the leading monetary authorities of the world also expressed this view. At a meeting of the Group of Seven in October 1995, the communiqué concluded: “The ministers and central bank governors agreed that in most countries the conditions for continued growth and employment gains are in place and inflation is well under control.”

However, the achievement of price stability has not created a new Utopia for monetary policy. Instead, it has brought about new challenges (e.g. IMF (1999)). One of the main challenges is the decrease in the room for manoeuvre for monetary policy.<sup>2,3</sup> The fall in the inflation rate in the advanced economies has coincided with a decline in the monetary policy interest rates (Figure 2).<sup>4</sup>

**Figure 2** Monetary policy interest rates



\* German rates for the period until 1999. Thereafter: Eurosystem rates.

The point is that – assuming zero storing costs for cash and perfect substitutability between non-monetary assets – nominal interest rates cannot go negative. In that case, the rate of return on cash (zero) dominates that on assets yielding a negative nominal return. In practice, nominal interest rates on (short-term) financial claims can be slightly negative if the cost of storing currency exceeds that of storing other claims (McCallum

<sup>2</sup> Vickrey (1954) argued against policies resulting in very low inflation or deflation. Deflation would prevent monetary policy from engineering negative ex ante real interest rates, which can be necessary for correcting downward tendencies in the economy.

<sup>3</sup> Another challenge is analysed by Akerlof et al. (1996). They have focussed on the existence of downward rigidities that would favour the central bank having a small but positive inflation rate objective.

<sup>4</sup> For an historic account of (the volatility of) inflation and interest rates, see McFarlane and Mortimer-Lee (1994) and Homer (1977) respectively.

(2000)), although exceptions to the lower zero bound have been rare.<sup>5</sup> Since for theoretical discussions the exact level of the floor to nominal interest rates does not matter, I assume for simplicity that nominal interest rates cannot go negative. In this context, the so-called problem of the zero lower bound on nominal interest rates is that the monetary authority is no longer in a position to pursue a policy of monetary easing by lowering nominal interest rates.<sup>6</sup> Under these circumstances, monetary policy may still be effective via other transmission channels than nominal interest rates. For instance, inflationary expectations can be fuelled via higher money growth. In this paper, I follow Buiter and Panigirtzoglou (2000) in their definition of a liquidity trap.<sup>7</sup> An economy is said to be in a liquidity trap if all channels of monetary transmission are blocked. Only in one case, the liquidity trap and the zero bound on nominal interest rates are identical concepts. This applies if the nominal interest is the only monetary transmission channel. In other cases, a binding zero lower bound is a necessary but not a sufficient condition for the liquidity trap to prevail.

The zero lower bound on nominal interest rates has long been regarded as a phenomenon of the past. It has been related mainly to the Great Depression in the US (1929-1930s). The main monetary policy rate in the US by then, the three months 'T-bill' rate, was close to zero from 1932 onwards; it did not exceed 1% until 1948. The long-term interest rate was also very low in this period. It has been suggested that monetary policy was completely ineffective by then, *i.e.* that a liquidity trap prevailed.<sup>8</sup> The only example of a binding zero lower bound in the period between the Great

---

<sup>5</sup> One recent example is the occurrence of slightly negative interest rates on Japanese short-term government bonds and some interbank lending in late 1998. Longer ago, in 1978, the Swiss authorities imposed negative interest rates on foreign deposits in order to fight speculative buying of the Swiss franc. During the Great Depression US T-bills occasionally gave a small negative yield in the context of exemption from personal property taxes in some States (Cecchetti (1988)).

<sup>6</sup> In such circumstances, monetary easing is said to be like "pushing on a string". This expression is attributed to Fed governor Marriner S. Eccles in 1935.

<sup>7</sup> In between these extreme positions on the interpretation of a liquidity trap, there exists a large range of slightly different interpretations of the liquidity trap. Since they all share common features, these differences are of limited importance to our discussion of the liquidity trap. For a detailed discussion of different interpretations, see Patinkin (1965, 1974) and Beranek and Timberlake (1987).

<sup>8</sup> In the 1960s and 1970s, there was an intensive, but inconclusive, debate on whether the US economy was in a liquidity trap during the years of the Great Depression. This debate focussed on the interest elasticity of the money demand function. Some authors found that the interest elasticity was without limit when the short-term nominal interest rate approached zero. Therefore, they concluded that the economy was in a liquidity trap (Eisner (1963 and 1971), Spitzer (1976)); others found a fixed interest elasticity and came to the opposite conclusion (Bronfenbrenner and Mayer (1960 and 1963), Meltzer (1963)).

Depression and the 1990s is Switzerland. In the late 1970s, Switzerland went through periods with nominal interest rates at or close to the zero lower bound. However, in contrast to the US during the Depression years, the Swiss economy was buoyant in the late 1970s. The very low Swiss rates have been associated with the liberalisation of global exchange rates in the early 1970s, although the introduction by the Swiss authorities of capital controls also played a role (Mauro (1995)). The new exchange rate regime implied appreciation and expectations of further appreciation of the Swiss franc.

Developments in Japan in the late 1990s have revived interest in the zero lower bound phenomenon. From February 1999 to January 2002 (completion of this paper), the uncollateralized overnight call rate was virtually zero.<sup>9</sup> Like the US economy during the Depression years, Japan has been characterised by a substantial output gap since the early 1990s.<sup>10</sup> The level of potential real economic growth is estimated to be around 1% (OECD (2000)). Given that potential growth in other large economies is generally estimated to be considerably higher<sup>11</sup>, it follows that even in steady state (*i.e.* output gap closed) the Japanese real long-term interest rate will be relatively low. Assuming identical risk and term premia across countries, this will go hand in hand with relatively low short-term nominal interest rates. The Japanese example illustrates that a zero lower bound can emerge in a modern capitalist economy. Krugman (1998, 1999b) and Svensson (2000) have warned explicitly that such a situation might also prevail in the US and the euro area, given the structural decline in nominal interest rates over the last two decades.

This paper surveys the literature on the zero lower bound on nominal interest rates and the related phenomenon of the liquidity trap. Section 2 sketches the main issues in the framework of a New-Keynesian model, which is a dynamic stochastic real business cycle model with nominal rigidities. Section 3 offers an appraisal of the four main strands in the literature. As it turns out, these theories are incomplete. In the concluding section 4, I argue that certain crucial insights got lost in the literature. This pertains in particular to expectations, which were totally left out in the static ISLM representation of a macroeconomy by Hicks (1937) to return only partly in later work. It appears that supply factors that undermine confidence are depressing total demand in a situation with a binding zero lower bound. Hence, a lack of confidence is the main force driving

---

<sup>9</sup> Until March 19, 2001, the uncollateralized overnight call rate was the direct operational target of the Bank of Japan. From then onward, the operational target has been the outstanding balance of the current accounts at the Bank of Japan, with the uncollateralized overnight call rate determined in the market.

<sup>10</sup> According to the OECD (2000), Japan's output gap in 1999 is 4.0% of GDP. Applying Okun's law, Krugman (1998) concludes that Japan's output gap is even higher, in the order of 10%.

<sup>11</sup> The OECD (2000) projects potential real growth in 2000 at 1.2% in Japan, 3.7% in the US and 2.4% in the euro area.

the emergence of a liquidity trap; similarly, restoring confidence is the main challenge in escaping from it.

## 2. The Consensus Model

The zero lower bound on nominal rates was recognised as early as 1896 by Irving Fisher (1896). However, Keynes (1936) was the first to elaborate on the problem of the liquidity trap<sup>12</sup> in Chapters 15 and 17 of *The General Theory* (see also Lerner (1952) and Ono (1994)). He emphasises the *liquidity preference* of economic agents, implying that the utility of holding money is always positive, even if more money is held than required by the transactions or precautionary motive (compare Modigliani (1944)). Keynes shows that a liquidity trap can emerge in an environment with liquidity preference and sluggish price adjustment. The basic idea is that an economic agent allocates his income to consumption, money holdings and bonds, assuming that all assets other than money are perfect substitutes for each other. Under normal circumstances, optimising behaviour will equalise the marginal rate of substitution between present and future consumption ((intertemporal) time preference rate), the marginal rate between present consumption and present money holdings (liquidity premium), and the nominal market interest rate. However, if the nominal market interest rate is below the liquidity premium, economic agents will keep consumption below the market clearing level. Persistent stagnation will occur, because economic agents will not be satiated with money, no matter how much they have accumulated. Liquidity preference prevails because of the speculative motive, based on uncertainty about future economic developments in general, and more specifically, about future nominal interest rates. If the long-term nominal interest rate is perceived to be very low (in the order of 2% according to Keynes (1936)), economic agents will expect this rate to rise and will hold liquid assets (money) in an attempt to benefit from it. In Keynes' (1936) view, money's role as a store of wealth is the reason that "changing views about the future are capable of influencing the present situation". With the market interest rate below the liquidity premium, consumption remains insufficient to restore market equilibrium, and money becomes a "bottomless sink for purchasing power". The economy is then said to be in a liquidity trap. In Keynes' (1936, page 207) own words:

"There is the possibility [...] that, after the rate of interest has fallen to a certain level, liquidity preference may become virtually absolute in the sense that almost everyone

---

<sup>12</sup> The liquidity trap as described by Keynes differs from the usual textbook description. The latter is based on Hicks' (1937) representation of a Keynesian economy in the famous ISLM framework. Hicks left out the intertemporal choice completely and put the economy in a static framework, thereby focussing on intratemporal choices that are key in Keynes (1936). In a one-period model, there is no role to play for (a change in) expectations. Hicks was well aware of the limitations of his simplification. He himself noted that the assumption of given expectations is not realistic.

prefers cash to holding a debt which yields so low a rate of interest. In this event the monetary authority would have lost effective control over the rate of interest.”

The classical economist Pigou (1943, 1947) disagreed with Keynes on this conclusion. In his view, the utility of money is satiable, meaning that ultimately the liquidity premium will decline sufficiently to reach the time preference rate when liquidity holdings increase.<sup>13</sup> In this view, rational economic agents will ultimately spend their cash holdings. The basic idea behind the mechanism that will restore equilibrium is the following. Economic agents realise that monetary growth will ultimately imply higher inflation (Fisher identity) and that future inflation will reduce their spending capacity. Hence, they have a strong incentive – at least in the long run – to spend before others do. If the time preference rate at the market clearing level is lower than the liquidity premium, economic agents will reduce consumption. This will imply disequilibrium in the goods market, and therefore generate deflation. As a result, real balances will rise over time, which will raise consumption until equilibrium is restored. This is the so-called Pigou effect.

By now, a consensus model has emerged to study the zero lower bound. In the long run, market clearing and the Pigou effect are generally believed to restore full employment equilibrium. Ultimately, there are no nominal rigidities and money is neutral. Hence, monetary policy has no real economic effects in the long run, and a liquidity trap is inconceivable as a persistent phenomenon.

As regards the short run analysis of the zero lower bound, different approaches have culminated in the New Keynesian synthesis<sup>14</sup>, which can be regarded as a symbiosis of Neo Classical and Keynesian thoughts. New Keynesian models introduce nominal price and/or wage rigidities in a dynamic stochastic real business cycle framework. It took a long time until serious consideration was given to the zero lower bound for nominal interest rates in this framework. Summers (1991) and Fischer (1994) have revived this old concern. Since then, Fuhrer and Madigan (1997), Krugman (1998), Orphanides and Wieland (1998), Svensson (2000, 2001), Buiter and Panigirtzoglou (1999, 2000) and Wolman (1998) have studied the zero lower bound and the liquidity trap in a New Keynesian framework. Although this framework has important limitations when analysing the zero lower bound, it has proven to be a helpful workhorse to study certain aspects of this issue. I take it as a starting point and discuss its limitations and possible extensions along the way. Following Smets (2000) and Viñals (2001), a highly stylised New Keynesian macroeconomic model can be specified as follows (equations (1-4)):

---

<sup>13</sup> Compare McCallum (1983) for a formal analysis.

<sup>14</sup> The New Keynesian literature is surveyed in Goodfriend and King (1997) and Clarida, Galí and Gertler (1999).

- (1)  $y_t = \rho_y y_{t-1} + (1 - \rho_y) E_t y_{t+1} - \sigma r_t + \varepsilon_{y,t}$
- (2)  $\pi_t = \omega \pi_{t-1} + (1 - \omega) E_t \pi_{t+1} + \lambda y_t + \varepsilon_{\pi,t}$
- (3)  $r_t = i_t - E_t \pi_{t+1}$
- (4)  $i_t = \rho_r i_{t-1} + \beta_\pi \pi_t + \beta_y y_t$

$y_t$  (in logs) is the percentage deviation of output from its steady state trend level in period  $t$ ,  $i_t$  the nominal interest rate,  $r_t$  the ex ante real interest rate, and  $\pi_t$  the inflation rate.  $\varepsilon_{y,t}$  and  $\varepsilon_{\pi,t}$  are the (serially uncorrelated zero-mean) stochastic components of equations (1) and (2), representing demand and inflation disturbances respectively.  $E_t x_{t+1}$  is the expected value at period  $t$  of variable  $x$  in period  $t+1$ ;  $\rho_y, \sigma, \omega$  and  $\lambda$  are parameters. Equation (1) is a representation of the demand side of the economy. Equation (2) is a Phillips curve, representing the supply side. With  $\rho_y$  and  $\omega$  equal to zero, Goodfriend and King (1997) have demonstrated that these equations can be derived from micro foundations. However, equations (1) and (2) consist of both forward and backward looking components in order to describe the inflation dynamics in industrialised economies satisfactory (Smets (2000)). Equation (3) describes the Fisher-relation between (ex ante) real and nominal interest rates. By definition, the zero lower bound is binding when the sum of the real rate of interest and the rate of expected inflation is zero. Nominal interest rates cannot go negative. For in that case, the zero rate of return on cash would dominate the rate of return on other assets, which is ruled out a priori. The model does not distinguish between short- and long-term interest rates.<sup>15</sup> Perfect substitutability is assumed between non-monetary assets. Finally, equation (4) is the Taylor type rule that describes the interest rate reaction function. The nominal interest rate is increased when current inflation exceeds its target (assumed to be zero) or when the output gap is positive. Equation (4) may require that the monetary authority set a negative real interest rate, which may be impeded by low or even negative expected rates of inflation. Then, the zero lower bound will be binding, and the economy will be in a liquidity trap in the absence of other transmission mechanisms than the nominal interest rate.

An economy with a low average real interest rate over the business cycle is in a more vulnerable position concerning the risk of drifting into a situation with a binding zero lower bound than an economy with a higher average real interest rate. Usually, however, an economic shock is necessary to trigger a sudden decline in the steady state

---

<sup>15</sup> For ease of exposition, the model ignores term and risk premia. The incorporation of risk premia would add a spread to the interest rate in equation (1), and would lift the lower bound to the nominal interest rate. In general, risk premia are increasing with the level of interest rates. If there would still be a risk premium with the riskless nominal interest rate at its lower bound - which seems likely - the incorporation of risk premia in the model would make a binding lower bound more likely.

real interest rates and/or the rate of expected inflation (e.g. Orphanides and Wieland (1998)). I discuss several kinds of shocks that can hit the economy.

First, a *downward cost-push shock* can trigger a binding zero lower bound. Examples are a downward shock in oil prices or increased competition. Such a shock implies a significant negative value of  $\varepsilon_{\pi,t}$  in equation (2). The direct effect is lower inflation in period  $t$ . As a result, the nominal interest rate will be decreased (equation (4)), moving in the direction of the zero lower bound. The ex ante real interest rate will decrease too, causing some counterbalancing upward pressure on inflation through  $y_t$ . In general, a downward cost-push shock is favourable, supporting output but reducing inflationary pressures.<sup>16</sup> Only if there is very strong initial downward pressure on inflation, there is a severe risk that the zero lower bound will be hit.

Second, a *downward demand shock*,  $\varepsilon_{y,t} < 0$  in equation (1), putting downward pressure on both output and inflation, can cause a binding zero lower bound. The output gap will fall first (equation (1)), resulting in lower inflation in the same period (equation (2)). Both effects are translated into a lower nominal interest rate (equation (4)), bringing closer a binding zero lower bound. A demand shock may originate from a collapse in aggregate demand, e.g. following a sudden lack of confidence. Contrary to the situation after a downward supply shock, both the output gap and inflation pressure have similar effects on the nominal interest rate. Therefore, this is potentially a more severe situation. Budgetary contraction offers an example of a negative demand shock that lowers real interest rates and can fuel deflationary expectations, as was the case in the US in the late 1920s/early 1930s.

Third, in an open economy, a sudden large *expected appreciation* can cause a binding zero lower bound (McKinnon and Ohno (2000)). To illustrate this, the model can be extended to include interactions with the outside world. I assume Uncovered Interest Parity (UIP), which can be stated as:

$$(5) \quad i_t = i_t^* + (E_t s_{t+1} - s_t)$$

$i_t^*$  is the foreign nominal rate of interest.  $E_t s_{t+1}$  is the expected nominal exchange rate of the foreign currency expressed in units of the domestic currency for period  $t+1$ . So, an increase in  $s$  means a nominal depreciation of the domestic currency. In real terms, UIP can be written as:

$$(6) \quad r_t = r_t^* + (E_t q_{t+1} - q_t)$$

---

<sup>16</sup> E.g. continued price cuts in the computer industry in the 1980s and 1990s associated with technical progress have not undermined investment in this sector, because productivity gains have more than offset the price effect. Other sectors of the economy have clearly benefited from lower computer prices.

$q$  is the real exchange rate ( $s_t P_t^* / P_t$ ), where the domestic price level  $P$  is assumed to be temporarily fixed; the foreign price level  $P^*$  is treated as given, because it is beyond the influence of the domestic monetary authority. The central bank can influence  $q$  via foreign currency interventions that alter  $s$ . I restate the model (equations (1-4)) in an open economy context as follows (equations (7-10)):

$$(7) \quad y_t = \rho_y y_{t-1} + \rho_y^* y_t^* + (1 - \rho_y) E_t y_{t+1} - \sigma_i + \alpha_1 (E_t q_{t+1} - q_t) + \varepsilon_{y,t}$$

$$(8) \quad \pi_t = \omega \pi_{t-1} + (1 - \omega) E_t \pi_{t+1} + \lambda y_t + \alpha_2 (E_t q_{t+1} - q_t) + \varepsilon_{\pi,t}$$

$$(9) \quad r_t = i_t - E_t \pi_{t+1} = r_t^* + (E_t q_{t+1} - q_t)$$

$$(10) \quad i_t = \rho_r i_{t-1} + \beta_\pi \pi_t + \beta_y y_t$$

$\rho_y^*$ ,  $\alpha_1$  and  $\alpha_2$  are parameters. In equation (7),  $\rho^* y^*$  represents foreign export demand<sup>17</sup>;  $\alpha_1 (E_t q_{t+1} - q_t)$  is an expression for changes in competitiveness. In equation (8) the term  $\alpha_2 (E_t q_{t+1} - q_t)$  is added to include the effects of expected costs of imported intermediaries. Equation (9) follows from equation (6). With a large expected real appreciation, the direct effect on the inflation rate will be downward (equation (8))<sup>18</sup>, bringing closer a binding zero lower bound (equation (10)). There is also an indirect downward effect on inflation via a lower output gap (equation (7)). Exchange rate arrangements that cause substantial real appreciation can turn out to be problematic in this respect. Keynes (1923) was well aware of the international propagation of deflationary pressures through the fixed nominal exchange rates of the gold standard, which limited the scope for domestic policy actions in an international environment with free capital movement (incompatible triangle). In the 1980s, the Plaza and Louvre agreements set similar mechanisms in motion, with negative effects on Japan (Siebert (2000)). The international movement towards stable and low inflation rates (section 1) has reduced the risk of the emergence of a sudden large expected appreciation in today's advanced economies.

Economic shocks are most devastating when they lead to persistent deflationary expectations, lifting real interest rates, and set in motion a chain of events that lead to stagnation, *i.e.* a *deflationary spiral* (Krugman (1999a)). Persistent deflationary expectations can stem from prevailing adaptive expectations (high value of  $\omega$  in the model). They can also stem from price and/or wage stickiness (*e.g.* DeLong and Summers (1986)). The implied slowness of price reductions can fuel (rational)

---

<sup>17</sup> In an open economy, net additional demand via net exports reduces the risk of very low ex ante real interest rates.

<sup>18</sup> In the Exchange Rate Mechanism (ERM) of the EMS (fixed but adjustable exchange rates), higher inflation of an ERM country relative to inflation in Germany (the anchor country) caused a loss of competitiveness (real appreciation), mitigating inflationary pressures.

expectations of still further price reductions ( $E_t \pi_{t+1}$  lower). Fisher<sup>19</sup> (1933), Tobin (1975, 1980), Minsky (1982), King (1994) and Bernanke (1995) have emphasised that high nominal indebtedness will make a deflationary spiral more likely to occur due to the heterogeneous nature of economic agents. More specifically, debtors, who spend a higher proportion of their income than creditors, get into trouble by deflation since their real income declines substantially. So, even if net debt is modest (with debtors and creditors offsetting each other), debt distribution is relevant. High nominal indebtedness can arise during an asset price bubble (Minsky (1982), Wolfson (1996)). When the bubble collapses, the debt may turn out to be unbearable, especially in a deflationary climate. An alternative propagation mechanism concerns the collateral value associated with the debt. Deflation will erode the collateral value. As a result the cost of capital will increase, subsequently decreasing investment demand (Bernanke and Gertler (1989)). A vicious circle can develop, with falling asset prices, rising real debt levels, lower aggregate demand, consumer price deflation and downward spiralling expectations. Note that a deflationary spiral is not the mirror image of an inflationary spiral. In the latter case, the monetary authority can stabilise the economy by raising the real rate of interest via an increase in nominal rates (assuming nominal price and/or wage rigidities). However, in a deflationary environment, the monetary authority will not be able to lower real rates below a certain level, due to the lower bound on nominal interest rates.

Usually, the risk of a binding zero lower bound is regarded as limited. According to Orphanides and Wieland (1998), the risk of hitting the zero bound would be negligible for the US with an average nominal interest rate over the cycle of 3%. To get this result, they use stochastic simulations of a small structural rational expectations model. They suppose stochastic shocks similar in magnitude to those over the 1980s and 1990s. Only with a lower level of the average nominal interest rate, they found a significant risk of a binding zero bound. Using a similar model, Viñals (2001) has compared the US and the euro area chance of hitting the zero lower bound. His findings for the US are more or less in line with those of Orphanides and Wieland (1998). For the euro area, his results suggest an even smaller chance than for the US of hitting the zero lower bound due to the structural characteristics of the euro area. However, finding that shocks that cause a binding zero lower bound are unlikely, does not rule them out altogether. The probability of a binding zero lower bound depends on the likelihood of a combination of extreme shocks. Since the frequency of such shocks is limited, they are hard to assess econometrically (King (1999)).<sup>20</sup> Typically, in a financial crisis, several different shocks can reinforce themselves. Mishkin (1991, 1996) defines a financial crisis as “a disruption to financial markets that sharply and severely increases asymmetric

---

<sup>19</sup> Fisher's debt-deflation theory is clearly analysed in Dimand (1999).

<sup>20</sup> Amirault and O'Reilly (2001) warn that relying on historical data to determine the risk of hitting the zero lower bound may underestimate this risk due to the recent world-wide tendency towards regimes with low average levels of inflation.

information [...] so that financial markets are no longer able to efficiently channel funds to those who have the most productive investment opportunities". He has found that most financial crises in the US started with a combination of shocks, including a sharp increase in interest rates, a stock market crash, and a sharp increase in uncertainty due to economic recession. In addition, the terrorist attacks on New York and Washington on 11 September 2001 offer an example of a rare combination of shocks. Lower demand as a result of the virtual stand-still of the US economy for several days, falling asset prices, together with strong negative confidence effects, can potentially trigger a binding zero lower bound.

### **3. Different Views on the Zero Lower Bound: An Appraisal**

Four main strands of the literature can be distinguished to discuss the zero lower bound. First, Krugman and his followers have emphasised the importance of lifting expected inflation to lower the market real interest rate at the zero lower bound. Second, Meltzer and other Monetarist authors have argued that transmission mechanisms other than the nominal interest rate will be effective at the zero lower bound. Third, Buiter and Panigirtzoglou as well as Goodfriend have proposed to introduce so-called *Gesell money*. As explained by Goodfriend (2000), Gesell money is a carry tax on money (both currency and bank reserves) to circumvent the interest rate floor. Fourth, Svensson has tried to combine several other approaches, and claims to have found a 'foolproof' way to escape from the liquidity trap. These different approaches are discussed below in the context of the consensus model. Meanwhile, it is important to keep in mind that Japan has been struggling for many years with a binding zero lower bound. This may indicate that the theories put forward are incomplete, although it is fair to say that this proposition does not follow from the Japanese example *per se*, as a referee has correctly pointed out. From the perspective that the available theories seem incomplete, this section also evaluates the limitations of the main strands in the literature.

#### **3.1 Krugman's view**

Several years before Krugman (1998), Summers (1991) had emphasised that a (very) low level of average inflation and low inflationary expectations will imply (very) low average short-term nominal interest rates. If the monetary strategy leads to inflationary expectations close to or below zero, this will make the emergence of a binding zero lower bound more likely. Krugman (1998) has triggered a discussion on Japanese monetary policies. In his analysis, *lifting expected inflation* is the way forward for Japan and other economies struggling with a binding zero lower bound. He makes a strong case for the announcement of an *inflation target* in a deflationary environment in order to guard inflationary expectations. Then, lifting expected inflation (equation (3)) can reduce the *ex ante* real interest rate, which is the interest rate decisive for economic performance (equation (1)).

According to, among others, Svensson (2000) and Smets (2000), *price level targeting* might be a better way to anchor expectations than an inflation target. This is because, in contrast to an inflation targeting regime, undershooting of the price level target in period  $t$  leads to inflationary expectations in period  $t+1$ . Berg and Jonung (1999) describe how Sweden dropped the gold standard in 1931 and adopted an explicit price level target. It turned out that price level targeting was a successful way for Sweden to stop deflationary expectations and mitigate the output decline. The potentially better performance of price level targeting as compared to inflation targeting is subject to the confidence of the general public and financial markets in the monetary authority's ability to reflate the economy.<sup>21</sup> In this respect, the public can be expected to be more confident if the central bank has at its disposal instruments with which it can create future inflation directly.

In addition to the long term orientation of monetary policy, monetary tactics (*i.e.* the way in which monetary policy is executed on a short-term basis) may also matter. Reifschneider and Williams (2000) have argued that if the central bank follows a Taylor-type rule and targets a (close to) zero inflation rate, the rule can be modified slightly to reduce dramatically the detrimental effects of the zero lower bound. In their paper, one possible modification with promising results is to lower the nominal monetary policy rate pre-emptively if a binding zero bound is expected. This would involve a higher value for  $\beta_\pi$  in equation (4) if there were a serious threat of a binding zero bound in the near future. The suggested policy reaction is in line with what several authors (*e.g.* Mundell (2000)) have concluded on Fed policies in the late 1920s. With hindsight, they have stated that the Fed should have lowered nominal interest rates sooner and more forcefully and should have injected reserves via its lender of last resort-function. Then, the Fed might have been in a position to prevent the rapid decline in broad money and the collapse of the banking sector. The deflation of the Great Depression would probably have been more modest, or even avoided.

Krugman launched his ideas in order to influence Japanese policies at the end of the 1990s. The Japanese authorities and others have been very sceptical about his recipes. In their view, the Bank of Japan cannot explicitly show how to achieve the desired inflation level. They fear following Krugman's advice would result in a loss of credibility (Okina (1999)). Whereas Krugman acknowledges that creating inflationary expectations might be difficult, especially when the public is convinced of the central bank's commitment to price stability, Buiter and Panigirtzoglou (1999) regard this virtually impossible. In their words "targeting a higher rate of inflation after you are caught in the trap would be like pushing toothpaste back into the tube". The problem is that Krugman's recipe is conditional on the central bank's ability to increase expected

---

<sup>21</sup> Batani and Yates (2001) have shown that the probability of hitting the zero lower bound under the alternative regimes is model specific.

inflation.<sup>22</sup> In reality, the central bank has no instruments available to force higher expected inflation. It might also be difficult to raise inflationary expectations because price stickiness can make the expected future price also sticky (Fuhrer and Madigan (1997) and Orphanides and Wieland (1998)). Krugman's ideas fit in the literature on time-inconsistency and credibility by Kydland and Prescott (1977), Barro and Gordon (1983) and their followers that credible central bank commitment to price stability can anchor expected inflation at a low and stable level. If his recipe works, it is important to avoid that creating higher inflationary expectations paves the way for a future inflationary spiral, which would be suboptimal from a microeconomic perspective. Therefore, it is crucial to base monetary policies on a nominal anchor provided by the medium term monetary policy strategy (Taylor (2001)). In so doing, the monetary policy strategy helps in reducing uncertainty about the future. Similarly, Svensson (2000) argues that the mere announcement of an inflation target is not likely to be enough to fuel inflationary expectations. Instead, it would be necessary to set up an inflation-targeting framework, including transparent inflation reports and published inflation forecasts among other things. In the words of Blinder (1998), it is about "words matching deeds". All in all, it seems unlikely that the exact set-up of the monetary policy strategy is essential for its success in solving the zero lower bound problem. What matters, is that it helps anchoring medium term inflationary expectations. But if a central bank is initially lacking credibility, it is unlikely that it is able to commit itself credibly to higher inflation.

### 3.2 Meltzer's Monetarist view

Monetarists argue that the monetary transmission channel<sup>23</sup> is much more complicated than is incorporated in equation (1). The Monetarist view differs from the consensus model in so far that monetary easing will still be successful with short-term interest rates at the lower bound because of other transmission channels (*e.g.* Mishkin (1996)). Meltzer (1963, 1995, 1999) and Brunner and Meltzer (1968) focus on the transmission mechanisms of monetary policy working through relative price adjustments of non-monetary assets that are imperfect substitutes in investors' portfolios. These relative price changes are transmitted along the yield curve and also impact on the exchange rate.<sup>24</sup> Meltzer's reasoning is based on the assumption that when the short-term nominal interest rate cannot fall due to the zero lower bound, yields on non-monetary assets are

---

<sup>22</sup> Wolman (1998) models an economy in which the monetary authority can always create inflationary expectations. Not surprisingly, in this case a policy regime where nominal interest rates are occasionally bounded by the interest rate floor generates higher welfare than a regime that always avoids nominal rates at zero.

<sup>23</sup> Walsh (1998) presents a useful overview of monetary transmission channels and empirical evidence of their importance in Chapter 7.

<sup>24</sup> In this paper, the monetary policy channel that works through foreign exchange markets is discussed in the context of Svensson's eclectic view.

not necessarily at their lower bounds.<sup>25</sup> Bernanke and Gertler (1995) have emphasised the credit channel in the monetary policy transmission process. This channel is not hampered by the lower zero bound on nominal interest rates. Monetary easing will reduce the exposure by debtors to the wedge between the cost of external and internal funds. This will support current spending.

The Pigou effect can be seen as an abstraction of ‘alternative’ transmission channels that do not work through the nominal interest rate. To see this, the model (1-4) can be extended as follows (11-15):

$$\begin{aligned}
 (11) \quad y_t &= \rho_y y_{t-1} + (1 - \rho_y) E_t y_{t+1} - \sigma r_t + \rho_{y,m} m_t + \varepsilon_{y,t} \\
 (12) \quad \pi_t &= \omega \pi_{t-1} + (1 - \omega) E_t \pi_{t+1} + \lambda y_t + \omega_m m_t + \varepsilon_{\pi,t} \\
 (13) \quad r_t &= i_t - E_t \pi_{t+1} \\
 (14) \quad i_t &= \rho_r i_{t-1} + \beta_\pi \pi_t + \beta_y y_t \\
 (15) \quad m_t &= \gamma_0 + \gamma_1 y_t - \gamma_2 i_t + \varepsilon_{m,t}
 \end{aligned}$$

$m_t$  (in logs) is the percentage deviation from steady state of the nominal value of the real money demand (*i.e.* nominal amount of money divided by the price level,  $M_t / P_t$ );  $\gamma_0, \gamma_1$  and  $\gamma_2$  are coefficients;  $\varepsilon_{m,t}$  is an error term. Notice that the endogenous variables  $y_t$  and  $i_t$  are determined by equations (11-14). Therefore, equation (15) merely describes which amount of money is necessary to implement the policy rule (equation (14)). The parameters  $\rho_{y,m}$  and  $\omega_m$  have been added. The Pigou effect is incorporated in equation (11) through  $m_t$ . With output below potential, real balances will increase until the price level and output are back in equilibrium. Ireland (2001a) has shown that the cross-equation restrictions require that real balances can be included in the demand function if and only if they are also contained in the supply function. As before, there is only one instrument variable. It is useful to regard  $m_t$  as the instrument variable, since lifting the real amount of money can boost output and inflation, even if the nominal interest rate is at the zero lower bound.

Does it make sense to add the Pigou effect to the short-term consensus model? At first sight, the Pigou effect seems at odds with the micro foundations of the consensus model, which is a representative agent model. Money is not perceived as net wealth in this kind of models, since wealth cannot be transferred across individuals. However, if the assumption of homogenous agents is relaxed, for instance by differentiating between

---

<sup>25</sup> In practice, monetary easing with the short-term interest rate at the zero lower bound might involve additional open-market transactions in other assets, such as commercial paper. Since late 1995, the Bank of Japan is implementing repurchasing agreements using commercial paper. In 1998, the Bank of Japan held circa one-third of the outstanding commercial paper stock. Transactions in longer-term debt, equity or property are also conceivable.

different generations, money becomes net wealth (Ireland (2001b)). In the Monetarist approach, the Pigou or real balance effect is incorporated in a short-run model. This is done to emphasise the role of monetary factors in the monetary policy transmission process. An increase in  $M_t$  is assumed to have real effects at short notice. In the consensus model, real balances ( $M_t/P_t$ )<sup>26</sup> only have long-run effects via the gradual real increase of real balances via deflation.

From a theoretical point of view, the Monetarist assertion that monetary transmission channels other than via nominal interest rates can prevent a liquidity trap is conditional on the assumption that the marginal utility of money eventually becomes zero as real balances expand.<sup>27</sup> However, if liquidity preference as defined in section 2 is assumed, the demand for money will asymptote to infinity as the interest rate asymptotes to zero. On mature financial markets, this can be thought of as a high preference by market participants for liquid assets. Monetary policy would then have no effect on total demand, because hoarding would absorb any additional money created. Money then becomes “a bottomless sink for purchasing power”. The consensus model takes on board liquidity preference in so far that there is no explicit Pigou effect.

From a more practical point of view, an important caveat concerning alternative monetary transmission mechanisms in a zero lower bound environment is that empirical evidence on the effectiveness of these channels in such a context is lacking. For instance, Clouse et al. (1999) have investigated which theoretical options are available for the Fed for stimulating aggregate demand by increasing monetary supply after the short-term interest rate has reached zero. They concluded that the Fed has a wide range of policy responses at its disposal, but they did not find convincing evidence of substantial quantitative effects. The most far-reaching policy option along these lines is allowing companies and individuals lending directly from the central bank on a massive scale. However, if the central bank is purchasing lower rated private sector securities, it will take substantial credit risks on its balance sheet. This can backfire on its credibility. Because of this risk, central bank legislation usually rules out this kind of transactions.

### 3.3 Buiter’s and Goodfriend’s view: Abolition of the zero bound

Buiter and Panigirtzoglou (2000) and Goodfriend (2000) have suggested the introduction of so-called *Gesell money*.<sup>28</sup> This would imply decreasing the zero nominal interest floor by taxing money (and other monetary liabilities on the central bank balance sheet). In terms of our model, the restriction that nominal interest rates cannot

---

<sup>26</sup> See the discussion of Pigou (1943, 1947) in section 2.

<sup>27</sup> Preferences for money balances would then exhibit satiation and money creation would ultimately be translated in demand for other assets and spending.

<sup>28</sup> Fisher (1932) and Keynes (1936) have hinted at this idea in the 1930s.

go negative is circumvented. With Gesell money it will always be possible to reduce the interest rate floor, even below zero.

The possible success of Gesell money is conditional on the availability of technologies that make it feasible without high costs. This is questionable in practice. The introduction of Gesell money will bring about high transaction and administrative costs, reducing its liquidity and thereby the main advantage of money (see Brunner (1971)). Moreover, the replacement of conventional money by Gesell money would make currency less attractive as compared to today's alternatives, such as foreign currency and e-money, assuming that e-money is not subject to the same tax (Gresham's law). This could impair the central banks monetary policy effectiveness, as explained by Friedman (1999).

### 3.4 Svensson's eclectic view with an important role for exchange rate policies

In line with Monetarist reasoning about different transmission channels of monetary policy, some authors have stressed the exchange rate channel in a zero lower bound situation.

A medium term strategy to devalue/depreciate the currency (an increase in  $E_t s_{t+1}$  in the model embodied in equations (7-10) can increase inflationary expectations. This strategy is only applicable to relatively open economies. It is assumed that the targeted country is not in a zero lower bound situation. Johnson et al. (1999) show that – assuming UIP holds – foreign exchange interventions at the lower bound can only have direct effects if they signal future further depreciation, or if domestic and foreign assets are imperfect substitutes. Both channels can be expected to be of minor importance, as is well known from the literature on foreign exchange intervention (Edison (1993), Eijffinger (1999)).

McCallum (2000) drops the UIP assumption explicitly.<sup>29</sup> In his model, the exchange rate replaces the short-term nominal interest rate as the monetary policy instrument. The central bank can determine real exchange rates via its control over nominal exchange rates, as is the case in our model (7-10). In the absence of UIP, McCallum is able to show that monetary stabilisation policy can still be effective via foreign exchange markets.<sup>30</sup> In line with McCallum, McKinnon and Ohno (2000) argue that if deflation is

---

<sup>29</sup> Empirical research tends to suggest that exchange rate movements are inconsistent with UIP (e.g. Froot and Thaler (1990) and Lewis (1995)).

<sup>30</sup> Meltzer (1999) is of the same opinion, stating "Suppose that with its short-term interest rate at zero, the Bank of Japan announces that it wants the dollar exchange rate to fall by 25 percent and that it is prepared to print yen to buy dollars until that occurs. Does anyone doubt that the yen would depreciate or that the depreciation would affect spending, output and prices in Japan?" McCallum's arguments can be interpreted as a special case in Meltzer's rejection of the liquidity trap framework.

caused by expectations of appreciation of the domestic currency, the forward rate of the exchange rate should be brought down, *e.g.* by international exchange rate agreements. Elaborating on these ideas, Svensson (2000, 2001) indicates that exchange rate pegging, involving a commitment to arbitrary large non-sterilised foreign exchange interventions, might play an important role. Since this strategy would involve putting into circulation domestic currency and buying foreign reserves, the central bank cannot run out of reserves. He drops UIP for his short-term analysis by assuming a sticky domestic price level, so that the real exchange rate can be influenced in the short run. In Svensson (2001), he has presented a very transparent model to explain his ideas. He claims to have found a ‘foolproof’ way for an open economy to escape from the binding zero lower bound. The idea is to jump-start the economy by a real depreciation of the currency via unlimited interventions and in so doing increase inflationary expectations. Initially, an exchange rate peg is established, which is later replaced by a price-level or inflation target when the price-level target has been reached. In so doing the risk of overheating is avoided.

A problem with Svensson’s ‘foolproof’ solution is that the expected real exchange rate depreciation in the initial phase will raise real interest rates with limited maturities relative to world real interest rates (Swank (2001)). This will counteract the exchange rate mechanism. If the real interest mechanism dominates, the inflation rate will not rise initially. A persistent low or negative inflation rate can undermine the credibility of the monetary authority and puts at risk the strategy as a whole. A practical problem is that the central bank cannot steer the exchange rate as it can steer interest rates. In the specific Japanese context, a problem is the relatively closed nature of the Japanese economy. Thus, very large exchange rate changes would be needed. Another practical obstacle to putting exchange rate targeting in place is that generally governments are in charge of exchange rate policies, not the central bank. This can make it difficult to pursue exchange rate policies as an integral part of the monetary policy strategy. Finally, such a large and persistent depreciation can significantly affect the economies of trading partners, which might give rise to retaliation measures.

#### 4. Concluding Remarks

What brings the suggested solutions to a binding zero lower bound together is their mechanical character. However, it is not certain that a solution that works in a specific economic model will also work in reality. Besides, all suggested solutions will in one way or another involve costs. These two considerations may explain why the Japanese authorities have so far not followed the non-orthodox recipes put forward.

A factor not incorporated in the models discussed is the general level of confidence. Using the concept of liquidity preference, Keynes has shown that lack of confidence is a crucial element of persistent zero lower bounds. In the current literature, the

precondition that a high degree of confidence must be in place to escape from a binding zero lower bound is undervalued. Policies to increase the expected rate of inflation can only be effective if monetary policy is credible, or if a framework is introduced that makes it credible. This is only feasible in an environment in which the central bank can create inflation. This implies that confidence must be in place. Otherwise, economic agents would increase their hoarding after monetary easing. Alternative monetary transmission channels, which feature prominently in Monetarist thinking, will only be effective if economic agents spend more after monetary easing, *i.e.* if they have confidence in the future. Then, economic agents will have no incentive for excessive hoarding. On the other hand, if confidence is lacking, the situation may arise that economic agents are characterised by liquidity preference, and do not increase spending after monetary easing. As discussed, *Gesell money* can only be expected to offer an effective escape route from a binding zero lower bound under strict conditions. However, it may help in restoring confidence by supporting nominal interest change effectiveness. As regards Svensson's (2001) promising approach offering a 'foolproof' way of escaping from a binding zero lower bound, it must be noticed that his solution works only in the specific context of his model. Because the central bank can devalue the exchange rate of the domestic currency without limit, its policies will be credible. In practice, the economy is much more complicated than the stylised model suggests. *E.g.* a central bank cannot steer the exchange rate precisely, as assumed in his model. Hence, it is impossible to prove that a certain solution to the zero lower bound will work always and everywhere. Without 'foolproof' solutions to the zero lower bound, restoring confidence will be of paramount importance to steer the economic agents towards spending more.

As long as confidence remains firmly in place, an economy may hit the zero lower bound due to particular circumstances, but this situation will not cause severe output losses. The Swiss case in the late 1970s offers an example. In such an environment, monetary policy with nominal interest rates at the lower bound can be expected to be effective. Unless confidence is restored, monetary policy cannot help in escaping from the zero lower bound. With monetary policy impotent, the economy is in a liquidity trap. Japan is currently in such a dreadful situation.

So, if there is a persistent zero lower bound and monetary policy is ineffective, the lack of confidence may be the main challenge. Here, demand and supply factors meet. The zero lower bound problem is usually seen as a demand side phenomenon. As the Japanese example shows, a binding zero lower bound can persist much longer than usual demand side problems, suggesting that confidence and supply factors also play a role. A lack of confidence can undermine demand for a considerable span of time. The clearest example of a joint supply and demand shock is a financial stability crisis. By definition, such a shock implies that financial market intermediation is interrupted (supply side effect). This will go hand in hand with lower demand, since business activity is severely hampered. The mechanism works also the other way around. In

terms of the illustrative model (equations (1-4)), an increase in the degree of confidence will manifest itself in lifting potential output and the output gap ( $y$ ), as well as the average *ex ante* real interest rate over the business cycle. The average *ex ante* interest rate is exogenous in the model, since it is specified in deviations from the steady state. With favourable economic prospects, profit prospects will be high, as will investors' propensity to invest. Also, consumers' propensity to save will be low because future income prospects are advantageous. In general terms, good governance (adherence to the rule of law, well-defined property rights, financial sector stability, flexible markets) creates an environment in which the economy can flourish, and steady state real interest rates will *ceteris paribus* be higher than without. What can government policies do to bring about such a situation?

In general terms, it is important that economic agents are confident that political leaders and economic and monetary policy makers are capable of their duties. If they lack public confidence, people that are trusted should replace them. The policy makers must pursue policies that restore confidence in economic prospects. As regards *monetary policy*, the monetary policy strategy is important for anchoring inflationary expectations. Actual policy decisions must show that the monetary authority acts according to its own words. *Budgetary policies* can be used to increase demand, and in so doing try to kick-start the economy. This will lift average *ex ante* real interest rates over the business cycle. The average real interest rate can rise partly through a direct expenditure channel. Expansionary fiscal policy will bring unemployed labour and capital into use, boosting output and tax revenues. However, this channel is conditional on the absence of Ricardian equivalence. The arguments in favour of and against Ricardian equivalence are discussed in Bernheim (1987). It is essentially an empirical<sup>31</sup> question. Barro's (1989) findings suggest that partial Ricardian equivalence prevails.<sup>31</sup> Apart from the Ricardian equivalence argument, the government may not be in a position to borrow because of a mounting public debt<sup>32</sup>, a loss of credibility or Stability and Growth Pact-like constraints on government borrowing (Buiter and Panigirtzoglou (2000)). Government expenditure can also raise the average *ex ante* real interest rate through an indirect confidence channel by revitalising economic prospects. Budgetary policies can support structural policies, for instance in financing the writing off of

---

<sup>31</sup> Ricardian equivalence does not play an explicit role in the models presented.

<sup>32</sup> With the debt to GDP ratio clearly above 100%, Japan may reach a point where the government's creditworthiness is so impaired that it is no longer in a position to borrow. A large debt may raise questions about government solvency in the long run in spite of a zero interest rate, because this situation will not last forever.

possible bad-loans. In this context, quality of government expenditure is important.<sup>33</sup> *Structural change* can offer a lasting channel to raise the average *ex ante* real interest rate. Of course, the direct effects of structural policies can take many years before they bear fruit. But in the short-term they can help in the reestablishment of confidence by improving the long-term prospects for the economy. From a longer-term perspective, what matters is that the economic structure determines to a large extent in what context macroeconomic demand policies work. In a zero lower bound environment, this regards above all trend productivity growth. The key insight is that higher productivity growth can lift low (average) *ex ante* real interest rates. Higher real interest rates can be achieved via a higher 'natural' rate of growth (summing the growth of the labour force and the rate of technical progress).<sup>34</sup> A higher natural rate of growth can result from exogenous factors, such as the emergence of a 'New Economy' (see *e.g.* Buiter (2000)), or good structural policies. It is basically about a mixture of credible policies that restore confidence by setting up sound old age pension systems, disability schemes and the like, and promote competition by reducing trade barriers, pursuing microeconomic deregulation and similar policies. Safeguarding financial sector stability is also a key element of these structural policies, since an advanced market economy cannot function without efficient and effective credit intermediation.<sup>35</sup> In sum, it is unlikely that an economy with robust institutions and confidence firmly in place, such as the US<sup>36</sup>, will end up in a situation with a binding zero lower bound on nominal interest rates. Of course, at the end of 2001, the Fed funds rate was reduced to the low level of 1.75%. But this must be seen against the background of sharp downward demand and confidence shocks (terrorist attacks, confidence fall in ICT sector), and a synchronised international cyclical downturn. As Fed chairman Greenspan has said at several occasions, the long-run economic prospects of the US economy remain favourable after the tragic events of September 11, 2001 (Greenspan (2001, 2002)). Enhanced productivity growth is expected to lift the US standard of living. In particular, Greenspan has stressed the health of the financial sector, which is in sharp contrast to

---

<sup>33</sup> In contrast to popular belief, Keynes (1936) did care about the quality of public expenditure. He preferred productive public expenditure to 'wasteful' expenditure. He departed from classical economics only when he stated that - in absence of productive possibilities for public expenditure - also 'wasteful' expenditure such as pyramid-building will enrich the community on balance when the economy is characterised by involuntary unemployment.

<sup>34</sup> In the 1950s and early 1960s inflation in the US varied between approximately 0 and 4%, but the zero bound was never reached. This is because productivity growth and average economic growth were high, and therefore also the equilibrium real interest rate and the short-term policy rate of interest.

<sup>35</sup> Viñals (2001) discusses the interactions between financial and monetary stability in a low inflation environment.

<sup>36</sup> At the end of 2001, the Fed funds rate was reduced to 1.75%. This must be seen against the background of sharp downward demand and confidence shocks (terrorist attacks, confidence fall in ICT sector), and a synchronised international cyclical downturn.

the Japanese situation. If an economy with a sound underlying structure would nevertheless hit the zero lower bound, an optimistic reassessment of expectations for economic growth by the public at large, and financial market participants in particular, will be crucial for escaping from it.

## References

Akerlof, G.A., W.T. Dickens and G.L. Perry (1996), The macroeconomics of low inflation, *Brookings Papers on Economic Activity*, nr. 1, pp. 1-76

Amirault, D. and B. O'Reilly (2001), *The zero bound on nominal interest rates: how important is it?*, Bank of Canada Working Paper nr. 6

Barro, R.J. (1989), The Ricardian approach to budget deficits, *Journal of Economic Perspectives*, 3, Spring, pp. 37-54

Barro, R.J. and D.B. Gordon (1983), A positive theory of a monetary policy in a natural rate model, *Journal of Political Economy*, 91, nr. 4, pp. 589-610

Batani, N. and A. Yates (2001), *Hybrid inflation and price level targeting*, Bank of England Working Paper nr. 135

Beranek, W. and R.H. Timberlake (1987), The liquidity trap theory: a critique, *Southern Economic Journal*, 84, pp. 387-396

Berg, C. and L. Jonung (1999), Pioneering price level targeting: the Swedish experience 1931-1937, *Journal of Monetary Economics*, 43, pp. 525-551

Bernanke, B.S. (1995), The macroeconomics of the great depression: a comparative approach, *Journal of Money, Credit and Banking*, 27, nr. 1, pp. 1-28

Bernanke, B.S. and M. Gertler (1989), Agency costs, net worth, and business fluctuations, *American Economic Review*, 79, pp. 14-31

Bernanke, B.S. and M. Gertler (1995), Inside the black box: the credit channel of monetary policy transmission, *Journal of Economic Perspectives*, 9, nr. 4, pp. 27-48

Bernheim, B.D. (1987), Ricardian equivalence: an evaluation of theory and evidence, *NBER Macroeconomics Annual II*, pp. 263-303

Blinder, A.S. (1998), *Central Banking in Theory and Practice*, London etc.: MIT Press

Bronfenbrenner, M. and T. Mayer (1960), Liquidity functions in the American economy, *Econometrica*, 28, pp. 810-834

Bronfenbrenner, M. and T. Mayer (1963), Rejoinder to Professor Eisner, *Econometrica*, 31, pp. 539-544

Brunner, K. (1971), A survey of selected issues in monetary theory, *Schweizerische Zeitschrift für Volkswirtschaft und Statistik*, CVII, pp. 1-146

Brunner, K. and A.H. Meltzer (1968), Liquidity traps for money, bank credit, and interest rates, *Journal of Political Economy*, 76, nr. 1, pp. 1-37

Buiter, W.H. (2000), The new economy and the old monetary economics, *Bank of England Quarterly Bulletin*, May, pp. 173-183

Buiter, W.H. and N. Panigirtzoglou (1999), *Liquidity traps: how to avoid them and how to escape them*, NBER Working Paper nr. 7245

Buiter, W.H. and N. Panigirtzoglou (2000), *Liquidity traps: how to avoid them and how to escape them*, Bank of England Working Paper nr. 11

Cecchetti, S. (1988), The case of the negative nominal interest rates: new estimates of the term structure of interest rates during the Great Depression, *Journal of Political Economy*, 96, nr. 6

Clarida, R., J. Galí and M. Gertler (1998), Monetary policy rules in practice: some international evidence, *European Economic Review*, pp. 1033-1067

Clarida, R., J. Galí and M. Gertler (1999), The science of monetary policy: a New Keynesian perspective, *Journal of Economic Literature*, 37, pp. 1661-1707

Clouse, J., D. Henderson, A. Orphanides, D. Small and T. Tinsley (1999), *Monetary policy when nominal short-term interest rate is zero*, Fed Board manuscript, October

DeLong, J.B. and L.H. Summers (1986), Is increased price flexibility stabilizing?, *American Economic Review*, 76, nr. 5, pp. 1031-1044

Dimand, R.W. (1999), Irving Fisher's debt-deflation theory of great depressions, in: H.E. Loef and H.G. Monissen (eds.) (1999), *The economics of Irving Fisher, Reviewing the scientific work of a great economist*, Edward Elgar, pp. 141-156

Edison, H.J. (1993), *The effectiveness of central bank intervention: a survey of the literature after 1982*, Princeton Special papers in international economics nr. 18

Eijffinger, S.C.W. (eds.) (1999), *Foreign exchange intervention: objectives and effectiveness*, Cheltenham: Edward Elgar

Eisner, R. (1963), Another look at liquidity preference, *Econometrica*, 31, pp. 531-538

Eisner, R. (1971), Non-linear estimates of the liquidity trap, *Econometrica*, 39, pp. 861-864.

Fischer, S. (1994), The costs and benefits of low inflation, in: J.A.H. de Beaufort Wijnholds, S.C.W. Eijffinger and L.H. Hoogduin (eds.), *A Framework for Monetary Stability*, Dordrecht etc.: Kluwer Academic Publishers, pp. 31-42

Fisher, I. (1896), Appreciation and Interest, in: *Publications of the American Economic Association*, XI, Macmillan

Fisher, I. (1932), *Booms and depressions*, Adelphi

Fisher, I. (1933), The debt-deflation theory of great depressions, *Econometrica*, 1, nr. 1, pp. 337-357

Friedman, B.M. (1999), The future of monetary policy: the central bank as an army with only a signal corps, *International Finance*, 2, nr. 3, pp. 321-338

Friedman, M. and A.J. Schwartz (1963), *A monetary history of the United States*, Princeton NJ: Princeton University Press

Froot, K.A. and R.A. Thaler (1990), Anomalies: foreign exchange, *Journal of Economic Perspectives*, 4, pp. 179-192

Fuhrer, J.C. and B.F. Madigan (1997), Monetary policy when interest rates are bounded at zero, *Review of Economics and Statistics*, 79, November, pp. 573-585

Goodfriend, M. (2000), Overcoming the zero bound on interest rate policy, *Journal of Money, Credit and Banking*, 32, nr. 4, part 2, pp. 1007-1035

Goodfriend, M. and R.G. King (1997), The New Neoclassical synthesis and the role of monetary policy, in: B. Bernanke and J. Rotemberg (eds.) (1997), *NBER Macroeconomics Annual*

Greenspan, A. (1989), Statements to Congress, *Federal Reserve Bulletin*, 75, pp. 272-277

Greenspan, A. (2001), *The September 11 tragedy and the response of the financial industry*, speech at the American Bankers Association's convention, October 23

Greenspan, A. (2002), *Testimony of chairman Alan Greenspan before the Committee on the Budget*, US Senate, January 24

Homer, S. (1977), *A history of interest rates*, New Brunswick NJ: Rutgers University Press

International Monetary Fund (1999), *World Economic Outlook*, October

Ireland, P.N. (2001a), *Money's role in the Monetary Business Cycle*, NBER Working Paper nr. 8115.

Ireland, P.N. (2001b), *The Real Balance Effect*, NBER Working Paper nr. 8136

Johnson, K., D. Small and R. Tryon (1999), *Monetary policy and price stability*, Fed Board International Finance Discussion Papers nr. 641

Keynes, J.M. (1923), *A Tract on Monetary Reform*, London: Macmillan

Keynes, J.M. (1936), *The General Theory of Employment, Interest and Money*, London: Macmillan

King, M. (1994), Debt deflation: theory and evidence, *European Economic Review*, 38, pp. 419-445

King, M. (1999), Challenges for monetary policy: new and old, *Bank of England Quarterly Bulletin*, November, pp. 397-415

Krugman, P.R. (1998), It's baaack: Japan's slump and the return of the liquidity trap, *Brookings Papers on Economic Activity*, nr. 2, pp. 137-205

Krugman, P.R. (1999a), *Deflation spirals*, paper available on the official Paul Krugman website

Krugman, P.R. (1999b), *The return of depression economics*, New York etc.: Norton & Company

Kydland, F.E. and E.C. Prescott (1977), Rules rather than discretion: the inconsistency of optimal plans, *Journal of Political Economy*, 85, pp. 473-491

Lerner, A.P. (1952), The essential properties of interest and money, *Quarterly Journal of Economics*, reprinted in: A.P. Lerner (1953), *Essays in Economic Analysis*, London: Macmillan, pp. 354-385

Lewis, K. (1995), Puzzles in international financial markets, in: G.M. Grossman and K. Rogoff (eds.), *Handbook of International Economics*, 3, Amsterdam etc.: Elsevier Science

Mauro, P. (1995), *Current account surpluses and the interest island in Switzerland*, IMF Working Paper nr. 95/24

McCallum, B.T. (1983), The liquidity trap and the Pigou-effect: a dynamic analysis with rational expectations, *Econometrica*, 50, pp. 395-405

McCallum, B.T. (2000), Theoretical analysis regarding the zero lower bound on nominal interest rates, *Journal of Money, Credit and Banking*, 32, nr. 4, part 2, pp 870-904

McFarlane, H. and P. Mortimer-Lee (1994), Inflation over 300 years, *Bank of England Quarterly Bulletin*, May

McKinnon, R.I. and K. Ohno (2000), *The foreign exchange origins of Japan's economic slump and low interest liquidity trap*, manuscript, June

Meltzer, A.H. (1963), Yet another look at the liquidity trap, *Econometrica*, 31, pp. 545-549

Meltzer, A.H. (1995), Monetary credit and (other) transmission processes: a monetarist perspective, *Journal of Economic Perspectives*, 9, nr. 4, pp. 49-72

Meltzer, A.H. (1999), The transmission process, in: Deutsche Bundesbank, *The Monetary Transmission Process: Recent Developments and Lessons for Europe*, Macmillan

Minsky, H.P. (1982), Debt deflation processes in today's institutional environment, *Banco Nazionale del Lavoro Quarterly Review*, 143, pp. 375-393

Mishkin, F.S. (1991), Assymmetric information and financial crises: a historical perspective, in: R.G. Hubbard (eds.), *Financial Markets and Financial Crises*, Chicago: University of Chicago Press, pp. 69-108

Mishkin, F.S. (1996), *The channels of monetary transmission: lessons for monetary policy*, NBER Working Paper nr. 5464

Modigliani, F. (1944), Liquidity preference and the theory of interest and money, *Econometrica*, 12, pp. 45-88

Mundell, R.A. (2000), A reconciliation of the twentieth century, *The American Economic Review*, 90, nr. 3, June, pp. 327-340

Organisation for Economic Cooperation and Development (2000), *Economic Outlook*, June

Okina, K. (1999), *Monetary policy under zero inflation*, IMES Discussion Paper nr. 99-E-20

Ono, Y. (1994), *Money, interest, and stagnation, dynamic theory and Keynes' economics*, Oxford etc.: Clarendon Press

Orphanides, A. and V. Wieland (1998), *Price stability and monetary policy effectiveness when nominal interest rates are bounded at zero*, Fed Board Finance and Economic Discussion Series

Patinkin, D. (1965), *Money, Interest and Prices*, 2nd ed., New York: Harper and Row

Patinkin, D. (1974), The role of the liquidity trap in Keynesian Economics, *Banca Nazionale del Lavoro*, nr. 108, pp. 3-11

Pigou, A.C. (1943), The classical stationary state, *Economic Journal*, 53, pp. 343-351

Pigou, A.C. (1947), Economic progress in a stable environment, *Economica*, 14, pp. 180-188

Reifschneider, D. and J.C. Williams (2000), Three lessons for monetary policy in a low inflation era, *Journal of Money, Credit and Banking*, 32, nr. 4, part 2, pp. 936-966

Siebert, H. (2000), Japan's policy trap: a European view, *The International Economy*, January/February, pp. 31-33

Smets, F. (2000), *What horizon for price stability*, ECB Working Paper nr. 24

Spitzer, J.J. (1976), The demand for money, the liquidity trap, and functional forms, *International Economic Review*, 17, pp. 220-227

Summers, L. (1991), How should long-term monetary policy be determined?, *Journal of Money, Credit and Banking*, 23, nr. 3, pp. 625-631

Svensson, L.E.O. (2000), *How should monetary policy be conducted in an era of price stability?*, NBER Working Paper nr. 7516

Svensson, L.E.O. (2001), The zero bound in an open economy, a foolproof way of escaping from a liquidity trap, *Bank of Japan Monetary and Economic Studies*, 19, nr. S-1, pp. 277-312

Swank, J. (2001), Comments [to Svensson (2001)], *Bank of Japan Monetary and Economic Studies*, 19, nr. S-1, pp. 317-319

Taylor, J.B. (2001), Low inflation, deflation and policies for further price stability, *Bank of Japan Monetary and Economic Studies*, 19, nr. S-1, pp. 35-51

Tobin, J. (1975), Keynesian models of recession and depression, *American Economic Review*, 65, pp. 195-202

Tobin, J. (1980), *Asset accumulation and economic activity*, Oxford: Basil Blackwell

Vickrey, W.S. (1954), Stability through inflation, in: K.K. Kurihara (ed.) (1954), *Post Keynesian economics*, New Brunswick NJ: Rutgers University Press, pp. 89-122

Viñals, J. (2001), Monetary policy issues in a low inflation environment, in: A. García Herrero, V. Gaspar, L. Hoogduin, J. Morgan, B. Winkler (eds.) (2001), *Why Price Stability*, Druckhaus Thomas Münzter, pp. 113-157

Walsh, C.E. (1998), *Monetary Theory and Policy*, Cambridge MA: MIT Press

Wolfson, M.H. (1996), Irving Fisher's debt-deflation theory: its relevance to current conditions, *Cambridge Journal of Economics*, 20, pp. 315-333

Wolman, A.L. (1998), Staggered price setting and the zero bound on nominal interest rates, *Fed Richmond Economic Quarterly*, 84, nr. 4