

Global Economics View

High Time To Get Low: Getting Rid Of The Lower Bound On Nominal Interest Rates

- Central bank policy rates have been constrained by a perceived or actual effective lower bound (ELB) on nominal interest in recent years. The existence of the ELB is due to the existence of cash (bank notes) – a negotiable bearer instrument that pays a zero nominal interest rate. We view this constraint as undesirable and relatively easily avoidable from a technical, administrative and economic perspective.
- Due to carry costs of currency, the ELB is not actually zero, but likely somewhat negative. The -100bp deposit rate set by the Swedish central bank suggest that the carry costs of currency are higher than past consensus guestimates. Nevertheless, they are unlikely to permit the policy rate to be moved as freely to -5% as to +5%.
- Removing the ELB simply restores symmetry to the setting of policy rates by central banks. The case for it does not rely on the desirability or likelihood of significantly negative nominal interest rates for extended periods.
- But such symmetry is likely necessary if central banks are to be able to target inflation rates of around 2% with fiscal policy mostly dysfunctional in many AEs. Removing the ELB would therefore at least be prudent preparation for the next recession. The option to lower interest rates significantly below zero would have been valuable in the past as an alternative to large-scale asset purchases (QE) by the Fed and the Bank of England and today in Japan and the euro area. Compared to QE, significantly negative interest rates would create fewer financial stability risks and political legitimacy risks associated with large scale quasi-fiscal actions of the central bank.
- We present three practical ways to eliminate the ELB: i) abolish currency, ii) tax currency or iii) remove the fixed exchange rate between zero-interest cash currency and central bank reserves/deposits denominated in a virtual currency.

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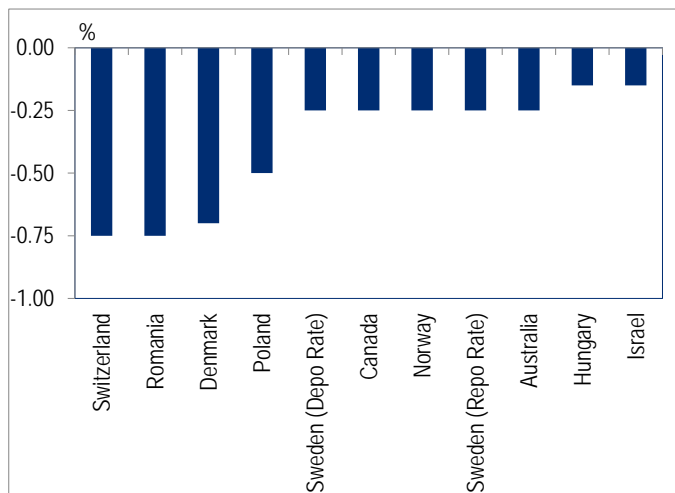
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Getting Rid of the Lower Bound

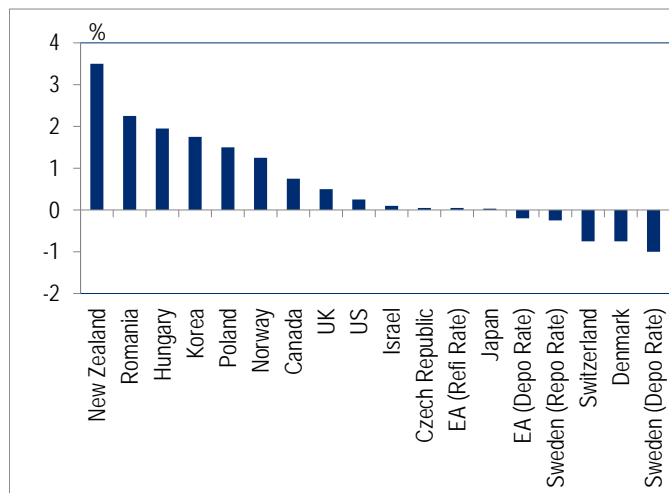
The number of central banks that have recently cut interest rates is steadily growing. Out of a sample of 69 central banks we consider, 34 have lower policy rates currently than they did a year ago (at the end of Q1 2014) and we expect 12 central banks (out of the 39 that we produce policy rate forecasts for) to cut rates between now and end-2015.

Figure 1. Selected Countries – Change in Central Bank Policy Rate (%) Between Q3 2014 and Q1 2015



Source: National Central Banks and Citi Research

Figure 2. Selected Countries – Level of Central Bank Policy Rate (%), April 2015



Source: National Central Banks and Citi Research

A number of these central banks have cut policy rates – generally the overnight deposit rate or the rate on excess reserves held with the central bank – to *negative* levels. Out of the 69 central banks, four currently have negative policy rates (the ECB, the Swiss National Bank, the Swedish Riksbank, and the Danish Nationalbank).¹ To our knowledge, this is more than at any other time previously – in fact prior to the current/ongoing episodes, the only other episodes we are aware of when a central bank imposed a negative policy rate were in Denmark (2012-14) and Sweden (2009-10).² Many more have rate policy rates which are at historically very low levels (Figure 2). Even though rates have fallen further and, in some cases, become more negative than most people would have thought likely or even possible not too long ago, the level of policy rates is still constrained at times by the existence of the effective lower bound (ELB) on interest rates.

The effective lower bound on interest rates is due to the existence of currency ('cash') – non-interest bearing bearer obligations with a zero nominal interest rate. When the prevailing (risk-free) nominal interest rates on non-cash stores of value are negative, cash becomes increasingly attractive as a store of value. So even though the central bank could offer to lend at significantly negative interest rates to its counterparties (banks and other credit institutions), in the absence of other institutional changes, it may struggle to encourage others to do so (as well as offering a perfect arbitrage opportunity to those able to borrow from the central bank and invest the proceeds in cash). Storage, safekeeping, insurance, transportation and handling costs of currency imply that the effective lower bound on interest rates is not zero, but somewhat negative (and uncertain). But the effective lower bound

¹ In all four cases, the relevant policy rate is a rate for depositing funds at the central bank.

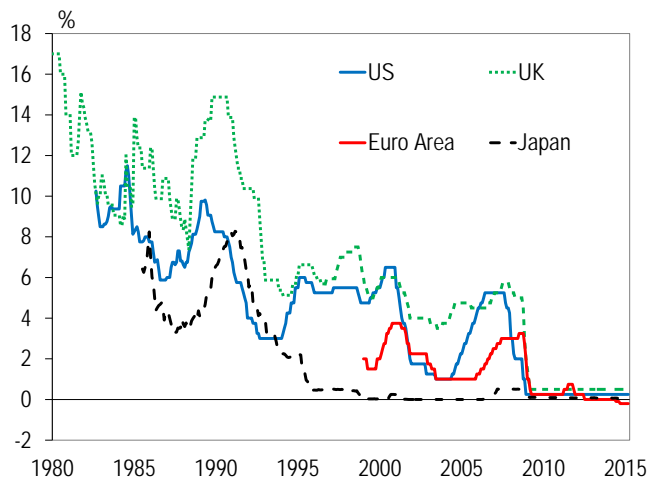
² In addition, Switzerland imposed nominal negative deposit rates on foreign deposits at various times in the 1970s, but these are more akin to capital (inflow) controls than to setting a negative policy rate applicable to all holders of the central bank liability in question.

on nominal interest rates is unlikely to be at the -5% or even -10% that central banks may at times wish to set the policy rate at.

In this note, we reiterate that the existence of the effective lower bound on interest rates is undesirable.³ It is also avoidable – we list three straightforward ways to remove the ELB completely. Getting rid of the ELB does not automatically imply that policy rates should currently be set at much more negative levels – that will depend on the specific circumstances in particular economies. But the rationale of getting rid of the ELB does not depend on the prevalence today of these specific circumstances: it simply removes the arbitrary asymmetry which acts as an avoidable constraint on monetary policy.

Even though the case for getting rid of the ELB likely does not require that much more negative interest rates are called for presently, we do argue that current circumstances in a number of economies around the world make removing the ELB more urgent. This is because in the absence of removing the ELB, central banks which desire to engage in more monetary policy stimulus have to rely more heavily on monetary policy instruments other than interest rates, notably large-scale asset purchases or collateralised lending operations, which bring with them material financial instability and political illegitimacy risks.

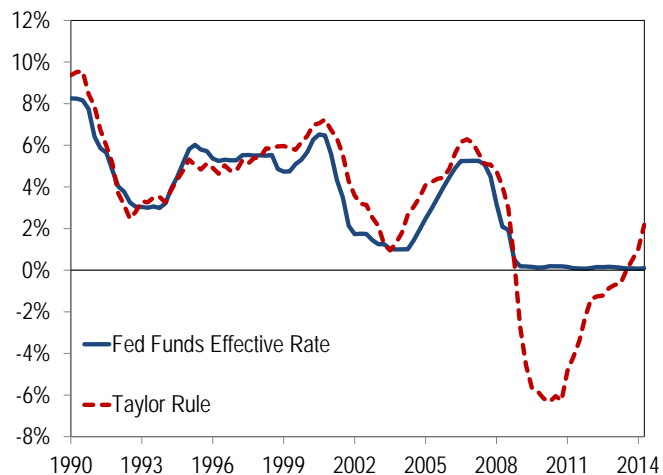
Figure 3. Selected Countries – Policy Interest Rate (%), 1980-2015



Note: Bank Rate for BoE, Collateralized Overnight Call Rate for BoJ, Marginal Deposit Rate for ECB and Federal Funds Target Rate for Fed.

Source: Bank of England, Bank of Japan, European Central Bank, Federal Reserve Bank and Citi Research

Figure 4. US – Effective Fed Funds Rate (%) and Rate Implied by a Taylor Rule, 1990-2014



Note: The Taylor rule used here uses a coefficient of 1.5 for the inflation gap and of 2 for the unemployment gap, and a neutral nominal interest rate of 4.2%.

Source: FRB and Citi Research

The Effective Lower Bound on Interest Rates

As noted, there is an effective lower bound on nominal interest rates because of the existence of currency (‘cash’ – bank notes and coins), a negotiable bearer instrument with a zero nominal interest rate, and because of the central bank’s willingness to exchange currency against reserves held with the central bank at a fixed (one-for-one) exchange rate and on demand. There is of course nothing that

³ See Silvio Gesell (1916), Robert Eisler (1932), Irving Fisher (1933), Hall (1983, 1997, 2002), Hall and Woodward (2009), Goodfriend (2000), Buiter and Panigirtzoglou (2001, 2003), Buiter (2004, 2007a), Buiter and Sibert (2007), Buiter (2009a, b, c, d), Buiter (2010), Davies (2004), Fukao (2005), Mankiw (2009), Taylor (2009a,b)).

constrains a central bank even currently from setting a negative nominal interest rate, but it may not have the desired effect. Suppose the ECB set the interest rate on its main refinancing operation at -10%. Any private German bank could then borrow funds at -10%, but rather than lending out the funds at -10% plus a reasonable spread, one attractive alternative would be for it to invest the funds in euro currency. The relevant effective interest rate that should determine whether households or businesses decide to spend or save today would not be -10% but (close to) zero, the interest rate on currency. There is therefore an obvious asymmetry in the ability of monetary authorities to use the short nominal interest rate (the key conventional instrument in the monetary policy arsenal) – central banks can raise it without limit if inflation is deemed too high and there is excess demand, but they cannot effectively lower it much below zero when inflation is below target and aggregate demand is lacking.⁴

The effective lower bound on nominal interest rates is not actually zero. This is because of the so-called carry costs of currency and non-pecuniary benefits of currency vs other currency substitutes. Carry costs include storage, safekeeping, including insurance, handling and transportation costs. Non-pecuniary benefits include the costs of using currency for transactions, including bringing currency back into the electronic payment system, if needed.⁵

We are not aware of any convincing evidence on the size of the carry costs of currency or of the non-pecuniary benefits of alternatives to currency, so these remain somewhat uncertain. These costs and benefits are also not fixed and will likely depend on the circumstances in an economy. They are probably somewhat larger than previously thought, which implies that the ELB is probably also somewhat lower than previously thought but it is probably still quite close to zero.

⁴ In the cases of Denmark and Switzerland – both small, highly open economies – the proximate catalyst to impose a negative nominal policy rate was a fear that the exchange rate would appreciate excessively (or that it would take an excessive expansion of the central bank balance sheet to prevent such an excessive appreciation) rather than current weakness in demand. Of course, a large appreciation in the currency would over time also weaken domestic demand and inflation, too. The economic meaning of an ‘excessively large’ central bank balance sheet is not apparent when this balance sheet is a risk-free money machine to the central bank, accepting deposits at -75bps and investing them in deposits with the ECB or equivalent instruments at -20bps. Fear of political interference with the central bank should it become the largest sovereign wealth fund in the world may explain why the SNB threw in the towel.

⁵ Formally, denote carry costs by c^M for currency and c for a safe, short-maturity non-currency store of value, and non-pecuniary benefits (convenience yield) b^M and b respectively that non-currency may offer. If we let i^M denote the nominal interest on currency (typically zero) and i the nominal interest rate on the non-currency store of value, then, to prevent an open-ended shift into currency by portfolio holders we require that the following weak inequality holds (carry costs and non-pecuniary returns are expressed as percentage nominal yields on the value of the underlying asset):⁵

$$i + b - c \geq i^M + b^M - c^M$$

or

$$i \geq i^M + (b^M - b) - (c^M - c)$$

If we make the plausible assumptions that the interest rate on currency, i^M and the carry cost of non-monetary instruments, c , are zero, the inequality above simplifies to: $i \geq b^M - b - c^M$

If we are in a liquidity trap and people are satiated with currency (the non-pecuniary benefits of holding currency are no higher than those of holding non-currency stores of value $b^M = b$, we get the simple constraint that the ELB on the short risk-free nominal interest rate is given by minus the carry cost of currency: $i \geq -c^M$

The ECB believes that its current trio of policy rates (0.05% for the refi rate, 0.30% for the marginal lending rate and -0.20% for the deposit rate) puts it at the effective lower bound.⁶ Even though the ELB is likely to depend on country-specific factors, the examples of the Swiss, Danish and Swedish central banks suggest that the ELB is likely somewhat lower than the ECB asserts. The SNB has a target range for 3-month Libor between -1.25% and -0.25%, and sets the interest rate on sight deposits with the SNB at -0.75%.⁷ Likewise, Denmark's Nationalbank now has a certificates of deposit rate of -75bp.⁸ The Swedish Riksbank is the only central bank to have a negative refi or repo rate (at -25bp). Its deposit rate (on excess reserves) is -100 bp. It is true that these negative deposit rates received by commercial banks at the central bank have not (yet) been passed on to any significant degree to the banks' customers. Still, the fact that banks have not responded to the deposit rates of -75bp or even -100bp by investing in large safes and stocking up on large-denomination banknotes suggests that the ELB is unlikely to be much above -100bp. If the central banks involved have used 'moral suasion' to stop the banks in their jurisdictions from switching out of central bank reserves into cash, something on which we have no evidence, the ELB could of course be closer to the -20bp suggested by ECB President Draghi.

The lower bound on nominal interest rates has been a binding constraint on a number of central banks in recent years. This is evident if we look at the evolution of policy rates and monetary policy since the global financial crisis. From mid-2008 to early 2009, the Fed, BoE and the ECB cut policy rates aggressively, but then policy rates remained constant for some time (at 0-0.25% for the Fed Funds target rate, at 0.50% for Bank Rate, at 1% for the ECB's main refi rate and at 0.10% for the BoJ's uncollateralized overnight call rate, see Figure 3). This was not because macroeconomic conditions did not call for further rate cuts. Rather, these central banks switched to asset purchases and changed the terms and scope of their funding facilities. The Bank of Japan's policy rate has effectively been pretty much constrained by its perception of the ELB since 1999.

The constraint on these central banks was mostly self-imposed (so perhaps more 'restraint' than 'constraint'), and in our view all of these central banks could have lowered their policy rates somewhat further at the time and could still do so currently. But the (unobservable) actual or true ELB would likely have been binding, too. For example, conventional Taylor-rule estimates suggest that the appropriate policy rate in the US might have been south of -5% in 2009 (see Figure 4), far below any estimate of the ELB based on carry costs of currency we are aware of.⁹

Three ways to get rid of the effective lower bound

The fact that the ELB has been binding in a large number of AEs in recent years is already a pretty good reason to get rid of it. But we stress that the case for removing the ELB is even more straightforward: it is simply about restoring symmetry for central bank policy rate setting or removing the arbitrary asymmetry that the ELB

⁶ "We did eventually reach the effective lower bound later in the year by lowering incrementally the corridor of policy rates in June and September." (Draghi (2015)) and [Euro Area - Balanced ECB minutes show uncertainty about 2017 forecasts](#)

⁷ However, negative interest will only be charged on the portion of the sight deposit account balance which exceeds a given exemption threshold defined by the SNB, based on the minimum reserve requirement and set individually for each bank.

⁸ The -75bps rate is payable only on deposits held at the central bank in excess of the current-account limits for the monetary policy counterparties; current account deposits up to the limit have an interest rate of 0 bps.

⁹ Rudebusch (2009) argues that, based on a conventionally estimated Taylor rule, the Fed Funds target rate should have been -5% at the end of 2009.

presents. It is justified by forward-looking considerations. With the neutral real risk-free rate of interest at historically low levels (possibly negative in most advanced economies) and with inflation targets of 2 percent or less, the risk of future episodes of the ELB becoming a binding constraint on the policy rate in the US, the UK, Japan, the euro area, Switzerland, Denmark or Sweden, to name but a few likely candidates is far too high for comfort.

There is nothing unnatural about negative nominal interest rates. Negative real interest rates – nominal interest rates corrected for expected or actual inflation – are quite common and not subject to an effective lower bound, provided there is no upper bound on (expected) inflation. As noted, the reason that an effective lower bound on the nominal interest rate exists is the existence of currency – negotiable bearer instruments that pay a zero nominal interest rate.

There are at least three relatively simple ways to remove the ELB on nominal interest rates: i) to abolish currency altogether, ii) to introduce arrangements to pay interest (positive or negative) on currency and iii) to end the fixed exchange rate between central bank reserves and currency.

Abolishing currency

The first option would be to retire currency. There are countless alternative stores of value, means of payment and media of exchange, private and public. The numeraire/unit of account role that currency – as one form of ‘money’ – can be absorbed by the other forms of base money which will remain in existence, notably central bank reserves.¹⁰

What are the disadvantages of abolishing currency? We address five.

First, and probably the most common, is that abolishing currency will constitute a noticeable change to many people’s lives and change often tends to be resisted. A recent estimate suggests that currency is still used in 85% of global consumer transactions.¹¹ But it is worth noting that in the advanced economies at least (and many emerging markets), there is an ever-growing range of electronic payment and settlement vehicles, and currency has virtually become a redundant medium of exchange and means of payment for legitimate, legal transactions (see e.g. Bolt (2006)). Among legitimate payments, currency is mostly used for smaller retail payments, which is why the share of cash in transactions by value is usually much smaller than by volume. For instance, in the US, cash is used in 46% of consumer transactions by volume, but only in 23% by value (Bargnall et al (2014)). The use of cash is also steadily declining.¹²

Second, currency use remains high among the poor and some older people. That is true even in advanced economies. At most, this would call for the preservation of low-denomination coins and currency, certainly nothing larger than a \$5 note and it would not be necessary for the central bank to provide such currency, potentially in unlimited amounts, on demand. Making a limited amount of small-denomination currency available would be a combination of our first and third proposals (the third one being allowing for an exchange rate between currency and central bank

¹⁰ Ultimately, the choice of unit of account or numeraire (e.g. for wage and price contracts) is endogenously socially determined, but the authorities can have a significant influence on this decision, e.g. by making central bank reserves the only form of legal tender, including for tax payments.

¹¹ See http://www.mastercardadvisors.com/_assets/pdf/MasterCardAdvisors-CashlessSociety.pdf

¹² See e.g. Federal Reserve Board (2014) or Cap Gemini and RBS (2014) for evidence that the use of non-cash has been growing briskly. We are not aware of any evidence that suggests that the use of cash has been growing at similar rates.

reserves). A limited amount of small-denomination currency available would be unlikely to ever be an effective constraint on the central bank's ability to set policy rates. Having said that, in our view, it would be preferable to provide the 'great unbanked' with automatic access to a bank account instead of retaining the limited use of currency. The benefits in terms of social and financial inclusion are likely to outweigh even non-trivial costs of account opening.¹³

Third, central banks and governments would lose seigniorage revenue. This is true, and the amounts of money involved can be non-trivial, unless there were to be an offsetting and significant increase in the demand for the other components of the monetary base. For instance, required reserves that pay less than the interest rate on non-monetary financial instruments would be a source of seigniorage and if excess reserves have some material non-pecuniary convenience yield, the central bank could even make profits on excess reserves held by the central bank. Seigniorage, the resources that can be appropriated through the issuance of central bank liabilities (including currency) that pay less than the market yield on otherwise similar non-central bank liabilities can be an important source of state revenue, either for the central bank or for its beneficial owner, typically the Ministry of Finance or Treasury, or for both. For example, over the course of 2014, the stock of euro bank notes and coins increased by €61bn (0.6% of GDP). For the Federal Reserve, the increase in the stock of coins and notes was \$87bn (0.5% of GDP). Elsewhere, we have pointed out the significance of seigniorage for central bank loss-absorption capacity and fiscal issues.¹⁴

Fourth, abolishing currency would inevitably be associated with a loss of privacy and create risks of excessive intrusion by the government (and other would-be inspectors). The well-known monetary economist Charles Goodhart indeed refers to the proposal to abolish currency as "*shockingly illiberal*". But this cost has to be seen against the cost that the anonymity of currency presents to society. Even though hard evidence is hard to come by, it is very likely that the underground economy and the criminal community are among the heaviest users of currency (where the value of anonymity that currency provides is likely to be the highest). Evidence consistent with this hypothesis includes the fact that high-denomination notes account for a rather large share of total currency outstanding (e.g. €500 notes account for almost 30% of total currency outstanding in the Eurozone by value¹⁵). In our view, the net benefit to society from giving up the anonymity of currency holdings is likely to be positive (including for tax compliance).

¹³ See the Better Than Cash Alliance (<http://betterthancash.org/>), a joint venture between a number of public and private sector organisations to boost the use of electronic payments, for evidence on the benefits of electronic payments, including for financial inclusion. Citi is a sponsor of this alliance.

With deposit insurance for transactions balances, such accounts would also be free of default risk up to a limit likely to exceed any conceivable legitimate use of cash.

¹⁴ See [Global Economics View - Looking into the Deep Pockets of the ECB*](#). The command over resources the state (the consolidated central bank and general government) obtains from seigniorage is the present discounted value (NPV) of the future interest saved by having base money liabilities outstanding rather than non-monetary liabilities, plus the NPV of the 'terminal' stock of base money – the stock of base money at the end of time. This NPV of current and future seigniorage can either be spent by the state on infrastructure or public consumption, or transferred to the private sector through tax cuts or transfer payments or subsidies. Either way aggregate demand gets boosted. If there is Keynesian underutilization of resources, this can help reduce the waste of real resources involved. If the central bank were to engage in transfer payments itself (the Chair, Governor or President sends a check to every legitimate resident of the polity), this transfer of seigniorage to the private sector would be called a helicopter money drop.

¹⁵ See <http://www.ecb.europa.eu/stats/euro/circulation/html/index.en.html>

Fifth, switching exclusively to electronic payments may create new security and operational risks. At times, payment systems, or other critical elements of infrastructure needed for transactions, book-keeping or appraisal purposes, may be unavailable or malfunctioning. It is true that anything that can be programmed can probably be hacked – there is no such thing as an absolutely secure ‘cyber currency’. But technological progress in IT (and notably payment systems) remains swift and should further reduce the incidence of outages and malfunctions over time. In addition, it is hardly true that currency works particularly smoothly, with the risk of forgery and counterfeit money probably at least as prevalent for currency as it might be for electronic payments.

In summary, we therefore conclude that the arguments against abolishing currency seem rather weak. Having said that, abolishing currency is not the only way to remove the ELB.

Create ways to pay interest on currency

Another way for the authorities to remove the ELB without abolishing currency is to tax it, as proposed by Gesell (1916), and supported by Irving Fisher (1933) and John Maynard Keynes (1936) (see also Fukao (2005)).

The reason it is awkward and costly, but not impossible, to pay either positive or negative interest on currency is that the holder (owner) of currency is anonymous: the issuer or the counterparty offering goods or services in exchange for currency does not (in principle) know the identity of the holder. The name or some other uniquely identifying attribute of the owner is not attached to (written or printed on) the currency note, as it is with so-called ‘registered’ securities. If the interest rate on currency were positive, the owner could present the same note repeatedly for payment during a time interval when he was entitled to just one payment. Stamping or otherwise marking the currency as the having interest that is due paid, that is, identifying it as current, is therefore necessary to pay a positive interest rates. In the old days, bearer bonds with periodic interest payments due, would have the appropriate number of ‘coupons’ attached to the bond certificate. Each payment of interest involved the clipping of a coupon. With currency having an open-ended (in principle infinite) remaining maturity, physically clipping coupons would result in bank notes of rather awkward (indeed infinite) size.

Should the interest rate on currency be negative, the problem for the issuer is how to incentivize the anonymous holder of a currency note to come forward and pay the interest due. Once the holder had paid the appropriate amount to the issuer, the bank note could be marked as being current. Absent an unlikely collective eruption of honesty, penalties for holding or accepting in payment, currency notes that are not current on the interest due by the holder to the issuer would be required to induce the holder of currency notes to receive their negative interest due.

The problem with taxing or stamping currency is that it is likely to be awkward, intrusive and probably even costly. Sanctions for non-compliance (confiscation of unstamped bank notes, fines, imprisonment or worse) are likely to be necessary to enforce that the required interest/taxes be paid on currency holdings. Simply declaring that ‘non-current’ on taxes due currency ceases to be legal tender or is repudiated as a liability by the central bank is unlikely to be sufficient. After all, whether or not a particular asset (physical, with or without intrinsic value, paper or electronic) is willingly held by a sufficient number of market participants, or widely accepted as a medium of exchange or means of payment is the outcome of a decentralized act of collective choice, not something that can be established by law. ‘Fiat’ money, or ‘Let it Be’ money is not synonymous with legal tender, which is

indeed a property of assets that can be granted and taken away by the State. Money is whatever collection of assets a sufficient number of people is willing to use as a medium of exchange and means of payment.

The payment of negative interest rates therefore does not just require that currency should be 'stamped' or 'marked' to indicate clearly and unambiguously that interest due has indeed been paid and that the holder of the negotiable bearer bond is therefore current on his obligations, but also requires penalties for non-compliance. The same logic applies to proposals to pay (negative) interest by randomly cancelling a certain fraction of each denomination of banknotes outstanding (based on their serial number, say, as proposed by Mankiw (2009)). If the public at large continues to accept these (cancelled) banknotes on the same terms as the continuing, still officially valid, bank notes, then the official cancellation is ineffective and will not amount to the imposition of a negative interest rate on currency. To make such an outcome unlikely it is necessary that sanctions be imposed on anyone caught with a cancelled bank note or offering/accepting it in payment. Although technically feasible, we are doubtful that such sanctions and enforcement will be politically manageable in most countries.

End the Fixed Exchange Rate Between Central Bank Reserves and Currency

The third mechanism for removing the ELB is to end the fixed exchange rate between central bank reserves and currency. The central bank would continue to supply both central bank reserves and currency on demand at the official policy interest rate, as it does today. To make the system as similar as possible to current practice, the central bank keeps the exchange rate between central bank reserves and currency constant (as it does today), as long as the official policy rate (the rate on deposits with the central bank) is zero or positive.¹⁶

However, when the policy rate is negative (say -5%), the central bank sets the one-period forward price of currency in terms of central bank reserves 5% below the current spot price (see Boyle (2002), Buiters (2004, 2007, 2009) and Davies (2004), developing the work of Eisler (1932)). Next period's spot price is then set equal to today's one period forward price. This amounts to a crawling peg, with the (confidently expected) rate of appreciation of the deposit currency vis-à-vis the cash currency equal to the interest differential between the deposit currency (-5%) and the cash currency (0%). In our example, assume that 100 cash dollars can be converted into 100 reserve dollars today. With a -5% interest rate, next period 100 cash dollars would only get you 95 reserve dollars. It follows that there is no incentive, when the policy is negative, for any rational economic agent to try and borrow at the negative policy rate and invest it in zero interest-earning currency. The depreciation of currency in terms of central bank reserves means that expressed in a common currency, currency and central bank reserves earn the same pecuniary rate of return. Alternatively, the authorities could peg the policy rate at -5%, say, and accept reserves and/or lend at that -5% as demanded by the market, but keep the stock of currency 'supply-determined.'¹⁷

In our view, ending the fixed exchange rate between currency and central bank reserves is both practical and likely to be effective. The only loose end, from the

¹⁶ In principle, one could impose perfect symmetry here, i.e. also end the fixed exchange rate between central bank reserves and currency when the policy rate is positive.

¹⁷ In that case, the central bank would let the exchange rate between currency and reserves be market-determined. Give or take an exchange rate depreciation risk premium, the expected rate of depreciation of currency in terms of reserves would be minus 5 percent.

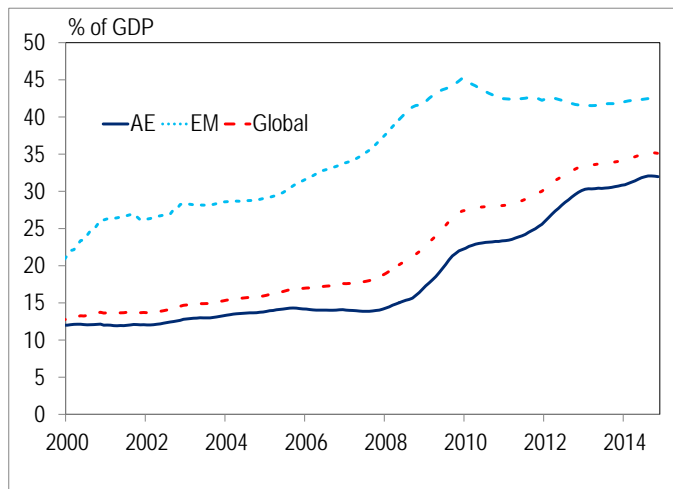
point of view of monetary policy, is that the authorities must ensure that in this case it is reserves (the deposit currency), rather than the cash currency, that acts as the numeraire or unit of account in terms of which wages and prices are set. The nominal interest rate (in terms of the numéraire--deposit currency) and the (expected) inflation rate (in terms of the numéraire) determine the real interest rate 'dog' that wags the real interest rate 'tail' of the non-numeraire cash currency tied to it through covered interest parity (if the authorities set the forward rate) or some version of uncovered interest parity plus an exchange rate risk premium if the authorities make a non-fully credible commitment to a future spot rate. That way the ELB is removed: there is no floor on the nominal interest rate on deposits. Should cash currency become the numéraire for wage and price contracts, the real interest rate on cash currency becomes the dog and the real interest rate on deposit currency the tail. The nominal interest rate on cash currency remains subject to the ELB, however, so monetary policy remains as asymmetric as is when deposit and cash currency are linked through a fixed exchange rate.

As we noted above, the choice of numeraire is socially endogenously determined and therefore not under the full control of the authorities. However, as we also pointed out, the authorities are not powerless, or without influence, either. They could, for instance, designate central bank reserves as the only legal tender as well as make reserves the unit of account and medium of exchange for all government-determined prices and contracts (including public sector wages) as well as for tax and subsidy payments. In extremis, they could make contracts denominated in currency unenforceable in domestic courts.

We should get rid of the ELB now

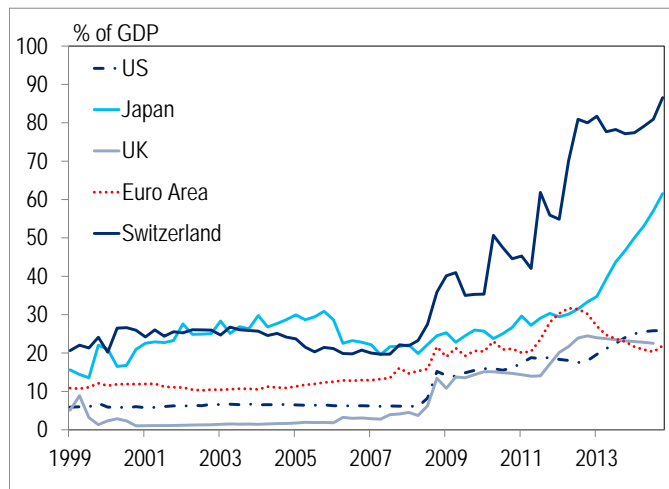
As we argued above, the case for removing the ELB is rather simple and does not rest on a current urgent need for significantly negative interest rates. We simply want a full, symmetric monetary policy toolkit to deal with future contractionary and disinflationary episodes. But at the same time, current circumstances illustrate that the case for removing the ELB is not just theoretical. In particular, once we are at the ELB and additional monetary policy stimulus is needed, we are squarely in the world of quantitative easing, qualitative easing, credit easing and other so-called unconventional monetary policy actions.

Figure 5. Global – Central Bank Balance Sheet (% of GDP), 2000-2015



Source: National Central Banks and Citi Research

Figure 6. Selected Countries - Central Bank Balance Sheet (% of GDP), 1999-2015



Source: National Central Banks and Citi Research

In the absence of other alternatives, the case for those measures was often strong in recent years in many advanced economies, even if one accepts that they are subject to diminishing returns. But they come with their own significant risks and costs, mostly related to the fact that these measures usually imply large-scale expansions of central bank balance sheets (LSEBS, both through outright asset purchases and extraordinary lending operations). This is true even though the large increase in balance sheet sizes was very much desired in these cases – given the alternatives the central banks were willing to contemplate.

The rise in the size of central bank balance sheets in recent years has been nothing short of extraordinary. The GDP-weighted aggregate of the central bank balance sheets of a sample of 33 advanced economies was 30% of GDP at end-2014, more than twice what it was in 2007 (see Figure 5). Some individual central banks have had even larger increases in their balance sheets. The Swiss National Bank, for instance, saw its balance sheet explode from around 20% of GDP in 2007 to almost 90% of GDP recently (Figure 6).¹⁸

The large increases in central bank balance sheets have been the cause of some controversy in virtually all of the economies in which they occurred. In some (e.g. in Switzerland), the massive increase in the central bank balance sheet (and the fear of future even faster and open-ended increases) have led to some fairly spectacular policy reversals.¹⁹ This is understandable, in our view, because the large increases in balance sheets come with material risks. Four potentially major such risks are:

First, LSEBS can create significant financial stability risks by feeding asset bubbles, including in, but not limited to, the asset markets in which the central bank is directly active. The global financial crisis of course showed how painful the consequences of a sudden bursting of such asset bubbles can be, particularly when leverage is high.

Second, even though monetary policy is inevitably associated with some fiscal and quasi-fiscal effects, the larger size and scope of LSEBS implies that the redistributive effects of monetary policy have also increased significantly.

Third, the large size of LSEBS and the large size of the resulting asset holdings constitute very large interventions in private asset markets and the real economy, which could potentially be highly distortive (and therefore undesirable).

Finally, and most importantly, the combination of the above three risks and costs implies that LSEBS can raise serious challenges for the legitimacy of central banks and raise the risk of a major political backlash against central banks.

Having the option to reduce policy interest rates to substantially negative levels can at least in part reduce the need for LSEBS. This is not to say that LSEBS would become redundant once we remove the ELB. Clearly, even with full freedom to move the nominal policy rate down to any level, and even with (expected) inflation predetermined or sluggish to adjust so that nominal policy rate cuts correspond, at least for a while, to material real interest rate cuts, the responsiveness of aggregate demand to a lower real interest rate may not be sufficient to restore full employment. Other policy measures, including expansionary fiscal policy or monetised fiscal stimuli (helicopter money drops) may be necessary. But we regard

¹⁸ Having said that, globally there are central banks with even larger balance sheet sizes relative to GDP. At end-2014, these were Luxembourg (226% of GDP), Norway (184%), Lebanon (183%), Hong Kong (142%), Saudi Arabia (97%), Taiwan (97%) and Singapore (88%).

¹⁹ [Global Economics View - Did the SNB score an own goal? Francly, yes.](#)

it as almost self-evident that when more monetary policy stimulus is called for, the 'corner solution' of full reliance on LSEPS while policy interest rates are stuck at the ELB is unlikely to be optimal. With fiscal policy both in the euro area and in the US seriously constrained by ideology, faulty economic analysis or political paralysis (or some combination of the three), removing the ELB is clearly highly desirable.

Should we not raise the inflation target instead?

Some may argue that raising the target rate of inflation would be a suitable (or perhaps even superior) alternative to eliminating the ELB. We are not categorically opposed to the idea that the optimal target inflation rate may be higher than the now common '2 percent' that many advanced economy central banks implicitly or explicitly target – the theoretical justifications for the 2% target were always tenuous. In the absence of straightforward ways to remove the effective lower bound, we would mostly be in favour of somewhat higher inflation targets (perhaps 2.5% or 3%) to reduce the risk of hitting the effective lower bound in the case of large adverse shocks. Even then, we would point out the dangers of higher inflation targets, notably that higher inflation rates are likely to be associated with higher inflation volatility (see e.g. Kiley (2007)), which is undesirable. In addition, higher inflation may lead to 'inflation creep' – the risk that effective (explicit or implicit) target inflation rates creep upwards over time, re-establishing an 'inflation bias' to monetary policy, which is reminiscent (if not fully equivalent) to the time inconsistency concerns about macroeconomic policy that were prominent in the 1970s and 1980s.

Perhaps the most important reason to reject the view that a higher target inflation rate would be a superior alternative to removing the ELB is that it does not actually do so: after all, changing the target is not the same as having an instrument to achieve that target. It may be possible that, in a world of very credible and effective monetary policy, raising the target inflation rate by itself reduces the frequency of occasions when the ELB will bind. But it is just as possible that having negative interest rates will be an instrument that will be essential in a policy mix needed to achieve the target inflation rate, particularly when the reason to raise the inflation target is a failure to have achieved even the lower target.

But what about the German saver (and all other savers)?

We anticipate howls of horror from various sources, notably German savers and their representatives, at the sight of the ideas and arguments we espouse in this note. Many of these will refer to negative nominal interest rates disapprovingly as 'punishing savers'. Most of that is simply people talking their own books and/or a failure to distinguish between nominal and real interest rates. But it is important to highlight that discouraging saving (and encouraging spending) is not a bug of significantly negative interest rates, but a feature. If aggregate demand is weak, i.e. there is an excess of saving (private plus public) relative to spending (consumption or investment, private or public), lowering interest rates is one way that could potentially lower saving and increase investment to eliminate the demand deficiency.

This is not to say that lowering interest rates are *always* the right response to a situation of weak demand. For instance, demand for savings may be boosted and investment discouraged by various forms of uncertainty, and neither the uncertainty nor the ex-ante saving-investment balance may be sensitive to changes in interest rates. But if demand is deficient and saving/investment sensitive to interest rates, then lowering the motive to save is very much the desired outcome. That *someone* will lose due to the change in interest rates is bad news for the losers, but not a

reason to reject the policy action per se.²⁰ It is a feature of both interest rate cuts and interest increases, and does not depend on whether the level of interest rates is positive or negative.

It is, of course, necessary to assess if lowering interest rates is likely to have the desired effect. For example, it is conceivable that lowering interest rates (in principle both when they are positive or when they are negative) would *raise* rather than lower desired savings, if savers have constant targets for the *level of nominal (or real) savings* in the future. A lower rate of return on savings with an unchanged level of target savings would require more saving contributions. That is another way of saying that the income effect of lower rates (positive for borrowers, negative for lenders/savers) outweighs the substitution effect (which would call for lower saving). Such constant saving targets may be implicit and personal (the income effect on creditors) or they may be institutionalised, for example for defined benefit pension schemes or life insurance with return guarantee features, as are common in Germany. If such constant targets are common, the effectiveness of rate cuts will be limited, although other interest-sensitive components of aggregate demand (capital expenditure) could still be boosted.

How far (down) will central banks go?

In the introduction, we noted that we currently expect 12 central banks to cut policy rates between now and year-end.²¹ Among these, there is none that we expect to set a negative policy rate for the first time. Israel may come close (its policy rate is already at 0.1% and we expect another small cut). And there are several countries where a negative policy rate in the not too distant future is conceivable, e.g. in Canada or Norway (if oil prices resume their decline) or in the Czech Republic or perhaps even Hungary (should their exchange rates appreciate aggressively).

Among the countries, that already have a negative policy rate, we currently only expect Sweden to cut its policy rate further (from -0.25% to -0.4%). But we regard further rate cuts in the other 'negative rate economies' (Denmark, the euro area, and Switzerland) as certainly plausible.²² In the euro area, the ECB may decide to further its deposit rate for operational reasons to ensure that it can carry out its planned purchases under the expanded asset purchase programme (EAPP) while complying with its self-imposed rule to not buy at yields lower than its deposit rate.²³

In none of the economies has the central bank actually hit the ELB yet, in our view, leaving the respective central banks with some scope to lower policy rates further before needing to consider the type of measures we discuss (the most negative policy rate we currently observe is in Sweden, where the deposit rate is at -1%). In countries where the primary motivation for negative interest rates is to deter excessive capital inflows, the effective lower bound is likely to be lower, given that carry costs of currency are likely to be larger and non-pecuniary benefits smaller for foreigners.

²⁰ A desirable policy action will increase the size of the pie and not just redistribute slices of the pie. It should therefore in principle be possible to compensate the losers so that no one would be worse off. In practice, administrative costs and constraints may, however, often make it unlikely that the losers will be compensated.

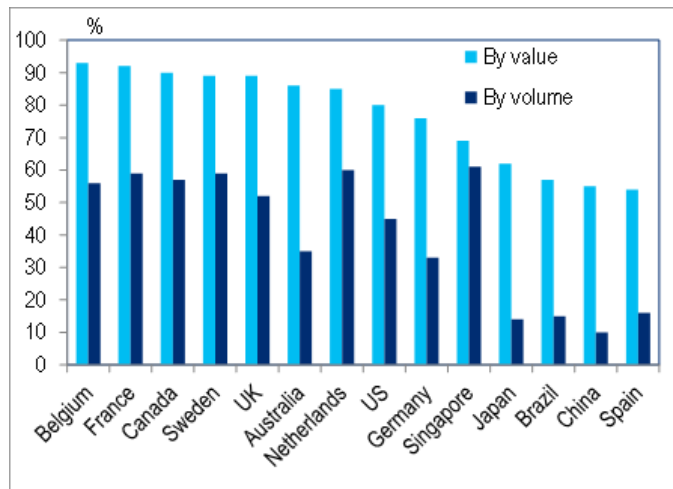
²¹ These are Australia, Brazil, China, Egypt, Hungary, Indonesia, Israel, India, Russia, Ukraine, Norway, and Sweden. See [Global Economic Outlook and Strategy - March 2015](#).

²² This is despite the fact that the ECB's latest minutes (from April 2, 2015), suggested that the deposit rate at -0.2% may be at the effective lower bound (see footnote 6).

²³ This self-imposed rule was probably put in place to avoid having negative carry even on some of its asset purchases. Of course, the ECB could also simply get rid of this self-imposed rule altogether.

Overall, we therefore expect that negative nominal interest rates will become increasingly common, as they become better understood (and irrational concerns about their effects less commonly accepted) and assuming that many advanced economies will continue to suffer from weak demand, necessitating some degree of monetary support. But institutional changes, such as the ones we propose in this paper are likely to be necessary to allow monetary policy to continue to be effective. Since the start of the Great Financial Crisis (GFC), many central banks throughout the advanced economies have either found themselves constrained by the ELB on the policy rate or too close for comfort to bumping into the ELB. Helicopter money drops are not legitimate except as an explicitly coordinated set of policy actions by the monetary and fiscal authorities (a temporary fiscal stimulus permanently monetised by the central bank). In addition, for mainly political reasons, fiscal policy has been a bystander in the battle to boost aggregate demand since the early fiscal stimuli of 2008 and 2009. Unconventional monetary policies - large-scale balance sheet expansions and changes in the composition of the assets and liabilities of the central bank, have turned out to be poor man's monetary policy. Better than nothing, but subject to diminishing returns when financial markets settled down after the panics of 2008-9 (in the US and Europe) and 2010-12 in the euro area.

Figure 7. Selected Countries – Share of Cashless Payments In Total Consumer Transactions (%), 2011



Source: MasterCard Advisors and Citi Research

Figure 8. Citi/Imperial College Digital Money Index of Digital Money Readiness, 2015

Rank	Country
1	Finland
2	Singapore
3	US
4	Sweden
5	Hong Kong
6	Norway
7	UK
8	Netherlands
9	Japan
10	Switzerland
11	Denmark
12	Germany
13	Austria
14	Canada
15	Qatar

Source: Citibank and Citi Research

Bringing symmetry to the central bank's traditional policy instrument, the official policy rate clearly makes sense. But politically, the abolition of currency would run into opposition from some of the legitimately cash-dependent poor and elderly, from those for whom the anonymity of cash is desired because they are engaged in illegal activities and from libertarians. The first constituency can be helped, the second can be ignored and the third one should take one for the team.

Which are the countries where we are most likely to see the type of policy innovations we discuss? In our view, these countries are likely to be those which i) are at or close to the ELB, ii) are highly financially developed and iii) tend to be 'policy innovators'. Countries with high levels of financial development are more likely to take measures to remove or lower the ELB. Countries with relatively low current use of cash (see Figure 7) should, other things equal, find it easier to abolish currency. In cooperation with Imperial College, Citi has also developed an index of 'readiness' for digital payments, the Digital Money Index, which comprises 90 countries. According to this index, Finland, Singapore and the US are the three

countries which are most ready to rely mostly on digital payments.²⁴ Taken together, prime candidates for countries most likely to abolish the ELB currently therefore include Denmark, Sweden or Switzerland, in our view. Should the lower bound bind, Canada, Australia, New Zealand and Singapore would also be plausible candidates, in our view.

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²⁴ See "Digital Money: A Pathway to an Experience Economy", Citi and Imperial College London, January 2015, http://www.citibank.com/icg/sa/digital_symposium/digital_money_index/pdf/Digital%20money%20A%20pathway%20to%20an%20Experience%20Economy.pdf

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Appendix A-1

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