Willem and the negative nominal interest rate

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The challenge: Can the nominal interest rate become negative?

The global economic crisis has made a special discontinuity in traditional economies very topical: The nominal lending rate is limited downwards by zero. This can be a binding constraint for monetary policy, if one wants to stimulate economic activity by lowering interest rates. Recently, Willem Buiter, a Dutch economist known for his forthright and provocative (in the best sense of the word) writings, has questioned whether this restriction should be taken at face value. He has instead advocated that the implementation of negative interest rates need not pose a particular problem in modern economies. So, the answer to the headline question is "yes".

In the "old" days (read: between the 1930s and mid-1990s), the zero lower bound on interest rates was a problem that had only academic interest, and which never created real challenges for monetary policy. Inflation was a phenomenon that was of significant importance, whereby the nominal interest rates in most economies were at a level far above zero. Statistically, it was therefore unthinkable that the "zero" could ever be a relevant scenario. The situation in which the nominal interest rate reached zero, was academically known as the "liquidity trap", in the sense that bonds and money were perfect substitutes, such that an increase in the money supply could not cause the usual reduction in interest rates, with the consequent stimulatory effect on the economy, as known from the IS/LM model.[1] Instead, cash

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[1] At the risk of committing a blunder in terms of history of economic thought, I dare to say that the idea of a liquidity trap comes from Keynes. This is at least what David Romer writes in the first edition of its Advanced Macroeconomics (1996), where the subject is relegated to a minor exercise in Chapter 5. This signals in itself that the situation was not considered relevant at that time. In the third edition (2006) of his book, however, Romer devotes a separate section to the zero interest rate bound. (So, most definitely textbooks are revised in light of changes in society and relevant new insights—contrary to what many critiques of modern macro would assert! But appropriately, changes are implemented through decisions of scientifically qualified individuals, and not because of populist statements from politicians or people just seeking to bash economists.) Anyway, in an IS/LM universe, only fiscal policy can stimulate demand and output in a liquidity trap. This obviously explains the discussion of the need for fiscal easing in the current situation.

would just be hoarded (the opportunity cost of holding money, the nominal interest rate, is zero).

This seemingly theoretical curiosity began to gain practical importance and academic attention due to, for example, the economic crisis in Japan during the 1990s when the Japanese short-term policy rate for long periods was around zero. Thereby, the traditional monetary policy response to economic downturns was no longer possible. Simultaneously, inflation became a phenomenon of minor importance in the industrialized world, implying that nominal interest rates adjusted correspondingly downwards. In consequence, economists began to take serious the possibility that the zero lower bound on interest rates could bind. In the new millennium, both the US and the ECB's monetary policy-interest rates to reach record lows. A new literature arose where the zero interest rate floor was taken seriously, and where different strategies for conducting monetary policy under this restriction and strategies to get away from the restriction were discussed.

Reality then the made the issue very much pressing in the wake of the financial crisis that began in 2007 and struck violently through the end of 2008. Some would argue that monetary policy before the crisis had been too lenient in the United States and therefore directly was a contributing factor to the crisis. It is not my intention to take this interesting discussion here. My starting point will be that the crisis is there: the economy is contracting and inflation is low. Those who believe that monetary policy can and should play a counter-cyclical role in such a situation will without doubt argue that interest rate should be cut.[2] This will also be the recommendation if you let interest rates follow a Taylor-type rule. As is well known, a Taylor rule posits that the interest rate reacts to inflation deviations from its mean (or "target") and output's deviations from potential output. Whether it is an expression of optimal monetary policy is debatable, but data is often consistent with Taylor-rule behavior in many countries.

With data from the US, Rudebusch (2009) demonstrates this for the period 1988 to 2012, when data for 2009-2012 is the FOMC forecasts. A Taylor rule (with unemployment as the activity variable) is estimated using historical data, and Figure 1 shows that it explains the historical setting of Federal Funds rate reasonable well.[3] In addition, the figure shows that if the economy is going to experience an increase in unemployment over the next few years (and a slight decline in inflation), then the Federal Reserve should aim for a negative nominal interest rate; and a considerable magnitude. If it had the opportunity to continue the historical pattern of monetary policy, one should set an interest rate below -5 per cent. But since late 2008, zero is the lowest one could go.[4] So, the figure suggests that the zero lower bound is

[2] From now on, "interest rate" means the central bank's policy rate.
[3] The interested reader can download the entire data set—including estimation—as an MS Excel spreadsheet by opening the link to the article.
[4] Americans therefore live in a situation where the Friedman (1969) rule for optimal (steady-state) monetary policy applies. As Friedman argued (and before him, Bailey, 1956), it is best if the private opportunity cost of holding money—the nominal interest rate—is equal to the marginal social cost of

relevant to the US right now and in the near future. Instead of designing new types of monetary policy strategies when the restriction binds, a simple and natural question is therefore whether one can completely remove it, thereby eliminating the asymmetry in monetary policy it entails?

Figure 1: The Fed funds rate in the future if a historical Taylor rule is followed
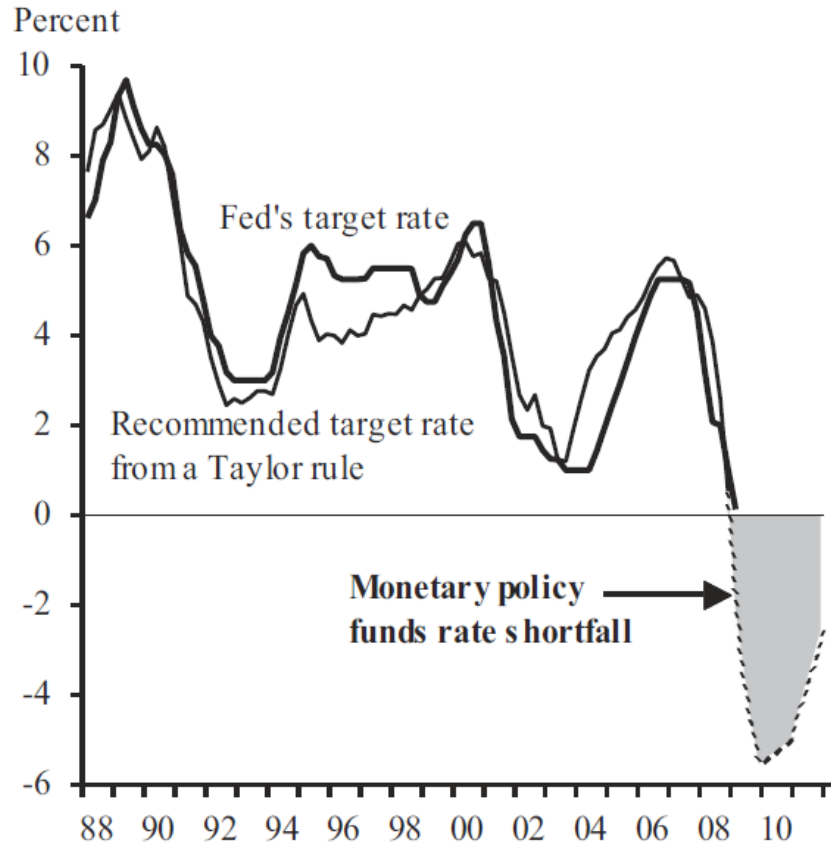
Source: Rudebusch (2009)

Why is it seemingly impossible to have negative interest rates?

Before I discuss Willem Buiter's solution(s) to how the zero lower bound can be eliminated, it is appropriate to recall briefly why the bound exists. Why does the

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producing money. Since the latter is approximate zero, the nominal interest rate must also be zero. In a multitude of theoretical models with flexible prices appears this result is unusually robust. Introducing realistic sluggish adjustments in nominal variables, the need for stable prices means that a positive nominal interest rates, ceteris paribus, desirable (if the steady-state real interest rate is positive—a reasonable assumption). Friedman's insight nevertheless demonstrates that positive nominal interest rates have costs when there is money that does not gives interest. But many will probably, along with Rudebusch, not think that the elimination of the "Friedman cost" can compensate for the loss of output and employment in the current recession.

Federal Reserve not just set the interest rate to -5 per cent, if that's what is needed to mitigate the unemployment problem? The reason is simple. There is no sane person who will lend to -5 per cent. If they did have the means to invest they would rather leave them as cash under the mattress. There, they after all provide a return of zero per cent.[5] So even though that there might be infinitely many that would borrow at -5 per cent (you get paid for borrowing, so the path to unbound riches is open), there will not be any lenders. I would think that even the bitterest opponent of assuming economic agents to possess minimal rationality will accept this.

So, the problem is the mere existence of cash. They provide zero percent interest, and thereby they define the lower limit on the nominal interest rate. Cash are anonymous bearer bonds that therefore cannot be taxed in any conventional manner. To eliminate the zero lower bound, Buiter's proposal is not surprisingly founded in different ways to challenge cash's zero return.[6] If cash for example decreased in value by 10 per cent, then it's suddenly not so foolish to lend out to -5 per cent. It is better than choosing the mattress. Infinite wealth accumulation through borrowing is not possible anymore, despite the "subsidization" of borrowing, since borrowers cannot gain from accumulating cash as cash now have even lower negative return than the lending rate.

Willem Buiter and his solution(s)

Who is Willem Buiter?

As indicated in the Introduction, Buiter is known as a sometimes controversial economist who says things very directly. His production is an interesting mix of mainstream state-of-the-art macro theory and intriguing and harsh attacks on different aspects of the same theories. He has besides his academic career served as external member of the Bank of England's Monetary Policy Committee (one of the few foreigners ever), for the first three years of UK's then relatively new inflation targeting regime (1997-2000) . The fact that he is a man with own views, was proven clear. During his tenure he set a still unsurpassed record of dissenting in almost half of all committee votes on the interest rate (Gerlach-Kristin, 2003). Interestingly, it was not because he held a systematically more or less "conservative" view on interest-rate determination: he voted for higher and lower interest rates with the same frequency. From 1998, members should in the event of dissent indicate how much their preferred rate differed from the majority's decision. In all cases, the deviations have been size +/- 0.25 percentage points. Except in one

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[5] The real value of cash is of course eroded by inflation, but inflation erodes the value of an investment in, e.g., a bond by the same percentage. So when comparing returns between bonds and money we do not need to consider inflation, and I ignore it for the most part. Moreover, I ignore non-financial costs of holding cash (for example, storage costs and the risk of theft). Introduction of these would reduce the return of cash to below zero, but probably not by much.

[6] It should be said immediately that Buiter stands on the shoulders of his predecessors. All proposals have historical roots, but Buiter's accomplishment is to bring the ideas forward in a modern form in a situation where innovation is welcome.

single case where Buiter in March 1999, against the majority, voted for a rate cut of 0.40 percentage points (Gerlach-Kristin, 2009). He is a man with attention to detail. Because of his, to some, unorthodox writings, he was nicknamed "Maverick". This moniker he brought with him when he later in his career, at the London School of Economics, started his blog "maverecon", which ended up becoming published by the Financial Times. The blog unfortunately stopped as of 1/1 2010, when Buiter again left the academic world (hopefully only for a time). This time for a job as chief economist at Citi. Therefore he can not continue as an academic blogger. As he says: "In Maverecon I wrote under the cover of 'academic immunity'. Academics have no duty other than to state the truth as they see it—to 'speak truth to power'. This gives them the ability to be undiplomatic, blunt, tactless and outspoken in ways that are unacceptable in the wider world—the world of grown-ups."

Buiter's solution(s)

Before leaving academia, he luckily managed to write some interesting blog posts about negative interest rates, and the possibility of achieving them. Buiter (2009a) is the main post, and Buiter (2009b) is his very undiplomatic sequel, which responds to a series of wildly excited reader comments, which the first post raised. As he tactlessly, but very witty, notes: "Because the heat and emotion are based on heart-stopping ignorance and lack of elementary logic, I will have another go at explaining the basics." But it must be stressed that he is not just firing blanks. As the serious economist he is, the writings are backed by academic articles that ensures that the posts do not amount to just politically or ideologically motivated aphorisms (two of these articles is Buiter, 2007 and 2009c). So even though his blog posts may not appeal to diplomatic, restrained, tactful and introvert adults, try giving the contents a chance for the sake of creative interest.

To the point! As shown in the previous section, the zero lower bound exists due to the existence of non-interest bearing cash. Therefore Buiter's proposals range from removing them completely from circulation, to tax them in clever ways or to eliminate their economic importance as a unit of account.

Taxing cash is obviously the suggestion that interests Buiter the least. He wrote about it in the context of the Japanese crisis at the turn of the millennium, but the problem is simply that it seems rather impractical. As mentioned, cash is an anonymous bearer bond, so you would have to introduce a form of labeling cash, which can then be used to indicate a decline in value. The basic idea that cash should not be allowed to be accumulated at no cost goes back to [Silvio Gesell](#) , who proposed to introduce tokens ("[scrips](#)"), which should be stamped to maintain value. When stamping, the authorities can then charge a tax.[7] Alternative, one can

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[7] See Champ (2008) for a description of Gesell's proposal (and actual implementations in the beginning of the last century), and for a review of how both Irving Fisher as Keynes found the idea interesting as this—cumbersome—stamping would make people spend money more quickly, which could be beneficial in a recession.

also date notes and announce that the new notes are worth less than the old one, or simply introducing an expiry date.[8] If one before expiry does not get stamped the note (and paid taxes), or swapped it to a new (at a cost), it becomes valueless. Buiter argues that such proposals are not operational. Besides the huge administrative hassle, notes have the value that people assign it. So despite the fact that a banknote is officially expired, missing a stamp or similar, some might accept it as payment, if others will, and others will, etc. One can therefore imagine a situation where stamping do not have any real effect on how the public views the means of payment. Then nothing is accomplished, and the authorities would almost have to resort to frisking people in the streets asking: "Do you have an expired note on you? Well, your note is confiscated; here is a new one of less value". So the risk of being detected must be large enough to make it unattractive to keep expired cash. It will therefore require a great deal of supervision to effectively "de-anonymize" (if there is such a word) an anonymous piece of paper as a banknote. As Buiter presents it, I am indeed convinced that this is not a viable option to break the zero interest rate limitation. Too much administration and costly interference by the public authorities.

The next proposal is much simpler but also (to some) quite drastic: Cash is simply eliminated from the surface of the earth. In modern economies, a larger and larger proportion of all trades are made by electronic means, and since most electronic payment instruments are not anonymous, a negative interest rate on their associated accounts poses no practical problem. The central bank can still manage short-term interest rates through manipulation of base money as base money besides cash also consists of bank reserves in the bank (see Woodford, 2003, whose basic model indeed consider such a "cashless limit"). An expansionary monetary policy in the form of expansion of the reserves will therefore push interest rates down, but in the absence of cash, the interest rate can now without problems be targeted at below zero in situations where this is considered desirable.[9]

A beneficial side effect of the elimination of banknotes and coins is that black economic activity and social services fraud become more difficult. Such activities are based on the existence of cash (cash in circulation is often used as an empirical proxy for "informal" economic activity; Smith, 1987). I have, e.g., never grasped why we need a 1000 kroner note in Denmark (around US $ 175). Or how about a 500 Euro note? I do not know many people who walk around with them in your pockets (my own bank could tell me that they do not take 500 Euro banknotes home as nobody wants them). Nevertheless, in Denmark about 30 billion kroner is in circulation as 1000 kroner notes . Simple arithmetic reveals that 30 million of these notes in circulation amounts to about 6 notes per Dane—from newborn to dying. It

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[8] Or consider a stochastic version where a lottery from time to time determines that all banknotes ending on digit *n* lose their value. This idea is attributed by a student of N. Gregory Mankiw (Mankiw, 2009). Buiter (2009b) mentions that Charles Goodhart has had the idea for years.

[9] Banks can of course still make profits on their interest rate spreads. Whether they offer zero per cent for customers' deposits and lend to 2 per cent, or offer -5 per cent for deposits and lend to -3 per cent, give the same profits.

seems to me, to be diplomatic, quite suspicious. Similar conditions apply for the Eurozone, which exhibits an absurd number of 500 Euro notes in circulation—even three times more than the number of 200 Euro notes![10]

Besides that criminals will have a considerably harder time without cash, the central bank will also lose seigniorage from the issue of cash. But since in most developed countries this represents a very small share of the financing of public expenditures, this loss will be correspondingly limited. Finally, there is a problem concerning monitoring again. Cash is useful for performing legal transactions that you would rather not see present on your bank statement. Elimination of cash can therefore be seen as a violation of personal freedom. But in a society that is already geared to electronic transactions, one could issue electronic payment cards that are charged with a give amount (as a phone card) from one's bank account. When they are emptied after performing legal economic activities and must be "refilled", then the interest rate—positive or negative—is applied.

Should the total elimination of cash as a way of making negative interest rates feasible appear too offensive, then Buiter has ready a final proposal. One implements a monetary reform, where you introduce cash that can be used as a means of payment (but you make sure that they do not have too high denomination to limit the scope for illegal transactions and fraud). At the same time one introduces a virtual currency, which acts as the economy's unit of account (the numeraire), and which is used to carry out all electronic transactions. It will thus, and that is the idea, be the relevant unit of account for the majority of economic activity in society. The central issue is that the unit of account is being separated from the value of the cash in circulation. The basic idea originates from the Austrian multi-talent Robert Eisler, who developed it in the 1930s.[11] Buiter became aware of it when he worked on the taxation of cash as an opportunity to break the zero lower bound, and realized that this separation can pave the way for a more convenient way to facilitating the feasibility of negative nominal interest rates.

Let's look at a situation where reform is implemented in Denmark. With the current monetary policy regime it is obviously not relevant as Denmark approximately copy the ECB's interest-rate policy for the sake of the fixed exchange rate policy. And

[10] Buiter has informally inquired at the ECB why they issue a 500 Euro note, which is after all quite a hefty size. One of the arguments was that house sales in Spain were often made in cash and therefore it would be too difficult to trade if you had to carry a lot of notes of small denomination. Similarly, I know from a reliable source that car trades in Germany often only takes place with cash. So people have to go to the bank, make withdrawals, and nervously carry several thousand Euros in cash on the way to the car dealer. To such arguments, based on such dubious trade patterns, I say just as Buiter (2009b): "Quatsch".

[11] Eisler's goal with the idea was monetary stability, since he interpreted the virtual currency (called "money banco") as being defined in relation to a product bundle. That it can be dangerous to propose controversial economic reforms is well known, but Eisler nearly lost his life by it. Prior to World War II, he proposed that Austria should join the Pound Sterling zone, and was immediately arrested by the Nazis and sent to concentration camp. He survived 15 months of forced labor in Dachau and Buchenwald. He lived in England afterwards.

since the Euro interest rates are subject to zero lower bound, the Danish interest rate does not need to be negative. But should, for instance, the Eurozone decide to somehow break the lower bound, and thus from time to time set a negative interest rate, then Denmark has to be able to do the same if the fixed exchange rate policy must be preserved. In this sense, it is perhaps not entirely far-fetched to describe the reform from a Danish perspective.

All electronic transactions continue to take place in the in kroner, and kroner continue to be the unit of account for prices and wages. Kroner have, however, become virtual, and can no longer be used as a physical means of payment. That is, cash denominated in kroner cease to exist. Unlike the proposal with the total elimination of cash, cash are introduced that are not denominated in kroner, but in something we will call a "Bernstein" (and they are introduced—with all respect— only low denominations in order not to subsidize the black economy too much).[12] This Bernstein has all the usual characteristics of cash. It is a bearer bond that does not carry interest. One can easily imagine that there are bonds issued in Bernsteins, but the interest rate on these will have a zero lower bound, for the same reason as existence of cash denominated in kroner today makes a negative krone interest rate impossible.

The simple trick is that with virtual kroner as a unit of account and the existence of a physical "parallel currency", Bernsteins, then it is possible that the krone interest rate can be negative: Monetary policy defines a spot exchange rate, S_t, between kroner and Bernsteins, which indicates the number of kroner per Bernstein. Next, let $F_{t,t+1}$ indicate the forward rate. Absence of arbitrage opportunities between kroner and Bernsteins therefore requires that a Buiter-Eisler version of the covered interest rate parity condition is met:

$$1 + ik_t = (1 + ib_t) \left(F_{t,t+1} / S_t \right)$$

where ik_t is the krone interest rate and ib_t is the Bernstein interest rate. It is seen that a negative interest rate on kroner can be achieved when the central bank lets the krone appreciate against the Bernstein ($F_{t,t+1} / S_t$) when its interest rate is zero. It this situation it is profitable to lend in kroner at a negative rate. The alternative investment in Bernstein cash in the mattress provides zero interest rate, but it will leave the investor with the same loss as the lending in kroner, since the relative purchasing power of the Bernstein has fallen. The real krone and real Bernstein interest rate will be the same. This can be seen by the fact that a product costs pk_t kroner or $S_t * pb_t$ kroner, where pb_t is the price of the product in Bernsteins. Use this "purchasing power parity" with the uncovered interest rate parity, where $E_t S_{t+1}$ replaces $F_{t,t+1}$, to get

$$(1 + ik_t) / (E_t \, pk_{t+1} / pk_t) = (1 + ib_t) / (E_t \, pb_{t+1} / pb_t) ;$$

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i.e., identical real interest rates (E_t is an expectations operator). One cannot become infinitely rich by borrowing at a negative nominal interest rate either. Placing funds in Bernsteins makes no net gain; see the argument above. Investment in shares or durable goods will yield same negative returns as the lending rate as a result of arbitrage, which implies expected losses on these assets (from presumably higher price levels). But monetary policy has moved the intertemporal price of consumption and investment, so it becomes more attractive to consume and invest now than later. And that's the whole idea of an expansionary monetary policy.

A negative rate of the krone is therefore feasible, and monetary policy stimulus through a reduction in the nominal interest rate, without worrying about a zero lower bound, becomes a reality. It will be effective if, and this is an important "if," most of the economy's transactions are made in kroner. Buiter (2009c) discusses in detail how the actual choice of the unit of account of important economic transactions is not trivial to manage for authorities. History contains many examples of instances where official unit of account has not been used. For example, the Euro was the official unit of account in all EMU countries from 1999, but before Euro cash was introduced at the beginning of 2002, most transactions were made in the still existing national currencies. He argues that adequate legislation will help ensuring that relevant transactions carried out in the selected unit of account.

Compared with the proposal with total elimination of cash, this proposal is probably more attractive. One maintains cash in circulation, which may be downright practical in some circumstances while also ensuring anonymity in some (hopefully legal) transactions.[13] Also, the central bank will be able to extract some seigniorage. The only losers seem to be actors in the criminal realm of the economy, if one makes sure that the nominal value of Bernsteins is not too large; notes or coins above 50 kroner (around $10) should not be necessary.

So for countries or unions that conduct countercyclical monetary policy, it is hard to see why one should not eliminate the bizarre policy asymmetry that the zero lower bound imposes on central banks and which right now forces central banks around the world to engage in more or less experimental quantitatively oriented policies.

Too modern, old-fashioned or just crazy?

The colleagues I have discussed these ideas with, do not appear particularly enthusiastic. I have often heard the argument that it is would be incomprehensible

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[13] It would also be preferable for people who seem to weigh a currency as a national symbol very heavily. There could then be a referendum concerning the name of the new currency. Or one could simply keep the krone as the cash currency, and then call the virtual something else; Buiter (2007) has a fun suggestion: "Phlogiston". If one is afraid that Danish identity is lost by that name, one could call it "The Danish people's sovereign unit of account in honor of God and Fatherland". I personally do not care.

to the population and "difficult" to implement. Or even that it involves the confiscation of citizens' wealth (those that are creditors) and therefore may be illegal. I cannot see that it should be incomprehensible or cumbersome. It corresponds to a change in the unit of account and the introduction of a new type of paper currency; reforms of that scale have been implemented many times in history around the world. Yes, it may not be done from one day to the other (Buiter, 2009a, however, believes that it can be done in a weekend). On the other hand, it cannot be any more cumbersome than to phase in a new tax reform. Regarding the confiscation argument, I do not know the legal aspects, but I know that the government every month "confiscates" a significant percentage of my salary. Governments have done that without legal issues all over the world for a very long time (and thanks for that). The fact that monetary policy under the proposed system from time to time may imply a negative nominal interest rate completely pales in comparison.

Note also that it will often be in the business cycle downturns with low inflation, or perhaps deflation, where there may be a need for negative nominal interest rates. Therefore, the real interest rate can be positive, even though the nominal is negative. Even if the real interest rate goes negative as well, it will not be uncommon at all in a historical context. Several times, inflation has exceeded nominal interest rates in Denmark and other countries. If this happens in a situation of negative nominal interest rates, then it is perhaps even a more favorable situation than in the historical instances. I would clearly prefer a real interest rate of -2 per cent as a result of zero inflation and a nominal interest rate of -2 per cent, rather than as a result of an inflation rate of 15 per cent and a nominal interest rate of 13 per cent. (just to emphasize the fact that the zero lower bound is more topical in a low-inflation environment that we fortunately live in nowadays).

Many are probably likely to consider the proposal with considerable skepticism. Several of the responses to Buiter's (2009a) blog post are in line with the most rude and perfidious comments you can find online, and many seem to suffer from the misconception that it's all about systematically stealing from citizens. It lead me to wonder if the reluctance could be rooted in a kind of bounded rationality, which also typically causes people to flatly reject a decline in nominal wages even if it is accompanied with a corresponding fall in prices; see, e.g., Fehr and Goette (2005).

In any case, I find Buiter's proposal interesting. It extends the scope for monetary policy action in the direction where it is most needed. Namely, when one wants to mitigate recessions. And why would anybody write off a greater scope for policymaking, which can be achieved without much cost? This would seem old-fashioned and completely crazy.

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