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The International Experience with Negative Policy Rates



by Harriet Jackson

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The International Experience with Negative Policy Rates

by

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Abstract

A key issue in the renewal of the inflation-control agreement is the question of the appropriate level of the inflation target. Many observers have raised concerns that with the reduction in the neutral rate, and the experience of the recent financial crisis, the effective lower bound (ELB) is more likely to be binding in the future if inflation targets remain at 2 per cent. This has led some to argue that the inflation target should be raised to reduce the incidence of ELB episodes. Much of this debate has assumed that the ELB is close to, but not below, zero. Recently, however, a number of central banks have introduced negative policy interest rates. This paper outlines the concerns associated with negative interest rates, provides an overview of the international experience so far with negative policy rates and sets out some general observations based on this experience. It then discusses how low policy interest rates might be able to go in these economies, and offers some considerations for the renewal of the inflation-control agreement.

JEL classification: E, E5, E52, E58, E6, E65

Bank classification: Central bank research; Financial markets; International topics; Monetary policy framework

Résumé

Une dimension centrale du débat entourant le renouvellement de l'entente sur la cible de maîtrise de l'inflation est celle du niveau approprié de cette cible. Au vu du recul du taux neutre et compte tenu des enseignements de la récente crise financière, de nombreux observateurs s'inquiètent de la possibilité que la valeur plancher effective des taux d'intérêt se fasse plus contraignante dans l'avenir si les cibles de maîtrise de l'inflation sont maintenues à 2 %. Certains vont jusqu'à penser que la cible d'inflation devrait être relevée pour réduire la fréquence des épisodes où le taux directeur atteint son plancher effectif. Une grande partie de ce débat repose sur l'hypothèse que le plancher effectif des taux se situe près de zéro, mais non au-dessous. Or, un certain nombre de banques centrales ont récemment adopté des taux directeurs négatifs. Dans son étude, l'auteure expose les enjeux associés à la négativité des taux d'intérêt, dresse un panorama de la situation à ce jour des pays qui ont fait passer leurs taux directeurs en territoire négatif et présente quelques conclusions générales tirées de l'expérience de ces pays. Elle se demande ensuite jusqu'à quel point ces taux directeurs peuvent descendre dans ces économies et suggère des pistes pour poursuivre la réflexion en vue du renouvellement de l'entente sur la cible de maîtrise de l'inflation.

Classification JEL : E, E5, E52, E58, E6, E65

Classification de la Banque : Recherches menées par les banques centrales; Marchés financiers; Questions internationales; Cadre de la politique monétaire

1. Introduction

A key question related to the renewal of the inflation-control agreement is that of the appropriate level of the inflation target. Many observers have raised concerns that with the reduction in the neutral rate, and in light of the experience of the financial crisis and its aftermath, the effective lower bound (ELB) is more likely to be binding in the future if inflation targets remain at 2 per cent. While there is considerable evidence that unconventional monetary policy can provide additional monetary easing at the ELB, it may not be a perfect substitute for conventional policy. Moreover, there are many potential costs from the prolonged use of such measures.¹ This has led some to argue that the inflation target should be raised to reduce the incidence of ELB episodes.² Much of this debate has assumed that the ELB is close to, but not below, zero. Recently, however, a number of central banks—the European Central Bank (ECB), Danmarks Nationalbank, Sveriges Riksbank and the Swiss National Bank (SNB)—have introduced negative policy interest rates, by lowering the target for the overnight rate to below zero and/or introducing a negative interest rate on deposits at the central bank.

Based on recent experience, some preliminary, high-level observations can be made about negative interest rates in these economies:

- There is growing consensus that the true ELB is negative. Rough estimates suggest that the ELB could be as low as about -2 per cent, although this is subject to considerable uncertainty, and, in practice, the ELB may be closer to about -1 per cent.
- Transmission of negative policy rates works, although pass-through to bank deposit and lending rates has generally been partial.
- There is little evidence to suggest that negative policy interest rates create excessive financial market volatility, although more time is needed for a full assessment of market reaction. Financial markets have continued to function without significant disruption (so far) in the presence of negative interest rates.
- From an operational perspective, market infrastructure in those jurisdictions that have introduced negative policy rates appears to be working well, although concerns have been raised over challenges in some submarkets.
- The impact on the real economy of a small move to negative rates is likely more modest than a similar-sized move that leaves the policy rate above zero.
- Expectations of the persistence of negative interest rates and disincentives associated with shifting deposits to cash will influence the effectiveness of negative policy rates, as well as how low they can go.

¹ Santor and Suchanek (2013).

² Blanchard et al. (2010).

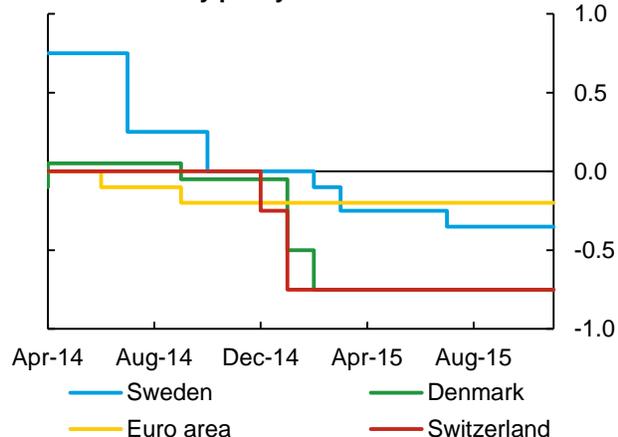
- A number of unintended consequences associated with negative policy interest rates have been envisaged, including the possibility of economic distortions as agents attempt to avoid negative interest rates.

The paper proceeds as follows. Sections 2 through 4 review recent policy actions in the economies that have introduced negative policy rates, describe briefly the transmission mechanism through which negative interest rates affect the real economy and set out potential concerns. Section 5 provides an overview of the experience so far with negative policy rates and offers some general observations based on this experience. Section 6 discusses how low negative policy rates could go in these economies, and Section 7 offers some considerations for the renewal of the inflation-control agreement.

2. Introduction of Negative Policy Rates Internationally

Since mid-2014, four economies have introduced negative policy interest rates (see Chart 1 and Table 1), either by charging a negative interest rate on reserves deposited at the central bank (Switzerland, Denmark, Sweden and the euro area), or, in some cases, by lowering the target for the key policy rate below zero (Sweden and Switzerland). Three-month money market rates have generally tracked changes in the policy rate (Chart 2).

Chart 1: Monetary policy interest rates

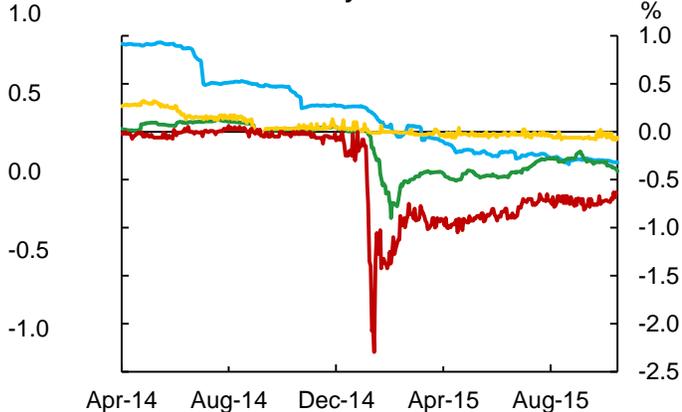


Note: Denmark - Certificate of deposit rate; Sweden - repo rate/rate of interest on Riksbank certificates; Euro area - deposit rate; Switzerland - midpoint of target range for 3-month Libor.

Source: Haver Analytics

Last observation: 3 Nov. 2015

Chart 2: 3-month money market interest rates



Source: Bloomberg L.P.

Last observation: 3 Nov. 2015

In Denmark and Switzerland, the introduction of negative rates was motivated by the desire to deter capital inflows and reduce appreciation pressures. Lars Rohde, Governor of Denmark's Nationalbank, stated in March 2015 that "in order to stem the capital inflow, Denmark's

Nationalbank intervened in the foreign exchange market for very large amounts, and we also reduced our monetary policy interest rates on several occasions.”³ Similarly, in its June press release, the SNB noted that “negative interest rates in Switzerland . . . will help to weaken the Swiss franc over time.”⁴ Sweden and the ECB introduced negative deposit rates in response to recessions, persistently below target inflation and falling inflation expectations.

Other central banks have not ruled out negative rates as an option for providing additional monetary easing. U.S. Federal Reserve Chair Janet Yellen, for example, indicated in congressional testimony in 2014 that negative interest rates were something the Fed “could consider going forward,” but thought that the benefits would be fairly small.⁵

Table 1: Negative policy interest rates

Central Bank	Action	Reason
Denmark	<p>July 2012 to April 2014: Certificates of deposit rate lowered to -0.2%; raised to -0.1% in January 2013, and back to positive in April 2014;</p> <p>September 2014 onward: Cut the certificates of deposit rate to -0.75% in a series of steps. Current account cap raised from DKK37 billion to DKK173 billion.</p>	<p>To discourage capital flows placing upward pressure on the krone.</p> <p>To manage upward pressure on the krone. Current account cap raised to reduce costs to the banking sector of the negative deposit rate.</p>
Euro area	<p>June 2014 onward: Lowered the Deposit Facility Rate (DFR) to -0.1% in June 2014 and -0.2% in September 2014.</p>	Weak growth and inflation.
Sweden	<p>July 2009 to September 2010: Cut deposit rate to -0.25%.</p> <p>July 2014 onward: Deposit rate lowered into negative territory (-0.5 %). Beginning in February 2015, the repo rate became negative (-0.1%) and was subsequently lowered to -0.35%, bringing the deposit rate to -1.10%.</p>	<p>Deep recession</p> <p>Persistently below target inflation.</p>
Switzerland	<p>1972: Penalty charge of 2% per quarter applied to the increase in CHF deposits from non-residents. Increased to 3% in November 1973 and 10% in February 1978.</p> <p>December 2014 onward: Target range for the 3-month LIBOR lowered to -1.25% to -0.25% in two steps. Rate on sight deposits at the SNB lowered to -0.75%.</p>	<p>To discourage capital inflows, particularly from oil-exporting countries.</p> <p>To manage upward pressure on the franc, weak growth and concerns over deflation.</p>

³ Rohde (2015).

⁴ SNB (2015).

⁵ Testimony before the Senate Committee on Banking, Housing and Urban Affairs, 27 February 2014.

3. The Transmission of Negative Policy Interest Rates

In theory, the transmission of negative policy interest rates to economic activity should be similar to a standard rate cut that leaves policy rates positive. Negative central bank policy rates will discourage banks from holding excess reserves at the central bank and increase incentives to lend, pushing down market interest rates as well as feeding through to asset prices via portfolio rebalancing effects and expectations about future earnings growth.⁶

More accommodative monetary policy will also affect the outlook for the economy, influencing confidence. These changes will in turn affect the investment and saving decisions of businesses and households, which should raise demand for domestically produced goods and services. By discouraging capital inflows, there will be downward pressure on the exchange rate, which should support external demand.

Taken together, these developments would help close the output gap and put upward pressure on domestic inflation. It is important to note, however, that the effect on lending will depend on investment opportunities, confidence and the health of domestic balance sheets, without which banks will continue to be reluctant to lend and/or consumers to borrow, despite negative interest rates.

Transmission may, however, be less powerful when policy rates fall below zero. In particular, banks may be less likely to fully pass through declines in the policy rate to lending and deposit rates in order to protect profits. To the extent that banks cannot fully pass on the cost of negative rates to depositors, a reduction in bank profitability may reduce the supply of credit.

As well, the impact on consumption will depend on household behaviour. If savings behaviour were unchanged, the impact should be no different from a similar-sized cut when rates are positive. If, however, consumers materially switch out of deposits and into cash in order to avoid negative deposit rates (or higher fees/charges for accounts), a reduction in deposits would reduce the availability of loanable funds, pushing up borrowing costs and dampening the stimulative effect of negative rates. In this context, whether there are disincentives to switch deposits to cash, as well as the ease and cost of storing cash, will influence depositor behaviour. Expectations about the ultimate level and persistence of negative policy interest rates will also influence the demand for cash.

⁶ The impact on market interest rates of changes in the central bank deposit rate compared to the target for the policy rate will depend on financial market conditions and institutional factors in the economy in question.

4. Potential Concerns Regarding Negative Rates

The possibility of reducing policy interest rates below zero means that central banks would be able to provide additional monetary easing while avoiding some of the potential costs of asset purchases.⁷ There are, however, a number of concerns associated with the use of negative policy rates, each of which is considered in turn.

Banks

Negative deposit rates impose a cost on banks with excess reserves, which all else equal would lower net interest margins, reduce profitability and hamper financial intermediation.⁸ The extent of the decline in profitability will depend on the degree to which banks' funding costs also fall. The impact on banks would likely be greatest on those with large retail business, rather than those more focused on corporate banking, since it may be easier to pass negative rates through to corporate clients than to retail clients. Banks could mitigate a decline in profitability by increasing charges on accounts, raising fee-based revenue or reducing deposits, but these efforts may not be fully offsetting. Further, to support profitability through new or higher charges on accounts risks prompting a withdrawal of deposits, which could affect the safety and liquidity of the banking sector. The central bank could reduce concerns about bank profitability by raising the threshold at which the negative central bank deposit rate applies. Doing so, however, could reduce the transmission of negative deposit rates to market rates.⁹

Concerns have also been raised that banks may choose to borrow less from the central bank, in order to lower excess reserves and avoid the negative deposit rate. This would put upward pressure on rates in the interbank and bond market, offsetting the stimulative impact of the negative policy rate.¹⁰ Trading volumes could fall if banks prefer to hold cash rather than lend excess liquidity at negative rates, which would impair market activity. Some banks could also begin rejecting liquid deposits, particularly if liquidity rules make it uneconomic to hold large institutional deposits.¹¹

Financial markets

⁷ See Reza, Santor and Suchanek (2015) for a discussion of the potential challenges associated with quantitative easing.

⁸ This is particularly so if banks need to deleverage simultaneously owing to more strict regulatory requirements or increased market scrutiny.

⁹ This is most obviously implemented in a system with required reserves, but is also feasible in systems without such requirements. See Bean (2013) for a discussion of the United Kingdom. Sweden also has a negative deposit rate and no reserve requirement.

¹⁰ Cœuré (2014).

¹¹ Kupiec (2015).

Another commonly cited concern is that with negative interest rates, money market funds would be unable to deliver attractive returns while remaining safe and liquid, prompting large outflows and closures, and reducing liquidity in a key segment of the financial system.

In terms of insurance and pension funds, a low-for-long interest rate environment poses challenges, which would be exacerbated by negative interest rates.¹² Duration mismatches could be compounded by negative investment spreads, if yields on long-term bonds fall below investment returns that have been promised to policy holders. Such challenges have prompted concerns that by squeezing returns, negative rates could incent financial institutions to take on inappropriately risky assets. A more aggressive search for yield could in turn contribute to financial imbalances through excessive asset price valuations and weak credit standards.

Lastly, risk management may be affected in a world of negative interest rates, since implied and realized volatility around zero interest rates may be higher than risk models suggest, given risk aversion, and most option pricing models either do not work or do not work well with negative interest rates.¹³

Operational issues

There are a number of operational issues associated with negative rates, particularly ensuring the compatibility of trading systems and other market infrastructure. Areas that have been cited as concerns are interest-bearing securities, particularly floating-rate notes (renegotiating, collecting interest, use as collateral) in the context of negative interest rates.¹⁴ Addressing these issues could entail transition costs.

Other concerns

McAndrews (2015) notes that long periods of negative interest rates would encourage people to search for ways to avoid them, including, for example, making large prepayments of debt or taxes (to earn a zero interest rate during the prepayment period),¹⁵ or creditors sitting on cheques rather than depositing them. In fact, “one could imagine the comic possibilities of seeing loan-sharks’ goons roughing up borrowers when the borrowers attempt to prepay their loans” (McAndrews 2015). Overall, this would mean that cash is idle, rather than being invested in a productive economic activity. Finally, some commentators, including Hannoun (2015), have raised concerns that negative interest rates would reduce the incentive for fiscal consolidation and structural

¹² See IMF (2015b) and OECD (2015).

¹³ Bassman (2015).

¹⁴ Garbade and McAndrews (2015).

¹⁵ Denmark has had to address tax prepayment issues (see Jensen and Spange 2015).

reform in cases where it is needed. Negative interest rates lower the debt service ratio, which would give a more positive picture of debt sustainability and could reduce market discipline by compressing sovereign bond yields.

5. International Experience with Negative Policy Rates

It is still early days in terms of gauging the experience with negative rates, and more time is needed to make a full assessment. Earlier episodes of negative deposit rates—for example, in Switzerland in 1972 or Sweden in 2009–10—were applied to only a small fraction of deposits. Denmark is the most recent and longest episode, with the lowest (along with Switzerland) policy interest rates. The euro area is the largest region to introduce negative policy interest rates, although the deposit rate is only marginally negative. A brief overview of the experience so far in each of the four economies is given below.

Denmark

In Denmark, there was considerable excess liquidity at the time the negative interest rate on certificates of deposit was introduced in July 2012, and consequently the deposit rate played a greater role in influencing money market rates than did the central bank lending rate.¹⁶ Treasury bills were already trading at a slight negative yield before the introduction of the negative deposit rate, and decreased somewhat further after the announcement. The term structure of money market rates up to one year fell. Pass-through to money market rates was immediate, but incomplete, as declines fell short of the reduction in the deposit rate. Volumes declined marginally, but this extended a trend that had begun in 2010. Yields on mortgage bonds also fell, suggesting that banks adjusted their portfolios somewhat to take advantage of other liquid markets.¹⁷ There was some concern that in order to protect profitability in the face of the negative deposit rate, banks in Denmark might increase lending rates to households and businesses. This did not occur, although loan volumes did decline somewhat. By April 2014, the central bank deposit rate was raised above zero.

In response to further pressures from capital inflows, the central bank again lowered the rate on certificates of deposit below zero in a series of steps beginning in September 2014. Pressure on the krone intensified in the wake of the SNB's decision to remove the euro cap on the franc. On the recommendation of Denmark's Nationalbank, the Danish government announced that it would suspend the issuance of Danish government bonds on 30 January 2015 in an effort to further

¹⁶ Hüttl (2014).

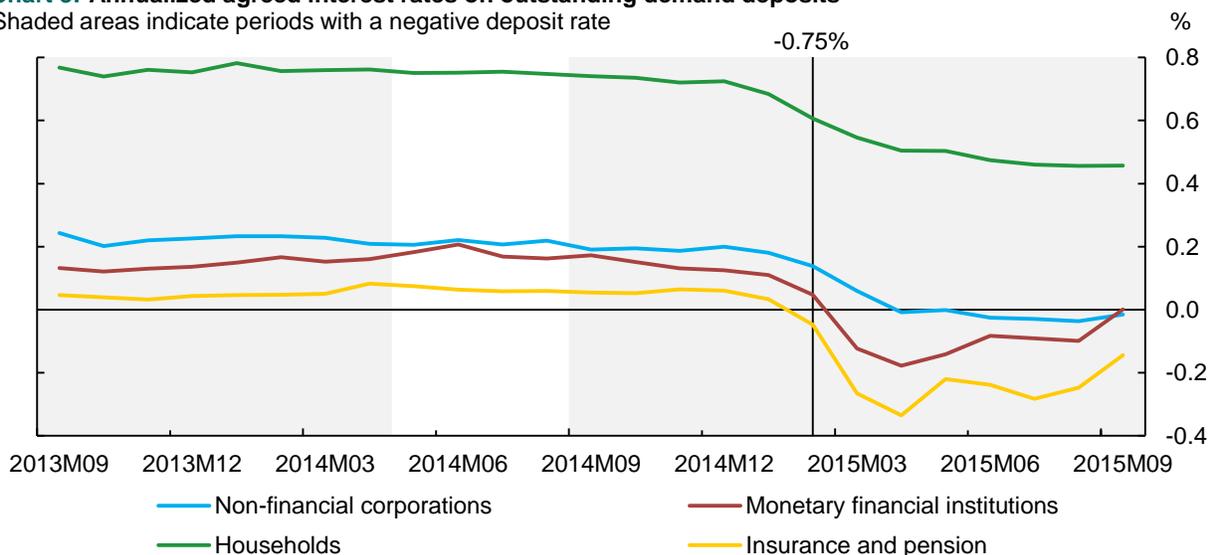
¹⁷ Jorgensen and Risbjerg (2012).

reduce yields on government bonds. Together, these actions pushed market rates negative, even at longer maturities.

In their latest assessment of the negative deposit rate policy,¹⁸ Danmarks Nationalbank finds that negative interest rates have not weakened the pass-through to money market rates, but pass-through to bank retail interest rates has declined. Negative rates have not been fully passed on to bank-administered deposit and household lending rates at the retail level, but the large deposits of firms and institutional investors are widely subject to negative interest rates (Chart 3).

Chart 3: Annualized agreed interest rates on outstanding demand deposits

Shaded areas indicate periods with a negative deposit rate



Source: Danmarks Nationalbank

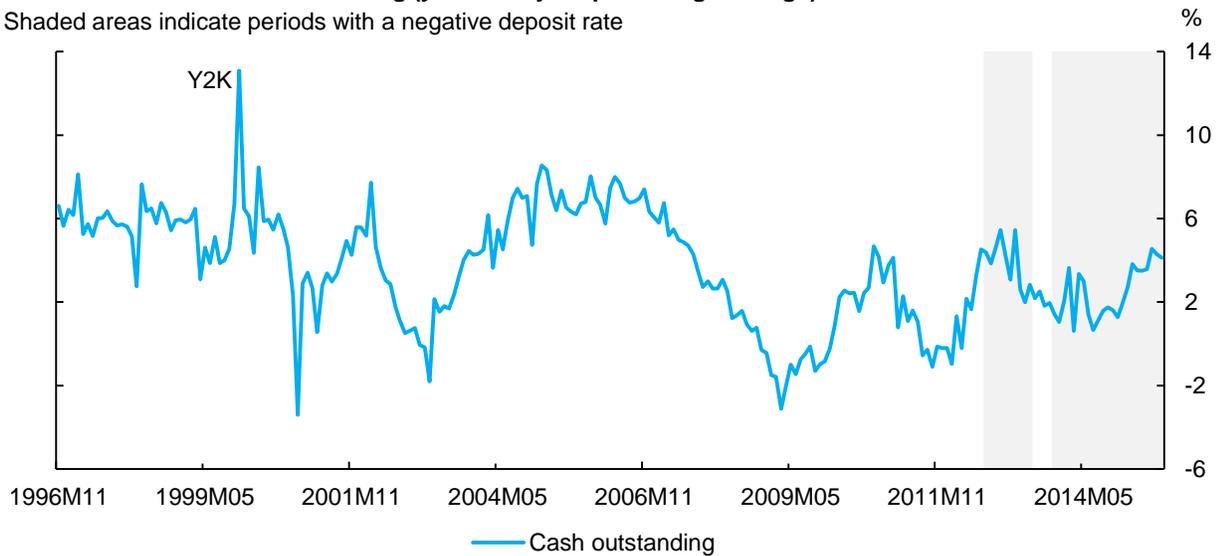
Last observation: Sept. 2015

Demand for cash has not increased materially (Chart 4), which the central bank interprets to mean that the lower bound on interest rates has not yet been reached. Nonetheless, the central bank judges that there is a limit to how much further the deposit rate can be reduced. In particular, the central bank notes that the other side effects of negative interest rates—such as reach for yield, the possibility of asset price bubbles (particularly in the context of a strengthening Danish economy) and pressure on the earnings of credit institutions—are important considerations. To reduce pressure on credit institutions, the central bank has increased the cap on the current account (to which a zero interest rate on deposits at the central bank applies) twice since March 2015.

¹⁸ Jensen and Spange (2015).

Chart 4: Denmark cash outstanding (year-over-year percentage change)

Shaded areas indicate periods with a negative deposit rate



Source: Danmarks Nationalbank

Last observation: Sept. 2015

There are concerns about the housing market in Denmark. Mortgage rates are very low: adjustable-rate loans with short, fixed interest periods have been negative since February, and the long-term rate (30 years) fell to just over 2 per cent. While house prices are still below the pre-crisis peak in 2006, they are rising very rapidly, especially in pockets of Copenhagen, where there are some concerns of a housing bubble. The central bank has urged the government to use tax laws to limit the growth of house prices.¹⁹ Negative mortgage rates have created some technical and legal challenges, although these appear to have been largely addressed.²⁰

Euro area

In the euro area, following the June and September 2014 decisions that took the deposit facility rate negative, lower rates transmitted well to money market rates in both unsecured and secured markets, although in the latter it was faster and more pronounced. Liquidity and volatility were broadly unchanged. The policy action was also transmitted to longer market rates and other market segments: the Euro Interbank Offered Rate (EURIBOR), 3-month EURIBOR futures, and yields on euro area Treasury bills generally declined, although rates for Italy and Spain rose after the September cut, extending a trend that began in August (Charts 5 and 6).²¹ Money market trading volumes were broadly stable, or increased marginally. There have been no significant outflows or dislocations in money market funds. There were some concerns that borrowing from the central bank would decline in response to the negative deposit rate, which would put upward

¹⁹ Rohde (2015).

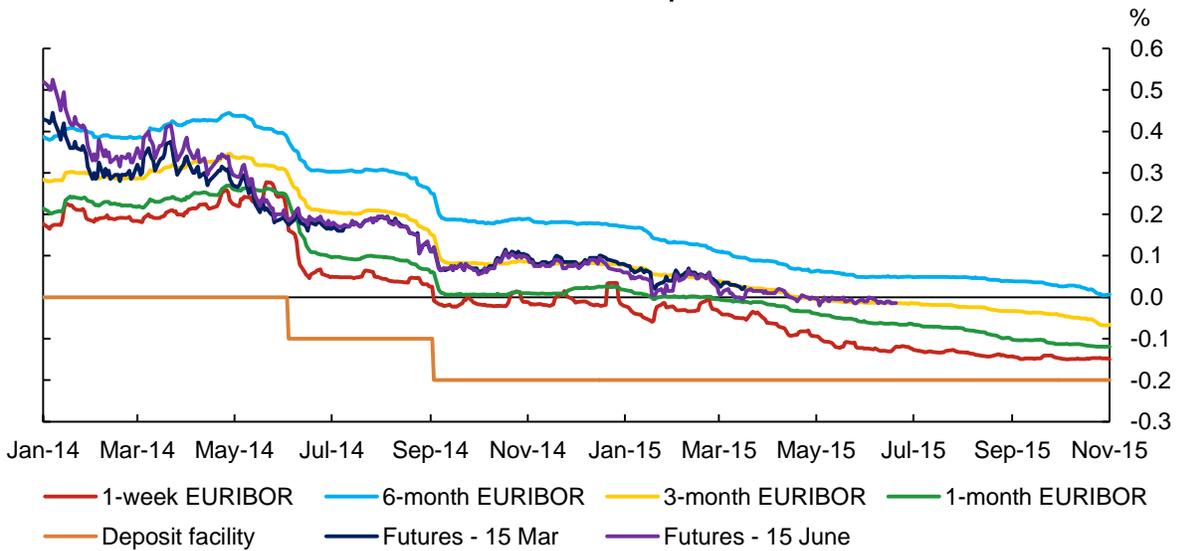
²⁰ Danmarks Nationalbank (2015).

²¹ ECB (2015).

pressure on rates in the interbank market and offset the policy action, but this has not occurred. Lower rates may also have reduced fragmentation, particularly in the secured market.²²

Transmission through the exchange rate channel is thought to be pronounced, contributing to a roughly 20 per cent depreciation in the euro since May 2014, although it is difficult to disentangle the impact of negative rates from other policy actions and economic developments in the United States (Chart 7).

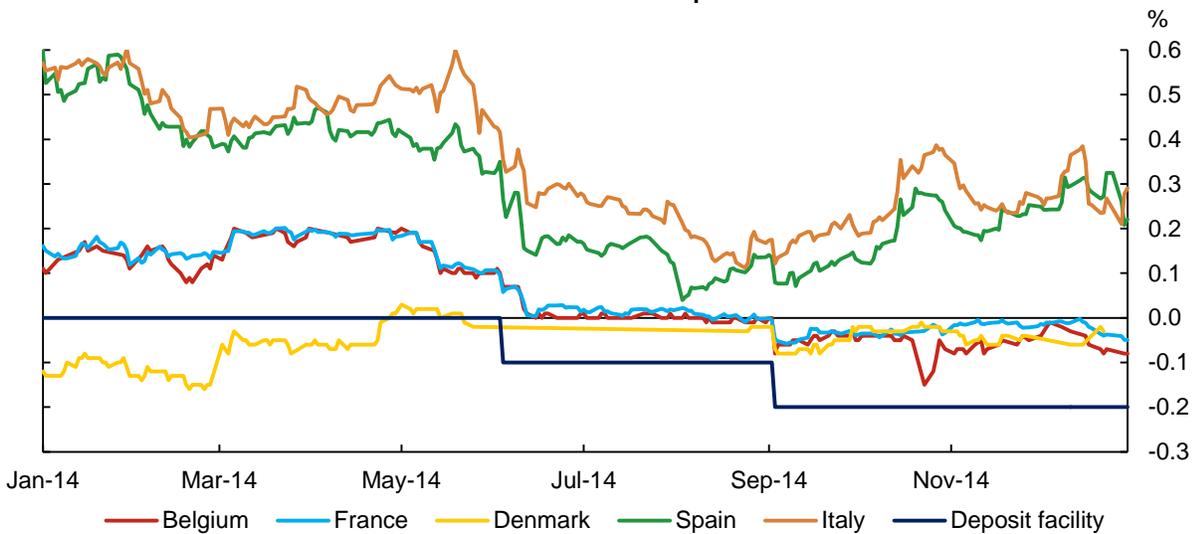
Chart 5: EURIBOR rates and three-month EURIBOR future implied rates



Source: Bloomberg L.P.

Last observation: 3 Nov. 2015

Chart 6: EURIBOR rates and three-month EURIBOR future implied rates



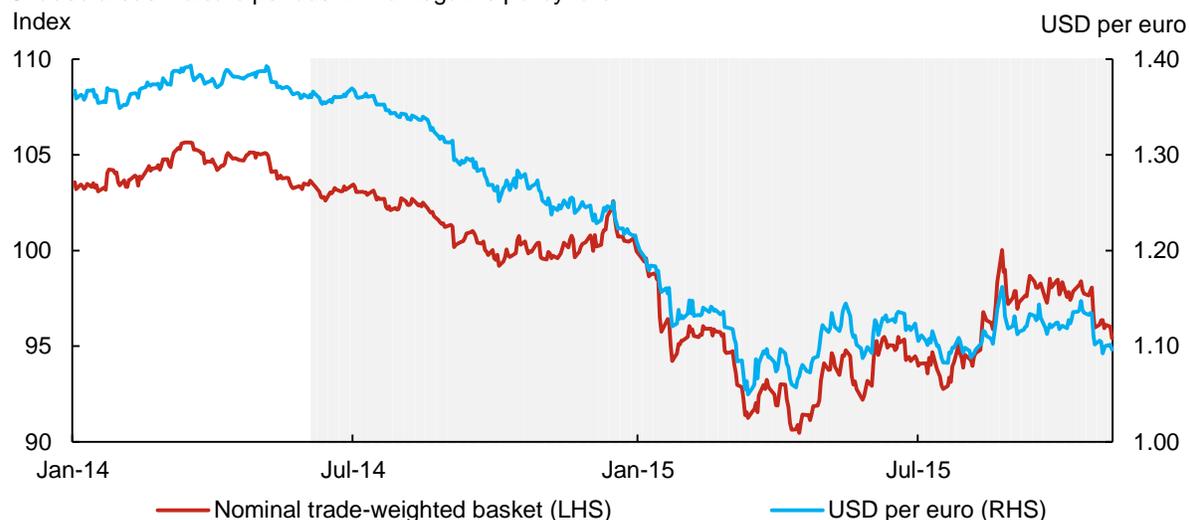
Source: Bloomberg L.P.

Last observation: 31 Dec. 2014

²² Cœuré (2014).

Chart 7: Euro area exchange rates

Shaded areas indicate periods with a negative policy rate



Sources: JP Morgan and Wall Street Journal

Last observation: 3 Nov. 2015

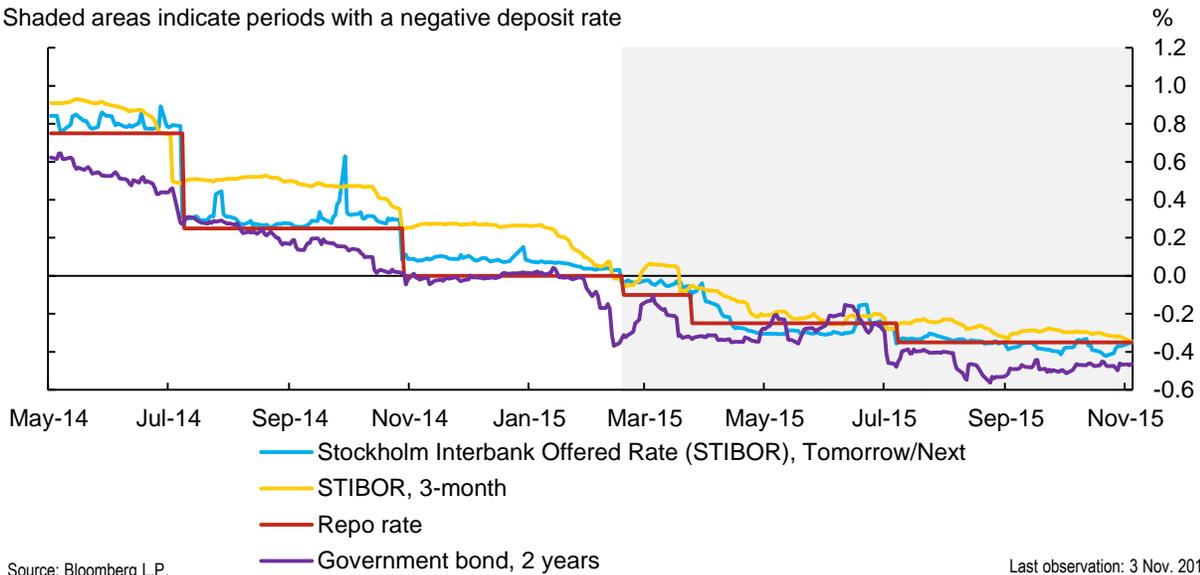
Sweden

The Sveriges Riksbank cut its repo rate in three steps to -0.35 per cent and has stated that it expects the rate to remain negative until at least the end of 2016. Deposits at the Riksbank are charged a penalty rate of -1.1 per cent. Transmission through short-term interest rates and the exchange rate has generally been normal, and there have been few technical issues.²³ Market rates, including treasury bills, a number of government and mortgage bonds, interest rate derivatives, and certificates, have traded at negative rates (Chart 8). Reductions in the policy rate, however, have not been fully passed through to deposit and lending rates. The Riksbank notes that market functioning so far seems fine, although there are some areas of concern, notably the market for bonds with variable coupons.

²³ Sveriges Riksbank (2015).

Chart 8: Sweden market rates

Shaded areas indicate periods with a negative deposit rate



There is little evidence of strain among credit institutions from the negative deposit rate. There are, however, concerns over risks in the housing market amid high household indebtedness, and the Riksbank has been encouraging the government to introduce measures to address these risks.²⁴

The Riksbank is of the view that “the lower bound for policy rates is soft,” but while additional reductions in the repo rate are possible, transmission through the interest rate channel may weaken further and technical problems could increase.²⁵

Switzerland

In Switzerland, negative policy interest rates were transmitted swiftly to the entire spectrum of money and capital market interest rates, and markets are generally functioning without incident. Rates became negative on Swiss government bonds with maturities out to 10 years, although it is difficult to disentangle the impact of negative policy rates from other policy actions undertaken by the SNB and the economic environment. According to the 2015 International Monetary Fund (IMF) Article IV report on Switzerland, “the initial effects from negative interest rates and the exit from the exchange rate floor on the financial sector appear to have been fairly limited,” although the IMF notes that it is still too early for a full assessment.²⁶ The impact on bank profits has been mitigated by the fact that the threshold at which reserves are charged the negative deposit rate by

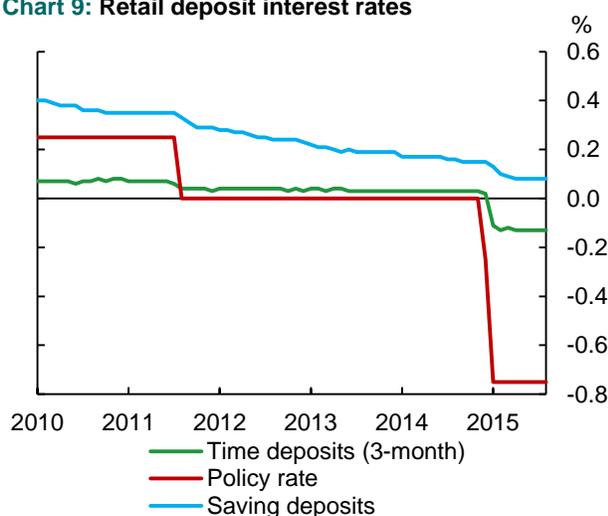
²⁴ Sveriges Riksbank (2015).

²⁵ Flodén (2015).

²⁶ IMF (2015a).

the SNB is quite high. In response to the negative policy rate, a number of Swiss banks have introduced charges on some cash accounts (Chart 9). While the year-over-year growth of currency in circulation has picked up following the lows of last year, cash hoarding per se has not been observed (Chart 10). There have, however, been a number of highly publicized attempts to avoid negative interest rates, including a Swiss pension fund that tried to withdraw cash and store it in a vault, saving 25,000 francs per 10 million francs after storage and handling costs (implying that these costs run about 0.5 per cent per year).

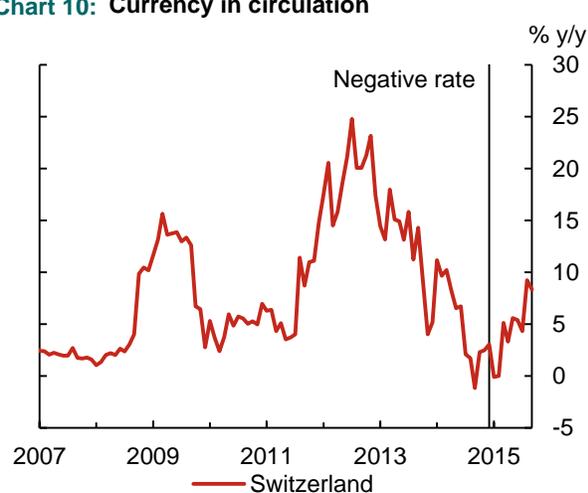
Chart 9: Retail deposit interest rates



Source: Swiss National Bank

Last observation: Sept. 2015

Chart 10: Currency in circulation



Source: Swiss National Bank

Last observation: Oct. 2015

General conclusions from recent international experience

Negative policy interest rates do not appear to have caused significant volatility, impaired market functioning or prompted a run on banks. Transmission has generally been swift, although pass-through to the economy appears to have been partial in most cases as banks have been reluctant to pass on negative rates to individual depositors. Transmission through the exchange rate channel, in particular, may be important.

Money markets have continued to function smoothly. It appears that as long as there is a positive spread to encourage borrowing and lending, the absolute level of interest rates is not particularly important for intermediaries. Trading volumes have generally been stable, and most transactions in the unsecured segment of the money market take place at negative rates without problems. Some analysts have cautioned that while the experience in the euro area has been smooth so far, money markets are less important in the euro area than in the United States. Di Maggio and Kacperczyk (2014) find evidence that with lower rates, U.S. money market funds are more likely to invest in

riskier asset classes and hold less-diversified portfolios. They are also more likely to exit the market, which, if accentuated by negative rates, would adversely affect liquidity.

So far, there has been no evidence of depositor flight to cash in any of the economies that have introduced negative policy interest rates. Expectations of the duration of negative interest rates may matter, however, as evidenced by more recent reports of banks introducing or increasing charges to discourage large deposits.²⁷

As with other unconventional monetary policies, it is difficult to gauge the effectiveness of negative interest rates, since assessment is complicated by many identification issues.²⁸ The effect of a reduction in interest rates in negative territory is likely more modest than a similar-sized cut that leaves rates in positive territory.²⁹ While negative interest rates are generally being charged to institutional and large corporate borrowers, they are not being passed through to retail depositors, which would mitigate the transmission of the policy action to the real economy. As rates become more negative, additional reductions may be less powerful as the impetus to switch to cash increases, barring additional policy actions that mitigate these incentives.

6. Defining the Lower Limit for Negative Policy Rates

It was long assumed that negative nominal policy rates were not feasible since it would always be possible for agents to switch to cash, which offers a zero nominal rate of return. Recent international experience indicates that negative policy rates are indeed a viable policy tool. The question now is how low negative rates can go in these economies and how long they can remain there before financial sector activity is impaired and negative policy interest rates become counterproductive.

Most recent analysis around the ELB has focused on the point at which agents would prefer to hold cash over bank deposits earning a negative interest rate. The cost of storage, insurance, safekeeping and transportation of cash, along with the price of convenience, are therefore key in determining the ELB. Using other stores of value as a gauge, the cost of carry for gold is roughly 0.2 per cent.³⁰ Estimates for storing cash are around 0.2 per cent to 1 per cent, although this could depend in part on the size of bills. With large denominations in Swiss francs (1,000 franc note, or US\$993), costs for storage, transportation and convenience could be lower than in Denmark, where the largest bill is the 1,000 krone note (US\$141), or the euro area where the largest

²⁷ See, for example, <http://www.wsj.com/articles/commerzbank-to-charge-fees-to-discourage-large-deposits-1416418127>.

²⁸ Kozicki, Santor and Suchanek (2011).

²⁹ See, for example, Bean (2013).

³⁰ Keohane (2015).

denomination is the 500 euro note (US\$530). The cost of convenience can be roughly proxied by fees associated with credit and debit card interchange fees, which were around 1-3 per cent annually, on average, before recent changes to regulate these fees.³¹ Put together, this could suggest that negative policy interest rates marginally below 2 per cent are possible without prompting depositor flight, although country-specific factors and the expected duration of negative policy rates will be important factors in determining the ELB.

Analysis by the ECB suggests that the unit social cost of cash is roughly 2.3 cents per euro transaction in the 13 euro area countries studied, with costs varying across countries depending on the use of cash.³² Those countries that are less dependent on cash have a relatively higher social cost. In Denmark, the comparable social cost is 3.8 per cent, which suggests that the ELB there could be lower than in some other EU member states.³³

The ECB stated in September 2014 that, with the Deposit Facility Rate at -0.2 per cent, it had reached the lower bound.³⁴ However, in October 2015, President Draghi indicated in his press conference that the Governing Council had discussed further lowering the deposit rate as an option available, if necessary.³⁵ Lars Rohde, Governor of Denmark's Nationalbank, has stated that with the certificates of deposit rate currently at -0.75 per cent, they have not yet found the lower bound.³⁶ According to Bean (2013), while significantly negative rates might be feasible, it may not be possible to hold them much below around -0.5 per cent for more than a year or two before provoking a move into cash, "unless the convertibility of bank reserves into cash were to be restricted in some way." This would, of course, be a major change to the operation of the monetary system.

The duration of negative rates may therefore matter, as would how common they become. While some argue that the ELB may fall as negative interest rates become more common, expectations that negative policy interest rates will be persistent could encourage financial innovations, including instruments that emulate currency, allow tax avoidance and undermine the policy intention of negative rates. For example, Cecchetti and Schoenholtz (2015) suggest that if rates were negative enough, banks could offer customers exchange-traded fund-like products as higher-rewarding alternative deposits. They call these products cash reserve accounts—a type of product backed by cash kept in a vault that allows for easy transfers that could act as a substitute for deposits. The implication is that negative interest rates may be bounded only slightly below

³¹ Keohane (2015).

³² Schmiedel, Kostova and Ruttenberg (2012).

³³ Jensen and Spange (2015).

³⁴ Cœuré (2014).

³⁵ <https://www.ecb.europa.eu/press/pressconf/2015/html/is151022.en.html>.

³⁶ Cited in Hannon (2015).

zero (they suggest about -0.5 per cent) and that rates could not be held there very long. In countering this argument, however, others point out that there is currently free convertibility between cash and deposits. It would be easy enough to charge a fee for converting deposits into cash, which would eliminate the arbitrage opportunity.

Ultimately, it will likely be a case of testing the limit to see at what interest rate—maintained for what length of time—agents start investing in safes or vault space to avoid negative rates and arbitrage flows out of central bank deposits into cash become significant. Going very negative, however, would likely require more fundamental policy changes, such as taxing cash, charging for convertibility between deposits and cash, or ultimately eliminating cash (and thus moving to exclusively electronic money), to further reduce or eliminate the effective lower bound. Under these conditions, there is theoretically no limit to how negative rates could go.³⁷

7. Policy Implications for the Renewal of the Inflation-Control Agreement

The neutral rate of interest has declined globally, and recent experience demonstrates that financial shocks can be large and persistent. Therefore, for a given ELB, a lower neutral interest rate shrinks the margin for conventional monetary policy action. Negative policy interest rates would restore some of this room to manoeuvre.

Identifying the true level of the ELB is an important part of any discussion about the appropriate inflation target. To the extent that policy interest rates can be reduced meaningfully below zero temporarily with limited costs to financial stability, arguments that the inflation target should be raised in response to a lower neutral interest rate become less powerful, particularly given the costs that permanently higher inflation imposes on society.

While the recent experience of Denmark, Sweden, Switzerland and the euro area demonstrates that the ELB is indeed negative in these economies, more time and analysis are needed to determine (i) how low rates can go, and (ii) whether negative policy interest rates are a viable policy tool over an extended period of time. It therefore remains an open question as to whether the lower “true” ELB can sufficiently compensate for the decline in the neutral interest rate.

³⁷ See, for example, Kimball’s blog at <http://blog.supplysideliberal.com/post/62693219358/how-and-why-to-eliminate-the-zero-lower-bound-a>.

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