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The lower bound on interest rates and ways to overcome it

Pia-Katharina Andres

Expansionary monetary policy was traditionally thought to be restricted by the zero lower bound on nominal interest rates. Yet since 2014, some central banks, facing secular stagnation and deflationary traps, have pushed key policy rates below zero. This paper reviews the theoretical literature on the zero lower bound and proposals to overcome it. It concludes that such proposals are primarily designed to discourage cash hoarding, and their success depends on the economic and cultural environment in which they are to be implemented.

1. Introduction

Economists have traditionally considered accommodative monetary policy to be subject to a zero lower bound on nominal interest rates.²⁴ This is because economic actors are presented with a choice to substitute for paper currency, which earns an interest rate of 0%.

In the context of secular stagnation in many advanced economies and nominal policy rates at or near 0%, central banks have moved towards unconventional measures, most notably large-scale asset purchase programmes known as ‘quantitative easing’. The lower bound on nominal interest rates and the possibility of pushing rates below zero have also gained increased attention. Since 2014, four central banks in Europe, as well as the Bank of Japan, have moved key policy rates into negative territory, showing that the effective lower bound on interest rates appears to be located below zero. This paper will discuss the source of the lower bound, the extent to which it represents a constraint on expansionary interest rate policy, and the three main proposals put forward to eliminate it: abolishing paper currency; taxing paper currency; and creating a variable, but targeted exchange rate between paper and digital currency. The technical practicalities, limitations and potential political repercussions of each mechanism will also be discussed.

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²⁴ Nominal rates differ from real rates in that the latter take into account the effect of changes in the price level.

The paper concludes that all such proposals primarily aim to discourage cash hoarding. Their main limitation is thus public resistance, such as a shift to other safe, liquid assets as a store of value. The success of implementing each of the proposals discussed would also depend on the specific economic and cultural context in which it is to be implemented.

The paper is structured as follows. Section 2 provides an overview of the cause of the lower bound on nominal interest rates as identified in the literature. Section 3 discusses the extent to which the lower bound represents a practical constraint on monetary policy. Section 4-6 discuss the three main proposals put forward to eliminate the lower bound. Section 7 summarises the experience of central banks which have implemented negative nominal policy rates, and section 8 concludes.

2. The lower bound on nominal interest rates: causes and impact

The ‘zero lower bound’ on nominal interest rates as a constraint on expansionary monetary policy in a low inflation environment is well-documented in the literature. Proposals on how to eliminate it were brought forward in the early 20th century by Silvio Gesell and as potential remedies during the great depression years by Robert Eisler, discussed by John Maynard Keynes, and advocated by Irving Fisher. John Hicks wrote on the lower bound:

“If the costs of holding money can be neglected, it will always be profitable to hold money rather than lend it out, if the rate of interest is not greater than zero. Consequently the rate of interest must always be positive.”²⁵

In the context of present-day monetary policy, imposing a negative interest rate on bank deposits or commercial banks’ reserves with the central bank should be uncomplicated. However, paper currency has traditionally earned a nominal interest rate of zero, because of the apparent logistical impossibility of paying (or charging) interest on it. This is the main issue identified in the literature. It would be impossible to verify how much interest was due under the current system, and even harder to enforce a negative interest rate: the holders of currency could simply refuse to come forward to pay it. Paper currency can be used and transferred

²⁵ Hicks, J., ‘Mr. Keynes and the “Classics”: A Suggested Interpretation’ (1937) *Econometrica*, 5, 147-159.

anonymously, and its holders can hardly be identified as due to receive or pay interest.²⁶

While the lower bound on nominal interest rates is often said to be zero, this may not strictly be the case. Recent policy decisions by five central banks to lower key policy rates below zero (to be discussed in more detail in section 7) have not led to cash hoarding by commercial banks. This should not be taken as sufficient evidence to dismiss the option of hoarding cash as a serious constraint. There are considerable costs involved in securely storing large amounts of paper currency. The lower bound on nominal interest rates is therefore likely to be below zero where large quantities of money are involved, and will depend on how long interest rates are expected to remain in negative territory.²⁷

The possibility that under some circumstances the lower bound may be hit at a positive rate of interest has also been considered;²⁸ this would be the case if there were benefits to holding paper currency (such as liquidity or anonymity) which exceeded both storage costs and a certain positive rate of interest on lending money in the form of bank deposits or otherwise. However, recent developments do not suggest that this ought to be a serious concern.

3. The lower bound on interest rates as a policy constraint

Central banks target interest rates to achieve their desired level of inflation. A crucial channel of the monetary transmission mechanism is demand management, which in recent years has increasingly become a monetary policy goal in its own right. What is usually thought to matter most in practice are real interest rates, which are obtained by deducting the level of inflation from nominal rates. At positive levels of inflation, real interest rates can easily go negative. In a low, zero or negative inflation environment, the lower bound on nominal interest rates can mean that real rates are sub-optimally high. When nominal rates are at their lower bounds and inflation remains below target, the economy has entered a 'liquidity trap'.²⁹

²⁶ Buiter, W.H., 'Negative Nominal Interest Rates: Three ways to overcome the zero lower bound' (2009) *NBER Working Paper* 15118.

²⁷ Bech, M. and A. Malkhozov, 'How have central banks implemented negative policy rates?' (2016) *BIS Quarterly Review*, March 2016.

²⁸ Yates, T., 'Monetary Policy and the Zero Bound to Interest Rates: A Review' (2002) *European Central Bank Working Paper* 190.

²⁹ Buiter, W.H., and N. Panigirtzoglou, 'Liquidity traps: how to avoid them and how to escape them' (1999) *NBER Working Paper* 7245.

After the high-inflation years of the second half of the 20th century, the danger of entering a liquidity trap was viewed as more of an academic concern:

“Overall, the risks of being trapped at the zero bound to interest rates are probably small, and probably overstated.”³⁰

However, times have changed. Inflation has been consistently below the central banks’ targets in several advanced economies, including the UK (prior to the recent Sterling depreciation in response to the EU referendum), the Eurozone and Japan. The US Federal Reserve kept its Federal Funds target range near zero for almost eight years after the 2008 financial crisis.³¹ In the Eurozone in particular, economic growth has been slow, and inflation at times even negative.³²³³

Amidst these circumstances, combined with a political climate favouring fiscal austerity, central banks turned to unconventional policy instruments; most notably, largescale asset purchase programmes also known as ‘quantitative easing’.³⁴ Some have also begun to move certain policy rates into negative territory.³⁵ The lower bound on interest rates has thus become a potentially binding constraint on current policy. The remainder of this paper will provide an overview of the main proposals to eliminate the lower bound, as well as the experience of central banks which have pushed policy rates below zero.

4. Abolishing paper currency

Abolishing paper currency presents itself as an obvious way to eliminate the lower bound on nominal interest rates, which is thought to be caused by the existence of currency as a liquid, riskless and interest-free way of storing money. Paper currency

³⁰ Yates, ‘Monetary Policy and the Zero Bound to Interest Rates: A Review’

³¹ Neate, R., ‘US Federal Reserve raises interest rates for second time since 2008 crisis’ (2016) *The Guardian – Business*, 14 December 2016.

³² Gimdal, G. and C. Karakas, ‘Secular stagnation and the euro area’(2016) *European Parliamentary Research Service*, pE 573.972.

³³ Hannon, P., ‘Eurozone Slides Back Into Deflation’ (2016) *The Wall Street Journal—Economy—Europe Economy*, 18 May 2016.

³⁴ Borio, C. and P. Disyatat, ‘Unconventional monetary policies: an appraisal’ (2009) *BIS Working Paper* 292.

³⁵ Bech and Malkhozov, ‘How have central banks implemented negative policy rates?’

is exceedingly used only for small payments, if at all, in many economies, and its abolition is therefore sometimes considered a relatively hassle free affair with the added effect of impeding black-market and other illegal activities.³⁶ In a cashless economy, nominal interest rates could theoretically become as negative as thought desirable - unless economic agents chose to substitute another type of safe, liquid asset for deposits, a limitation which applies to all three proposals and will be discussed further in section 8.

Consideration should be given to several issues potentially arising from such a move. The ease with which paper currency could be abolished and the readiness with which this would be accepted by the general populace should be expected to vary from country to country. Sweden is seen as the champion of de-facto cashless societies: its central bank estimates that paper currency in circulation makes up less than 2% of GDP³⁷ and (according to anecdotal reports) cash payments are frequently refused even during small transactions such as paying a taxi fare.³⁸ While elsewhere some businesses accept only cash or charge fees for card payments, the opposite is true in Sweden. 'Contact-less' credit or debit card payments are also exceedingly common in the United States and other Anglo-Saxon countries. However, elsewhere paper currency is used much more frequently: in Japan, for example, it is used for the vast majority of retail transactions.³⁹ Under such circumstances the decision to abolish cash may well be met with a substantial amount of resistance and it might be disruptive to day-to-day economic and social life. It would also involve additional costs to businesses who do not possess card payment facilities, which would most likely affect small businesses disproportionately. These necessary investments could of course be subsidised by government.

In a society resistant to the abolition of paper currency the latter might very possibly be replaced by alternative means of payment offering a similar level of anonymity and liquidity. After all, anything can be used as a medium of exchange as long as it is accepted by those one wishes to trade with and can be carried

³⁶ cf. Buitter, 'Negative Nominal Interest Rates: Three ways to overcome the zero lower bound'

³⁷ Sveriges Riksbank, 'The Swedish Financial Market' (2016) *Sveriges Riksbank Publications*, Stockholm, August 2016.

³⁸ Heller, N., 'Imagining a cashless world' (2016) *The New Yorker – Letter from Stockholm*, 10 October 2016.

³⁹ Mayger, J. and C. Anstey, 'Cash Is Still King in Japan, and That Could Be a Problem for the BOJ' (2016) *Bloomberg Markets*, 8 November 2016.

without unreasonable effort; the familiar example of cigarettes as a type of currency among prison populations springs to mind.

While the prospect of impeding illegal activities and tax fraud by making anonymous payments impossible may sound appealing, consideration should also be given to the question of civic rights. Abolishing anonymous payments altogether could be seen as an infringement upon rights to data protection, civil liberty, and privacy.

Abolishing cash would also prevent the economic participation of agents who do not have bank accounts, despite not being involved in illegal activities. This may include children and the homeless. Immigrants, particularly those without legal status, would also be extremely vulnerable. While their labour force participation falls under illegal activities and some might welcome their exclusion, it remains a contentious political and economic issue.

Less radical proposals involve measures to effectively ‘phase out’ paper currency. Rogoff⁴⁰ proposes that holding large sums of money be made more difficult by the abolition of large banknotes; Kimball⁴¹ suggests that stripping paper currency of its legal tender status might make cash less attractive as a store of value, without removing its function as a means of payment (at least for smaller transactions).

5. Taxing paper currency

Buiter⁴² and others attribute the suggestion to impose a ‘carry tax’ on paper currency to Silvio Gesell, who proposed introducing a chargeable, monthly stamp required in order for banknotes to retain their value.⁴³ The purpose of this proposed policy was to prevent money hoarding; an idea favoured also by Fisher.⁴⁴

Inspired by Gesell’s proposal, an alternative currency called ‘Wara’ was temporarily used in some German communities in the early 1930s. At the time, the Reichsmark tended to be hoarded due to the uncertain economic environment, and the resulting insufficient supply of currency in circulation further depressed economic activity. The Wara had to be stamped weekly at a rate of 2% of its value, which led

⁴⁰ Rogoff, K., *The Curse of Cash* (2016) Princeton: Princeton University Press.

⁴¹ Kimball, M., ‘A Minimalist Implementation of Electronic Money’ (2013) *Confessions of a Supply-Side Liberal*, 20 May 2013.

⁴² Buiter, ‘Negative Nominal Interest Rates: Three ways to overcome the zero lower bound’

⁴³ Gesell, S. and P. Pye, *The natural economic order* (1958) London: Owen.

⁴⁴ Fisher, I., *Stamp Scrip* (1933) New York: Adelphi.

to its faster circulation. The resulting revival of one particular community's economy became known as the 'miracle of Schwanenkirchen'. A similarly successful experiment using stamp scrip was carried out in the Austrian town of Woerl, and some local areas in the United States followed these examples. The scrip currencies were later deemed illegal in Germany and Austria.⁴⁵

Thanks to more advanced technology, a carry tax on paper currency could now be imposed via more sophisticated means than by using a stamp (which would be highly vulnerable to counterfeiting). Goodfriend⁴⁶ proposes implanting a magnetic strip in each banknote in order to monitor when the bill was last withdrawn and tax it accordingly. Buitter and Panigirtzoglou⁴⁷ highlight the danger that unstamped currency may continue to be accepted as a means of payment and the tax thus be circumvented. In order to enforce the carry tax, they propose a more visible distinction than that proposed by Goodfriend, such as a stamp, and to introduce a penalty on those who hold currency on which the carry tax or negative interest has not been paid, such as confiscation.⁴⁸

6. Decoupling paper currency from the unit of account

Paper and digital currency commonly hold the same value and can be exchanged at a ratio of 1:1.

Robert Eisler envisaged a distinction between the values of bank money and paper currency, within a broader programme for maintaining price stability.⁴⁹ Buitter⁵⁰ provides a number of historical examples in which the unit of account differed from the medium of exchange. In practice, paper currency could be abolished and replaced by a currency of a different name, or it could remain as it was but be stripped of its parity in value with electronic money.

⁴⁵ *ibid.*

⁴⁶ Goodfriend, M., 'Overcoming the Zero Bound on Interest Rate Policy' (2000) *Journal of Money, Credit and Banking*, 32, 1007-1035.

⁴⁷ Buitter and Panigirtzoglou, 'Liquidity traps: how to avoid them and how to escape them'

⁴⁸ Buitter and Panigirtzoglou, 'Liquidity traps: how to avoid them and how to escape them'

⁴⁹ Eisler, R., *Stable Money: The Remedy for the Economic World Crisis* (1932) London: The Search Publishing

⁵⁰ Buitter, 'Negative Nominal Interest Rates: Three ways to overcome the zero lower bound'

Modern proposals based on this idea, such as time-varying deposit fee at the central bank's cash window suggested by Kimball⁵¹⁵² or the 'euro and wim' economy described by Buiter,⁵³ emphasise the imposition of a controlled exchange rate between digital and paper currency. This exchange rate could be achieved by imposing a variable deposit or withdrawal fee, either on all bank deposits/withdrawals or only at the central bank.⁵⁴ Alternatively, instead of using a fee as such, the central bank might impose an exchange rate in regular intervals and treat commercial banks' cash deposits (or withdrawals) accordingly, requiring banks to do the same. If, for instance, at a given point in time the exchange rate stood at 1.1 units of paper currency to 1 unit of digital currency, a person depositing 1 unit of paper currency at a commercial bank would only see their account credited by 0.99 units of digital currency. This would be because the same principle would apply to commercial banks depositing (or withdrawing) reserves at the central bank.

Retaining the digital currency as the unit of account could be required by law. During periods in which nominal policy interest rates are negative, the paper currency would be made to depreciate against the electronic currency. Parity could be re-established (as it is now) whenever rates are positive, or paper currency could be made to appreciate during such times.

An important limitation is the danger that the public might resist using the digital currency as the unit of account, and refer to the paper currency instead, if unofficially.⁵⁵ In effect, then, digital money would gain value, instead of paper currency losing it. Furthermore, the policy might result in significant menu costs for businesses if both prices were to be provided at all times and the exchange rate changed frequently.

7. Negative nominal interest rate policy in practice

In the aftermath of the 2008 crisis and a context of secular stagnation, central banks in several advanced economies reached the limits of conventional interest rate policy, with rates at or near zero. To provide further stimulus, balance sheet policies in the form of large-scale asset purchase programmes were introduced.

⁵¹ Agarwal, R. and M. Kimball, 'Breaking through the zero lower bound' (2015) *IMF Working Paper* 15/224.

⁵² Kimball, M., 'Negative Interest Rate Policy as Conventional Monetary Policy' 2015 *National Institute Economic Review*, 234, R5-R14.

⁵³ Buiter, 'Negative Nominal Interest Rates: Three ways to overcome the zero lower bound'

⁵⁴ Agarwal and Kimball, 'Breaking through the zero lower bound'

⁵⁵ Buiter, 'Negative Nominal Interest Rates: Three ways to overcome the zero lower bound'

Since 2014, the central banks of the Eurozone, Denmark, Switzerland, Sweden and Japan, and to some extent Hungary and Norway, have also breached what was previously thought of as the lower bound on nominal interest rates and lowered policy rates below zero. As of yet, rates have not gone below -1.25% in any jurisdiction.

The rationale for introducing negative nominal policy rates differed between jurisdictions. In the euro area, Sweden, Hungary, Norway and Japan, the aim was to stimulate growth and inflation. In Denmark and Switzerland, negative rates were primarily a reaction to the negative interest rate policy of the ECB, which put considerable appreciation pressure on the Swiss franc and Danish kroner (as well as other European currencies). Overall, negative rates fed through to financial markets normally and were quite successful in stabilising exchange rates, while effects on growth and inflation were mixed. There has been no evidence of cash hoarding by banks in any of the jurisdictions in question.⁵⁶

8. Conclusion

This paper has provided an overview of the literature on the lower bound on nominal interest rates, which arises due to the existence of paper currency as a safe, interest-free store of value. Three proposals put forward to eliminate it have been discussed: abolishing paper currency, taxing it, and decoupling its value from the unit of account. The paper has also provided a brief overview of central banks which have pushed some policy rates below zero; notably, none of them used any of the proposals previously discussed.

In essence, proposals to eliminate the zero lower bound always aim to prevent cash hoarding. The biggest threat to their effectiveness is therefore the possibility of public resistance. Even if paper currency were abolished completely, people might turn to other assets to replace it, such as precious metals or foreign currencies. As Keynes pointed out, dismissing Gesell's stamped currency,

“money [is] not unique in having a liquidity-premium attached to it, but differ[s] only in degree from many other articles [...] if currency notes were to be deprived of their liquidity-premium by the

⁵⁶ cf. Bech and Malkhozov, ‘How have central banks implemented negative policy rates?’

stamping system, a long series of substitutes would step into their shoes [...]"⁵⁷

Opinions on the likelihood of this occurring vary among scholars,⁵⁸ but it is a danger that should not be dismissed outright. Negative nominal interest rates, especially if they were imposed on individual savers, might prove politically controversial. The argument that negative real interest rates have always existed and been accepted without further protest may not be reliable prediction of public reactions: public awareness of inflation levels and knowledge of the difference between nominal and real interest may not be as strong as economists might hope or assume. In other words, the public is likely to exhibit ‘money illusion’.

Moreover, the more negative nominal rates become, the more likely it seems that each mechanism’s limitations might come into play. If paper currency were abolished, the only way to circumvent the negative rate would be to substitute for other safe, liquid assets. Parallel currencies might appear. If paper currency were to depreciate against digital currency or be taxed, resistance to the policy through continued use of unstamped cash or use of paper currency as the unit of account might be more likely to emerge at increasingly negative levels of interest rates than only slightly negative ones. Any choice of steps to eliminate the lower bound should thus be evaluated with a view to the specific cultural and political context in which they are to be implemented. In countries like Sweden, phasing out or abolishing paper currency might be feasible. Elsewhere, a currency tax or exchange rate might prove more effective. Furthermore, empirically, negative nominal interest rates have not typically had any substantial effects on growth and inflation (in the Eurozone, for instance, both are still below target) and it is uncertain whether removing the lower bound on nominal interest rates will be sufficient in addressing secular stagnation.

⁵⁷ Keynes, J.M., *The General Theory of Employment, Interest and Money* (1936/1939) London: Macmillan.

⁵⁸ cf. Goodfriend, ‘Overcoming the Zero Bound on Interest Rate Policy’

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