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How can government bond purchases make monetary policy more expansive?

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A number of central banks abroad have purchased different types of assets with a view to making monetary policy more expansive. In the spring, the Riksbank too initiated asset purchasing in the form of government bonds. In this commentary, we describe what economic theory says about how purchases of government bonds affect the expansiveness of monetary policy. The bond purchases are expected to make monetary policy more expansive by influencing market rates and other financial prices through various channels: signalling, premium, portfolio balance and liquidity channels.

Inflationary pressure in the Swedish economy has been low for several years. In order to ensure that inflation rises towards the target, and that inflation expectations remain anchored to the target, the Riksbank has gradually cut the policy rate to -0.35 per cent. In addition the Riksbank has, for monetary policy purposes, also purchased government bonds. How, then, can monetary policy be made more expansive by the Riksbank purchasing government bonds? In this commentary, some of these channels are described. In the commentary of Barros de Rezende et al (2015), the effects of the Riksbank's purchases of government bonds on financial prices are quantified.

How monetary policy normally affects inflation and the real economy

The Riksbank conducts flexible inflation targeting that aims to stabilise inflation around two per cent and resource utilisation around a normal level. When the Riksbank reduces the repo rate, financial prices and volumes change; for example, the market rates encountered by households and corporations usually decline too. Provided that some prices in the economy are sluggish, the real interest rate also declines, in which case incentives to consume and invest increase. This leads to heightened economic activity and hence a tighter labour market, resulting in higher salaries. The combination of higher demand and increased costs lead corporations to hike prices, and inflation therefore rises. Expansive monetary policy usually also leads to a weakening of the exchange rate initially, which boosts exports and curbs imports. In addition, imported goods become more expensive, and inflation thus increases directly via this channel.[2]

It is important to note that the factor which ultimately affects households and corporations is the interest rates that they actually encounter on the market, and not the repo rate itself. The Riksbank usually influences these market rates by adjusting the repo rate and by communicating the expected future direction of the repo rate.

When the repo rate approaches a lower bound, a central bank might need to use more direct methods to make monetary policy more expansive. In several countries, the central bank has, in such cases, opted to expand its balance sheet, such as by issuing loans to banks or purchasing various assets such as government or mortgage bonds. Between 2008 and 2010, the Riksbank's balance sheet expanded for the very reason of granting loans to the banks. This year, the Riksbank's balance sheet is expanding once more, this time because of the Riksbank's purchases of government bonds. These purchases can be expected to affect market rates, which in turn affect the economy as described above, through a number of different channels:

- **The signalling channel:** The purchases signal expansive monetary policy, also going forward.

1. We thank Jonas Söderberg, Ulf Söderström, Anders Vredin and Per Åsberg-Sommar for their input on this commentary.
2. See Hopkins, Lindé and Söderström (2009) for a more detailed description of the monetary policy transmission mechanism.

- **The premium channel:** The purchases reduce the supply of bonds, which pushes bond prices upwards so that interest rates fall.
- **The portfolio balance channel:** The purchases can bring about contagion effects to prices of other assets.
- **The liquidity channel:** Because of the purchases, the liquidity surplus of the banks in relation to the Riksbank increases.

The first three channels are well-documented in the international literature regarding bond purchases. What is referred to as the "liquidity channel" above is, in this context, less discussed, although there are other related references about similar effects through the banking system (credit channel, bank lending channel).

In all cases, effects on the economy are generated by an interaction between price and volume effects. The purchases aim to influence the real market rates encountered by households and corporations, and hence also the volume of loans. Lower interest rates lead to households with floating-rate loans having greater scope for consumption, which can be expansive in itself.[3] The volume of loans increases in proportion to the extent of rate-sensitivity of households and corporations, which further increases expansiveness.

In the following, we describe first of all how the long government bond rate can be interpreted as the sum of expected short rates, and a premium, and the factors that can explain the latter. We then go through each of the four above-mentioned channels in turn.

What determines the longer market rates?

The rate of a government bond can be broken down into two parts – the average of expected short rates over the maturity of the bond, and a premium.

Long government bond rate = average expected short rate + premium

The background to this common breakdown is that an alternative investment to the long government bond is investing in short maturities on an ongoing basis. If the market did not require a premium, longer rates should be equal to the expected average short market rate over the maturity of the bond. The short rate is closely linked to monetary policy decisions.[4] Expectations about future monetary policy decisions thus affect the longer bond rates.

However, there are many reasons why the rate on a longer bond may diverge from future expected short rates, and hence give rise to a premium.

The most common explanation in the literature is that the premium reflects the price risk of the longer bond. The market price of a longer government bond may unexpectedly change in the future, either if expectations about the Riksbank's monetary policy, or the size of the premium, change.[5] An investor that did not intend to keep the bond to maturity is then exposed to a risk.

A reason for the existence of a negative premium contribution is if the bond provides its holder with a further use other than merely the right to the bond's future payouts. One such use of importance is as collateral in financial transactions. One reason, aired in many theoretical models used to evaluate the effects of government securities purchases for monetary policy purposes, is that market participants – for various reasons (regulation, investment strategy, etc.) – are not prepared to switch between different maturities and asset classes.[6]

3. While households with a high level of savings indeed obtain lower interest income when interest rates are low, it is reasonable to believe that borrowers' inclination to consume is higher, and the net effect is thus expansive.
4. When the banks deposit their liquidity surplus with the Riksbank for a very short time, they receive the repo rate. Hence, the banks' rates for loans to each other with the same short maturity are closely linked to the repo rate.
5. According to economic valuation models, an asset that provides unexpectedly high return when the economy fares unexpectedly poorly provides a further "benefit" besides expected return – the possibility of evening out consumption over time. Such an asset thus has a negative premium (higher price and lower expected return).
6. The theory that bonds with different maturities are not perfect substitutes goes back to e.g. Culbertson (1957) and Modigliani and Sutch (1966), but has recently been described by Vayanos and Vila (2009).

The signalling channel: Purchases signal expansive monetary policy ahead

One way of influencing longer market rates is to signal that the interest rate will be low for some time, which the Riksbank can do by publishing its rate path. If the Riksbank purchases government securities with the intention of making monetary policy more expansive when the repo rate is approaching its lower bound, this can be interpreted as a promise to keep the repo rate low for a long period of time, because the Riksbank will incur losses if the interest rate is hiked sharply before the bonds have matured (see below on balance sheet risks). Hence, the purchases can help create credibility in a low rate path.[7] This channel, with which bond purchases ultimately bear effects on inflation and growth, is known as the expectations channel or signalling channel, because it fundamentally affects the very expectation component in market rates.[8]

The extent of this channel's relevance depends on where market expectations about future monetary policy are situated in relation to the Riksbank's own view. The signalling channel serves to supplement other types of communication about future monetary policy. Where the Riksbank is concerned, the rate path is usually used for communication about future rate levels. Other central banks have instead used different types of forward guidance, e.g. that the interest rate will be kept low until unemployment falls below a certain value.

The premium channel: The premium drops when the Riksbank purchases bonds

How can purchases of government bonds affect the premium? We describe three examples of the "additional benefit" provided by the bond to some of its holders, and then discuss how a reduced volume of outstanding bonds affects the premium. A first important example is the Swedish repo market, on which investors may lend bonds.[9] Through this market, the holder of a government bond may, at short notice, convert it into liquidity, which creates added value compared to assets that do not afford such possibilities. Another example is that banks may use government bonds as collateral in transactions with each other and with the Riksbank. A third example is that a life insurance company with long-term undertakings may, according to regulations, be required to hold assets with a certain maturity and risk profile, and thus cannot simply switch such assets for others.

Examples of analyses about how government bond purchases make monetary policy more expansive by getting premiums to decline are provide by Chen, Cúrdia and Ferrero (2012), Andrés, LópezSalido and Nelson (2004), Harrison (2012) and De Graeve and Iversen (2015). According to these theories, some market participants are "investors" with a tendency of sticking to bonds with certain maturities. The remaining market participants are "arbitragers" who can invest unimpeded in all maturities on the yield curve.

When the Riksbank purchases bonds from market participants, the outstanding volume decreases and competition for the remaining bonds increases. Given a sufficiently large share of participants being reluctant to switch to other assets, the premium on government bonds will decline (the price increases), and hence bond rates too. The greater the share of market participants that fall into this category, the heavier the pressure on the premium, which thus increases the efficiency of the purchases through the premium channel.

As mentioned above, the long rates can be broken down into a premium, which declines in connection with the purchases, and into expected future repo rates. If government bond purchases are successful, they lead to rising inflation expectations, which in turn create higher expectations about future repo rates. Hence, longer rates can decline less than the premium. A comprehensive evaluation of the efficiency of

7. See Söderström and Westermark (2009) and De Graeve and Lindé (2015) for a more detailed discussion.
8. See DeGraeve and Lindé (2015).
9. The bond is formally sold with an agreement to repurchase it at a future point in time at a predetermined price (repo).

the purchases may thus require supplementing with an analysis of how the real rates moved in connection with the purchases.[10]

The portfolio balance channel: contagion effects so that other market rates fall

If the central bank can influence premiums on the government securities market, bond purchases may have a contagion effect to other asset prices and also affect credit volumes through the "portfolio balance channel". The strength of this channel is determined by what the market participants who sell their government bonds to the Riksbank choose to do after the sale. One possibility is to invest in other, close assets. This could be a case of government bonds with other maturities, covered bonds issued by banks, or corporate bonds.[11] When the investors buy such assets, prices rise and interest rates fall, provided that the assets are not perfect substitutes. The higher the number of investors who actively opt to reinvest their money, the greater the effect on other market rates will be attained. Through this rebalancing effect, the central bank's purchase of government bonds can lead to a broad decline in interest rates in the economy.

This channel also works when monetary policy, through a repo rate cut or communication regarding future repo rate cuts, manages to influence longer government bond rates. The difference is that the effect in the portfolio balance channel primarily passes through the premium, not through the expected repo rate. Another difference is that the purchases increase the banks' liquidity surplus (we revert to this below). The declining interest rates create even greater demand for loans, which ultimately gives increased investment and heightened economic activity.

There are international studies that indicate that this type of rebalancing effect occurs in connection with carrying out bond purchases. In the US, Carpenter et al (2013) have studied how the central bank's asset purchases have caused investors to rebalance their portfolios. The authors find that the central bank's purchases of government bonds really has been a reason for the private sector reducing its holding of government bonds and instead increasing its holding of e.g. corporate bonds and municipal bonds. In the UK, Joyce et al (2014) have studied how the investments of insurance companies and fund management companies have been affected by the central bank's asset purchases. They concluded that both the insurance companies and fund management companies reduced their holdings of government bonds and increased their holdings of corporate bonds more than they would otherwise have done. In turn, this has increased the investment opportunities of the non-financial companies.

The liquidity channel: Effects when the Riksbank pays for its bonds

It cannot be ruled out that part of the monetary policy effects from bond purchases might arise as a direct effect of the Riksbank opting to pay for the bonds by increasing the volume of central bank reserves.[12] This channel passes through the Riksbank's operational framework for the implementation of monetary policy and takes effect through the volume of money rather than the rate effect. In order to understand this, we must first of all provide a brief introduction to the Swedish payments system.

10. An extreme example is if the drop in the premium were so expansive that inflation expectations, and hence expectations about short rates, rise by as much as the premium dropped. In that case, the highly successful purchases – which managed to bring down the real interest rate by as much as inflation expectations rose – thus do not appear to have affected long rates at all.
11. The Swedish corporate bond market is relatively small compared with e.g. the US equivalent, although there are signs that a greater share of new borrowing in the past few years comes from this market than has been the case in the past.
12. An alternative approach would be to sell off another asset and then use the sales proceeds to pay for the government bonds. The Federal Reserve used this approach recently in its maturity extension programme, in which short bonds were sold to fund purchasing longer bonds http://www.federalreserve.gov/monetarypolicy/maturityextensionprogram.htm.

Box: The Swedish payments system

Each bank has an account with the Riksbank that is used to handle interbank payments, which occur for example when a customer of one bank wishes to transfer money to a customer of another bank. The banks that have a deficit on their accounts at the end of the day borrow money from those with a surplus, and the remaining surplus may be deposited with the Riksbank overnight.[13] The interest rate on this remaining surplus (or deficit) is decided by the Executive Board of the Riksbank in its monetary policy decisions.[14]

The banks themselves are limited in terms of how much money they may lend to another individual bank overnight, because such loans are unsecured. Each bank therefore has a liquidity system that ensures that it does not end the day with too much of a deficit. The banks may also borrow money from the Riksbank, but then at a substantially higher interest rate and related reputational risks, and this therefore occurs very seldom indeed.

When the Riksbank purchases bonds, payment is made by increasing the balance in the account of the selling bank (on its own account or the customer's). Because the other banks are not affected by this transaction, the sum of the banks' aggregate balance increases, i.e. the volume of liquidity (central bank money) in the banking system rises. The same type of effect occurred in 2008-2010 when the Riksbank lent to banks.

When liquidity in the banking system increases in this manner, the risk decreases of an individual bank ending up with an excessive deficit in relation to the other banks at the end of the day. This can lead to banks, at the margin, being prepared to increase lending somewhat to households and corporations. This contributes to the expansiveness of monetary policy and this channel thus takes effect through the Riksbank paying for the bonds. It is reasonable to believe that this channel is much more important if the financial system is under stress.

Another effect of liquidity rising, which is highly reminiscent of the portfolio balance channel above, is described by Christensen and Krogstrup (2015). They highlight that when the central bank increases liquidity in the financial system, there is a reduction in the duration, i.e. the average maturity, of the aggregate asset portfolio of the banking system. This is because the banks, at the end of the day, are obliged to deposit the surplus liquidity with the central bank. Therefore, according to this argument, the banks must extend the maturity of the rest of their asset portfolio, which occurs by means of them purchasing longer-maturity assets. Christensen and Krogstrup call this a "reserveinduced" portfolio balance effect.

What affects the impact on resource utilisation and inflation?

The degree of efficiency of the portfolio balance channel in the transmission to the real economy partly depends on the fixation periods of corporations and households. If maturity is an important factor in terms of how close a substitute various assets might be considered to be, purchases of longer bonds will be less effective if households and corporations employ a short fixation period.

The manner in which households and corporations react to lower interest rates also depends on their beliefs about the future economic trend. If capacity utilisation is low and developments abroad are considered lacklustre, investment in the export industry, for example, may be lower than what is normal when the interest rate is cut, because there are plenty of available resources to use before fresh capital is required.

According to economic theory, the exchange rate is weakened if Swedish rates drop compared to equivalent foreign rates. The repo rate or repo rate path is usually cut so

13. In the case of the banking system instead having a liquidity deficit in relation to the Riksbank, the banks may borrow money at the repo rate. The banks' aggregate liquidity position in relation to the Riksbank has, for various reasons (primarily the reduced use of banknotes and the Riksbank's profit distributions to the government) trended from a deficit to a surplus.
14. More precisely, banks today may choose whether they wish to deposit money overnight with the Riksbank at the repo rate minus 0.1 percentage points, or invest it for a week through certificates at the repo rate.

that this may lead to declining government bond rates, which then leads to a weaker exchange rate. When government bonds are purchased, interest rates will instead be lower as an effect of the premium declining. A crucial factor in terms of impact on the exchange rate is to influence rates of bonds with the maturities that are most strongly linked to exchange rate fluctuations.

In this case, purchases of government bonds – all else equal – lead to a lower premium, and hence lower interest rates and a weaker exchange rate. Because it is the relative interest rate level that matters, the purchases of other central banks (such as the ECB) will however work in the opposite direction.

Are there also risks associated with central banks purchasing government bonds?

Purchasing of fixed-income securities aims to make monetary policy more expansive by pushing down longer market rates and increasing the volume of money in the economy. This also poses negative risks, of which the Riksbank is well aware, such as risks to the Riksbank's balance sheet and risks to market liquidity.

- **Balance sheet risks:** The Riksbank "funds" purchases of securities by depositing newly created electronic money into the banks' accounts at the Riksbank. When this occurs, the banks' total surplus of money increases vis-à-vis the Riksbank. The Riksbank pays interest on this surplus.[15] If this interest, on average over the maturity of the bond, proves higher than the interest received by the Riksbank on the bond, the Riksbank incurs a loss.[16]
- **Risks to market liquidity:** Substantial bond purchases can also bring about reduced trading volumes on the bond market when the supply of bonds contracts. Many market participants find that liquidity has declined on both Swedish and foreign bond markets, and that a reason for this is altered behaviour of the banks following the global financial crisis and as a result of new regulations. The Riksbank's bond purchases can thus further impair liquidity on the Swedish government bond market and it is important to closely monitor developments.

These and other risks (the general risks that also usually accompany lower interest rates, such as risks associated with higher indebtedness) must be weighed against the risks posed in turn by overly tight monetary policy: risks that affect resource utilisation, inflation and anchoring inflation expectations.

Conclusions

In this commentary, we have attempted to elucidate how the Riksbank's purchases of government bonds can influence the expansiveness of monetary policy. We have done so by describing four different channels.

First, bond purchases can give rise to an expectation of more expansive monetary policy for a long period of time. This "signalling channel" helps keep a lid on expectations regarding future short rates. Second, a central bank's purchases can affect the premiums of various bonds, leading to a drop in interest rates. If investors also modify their asset portfolios to obtain better return, this portfolio channel can cause a broader downturn in interest rates. Finally, the Riksbank's payment for bonds gives rise to a liquidity surplus at the banks, which can be a factor in increasing the volume of available credit in the economy.

This commentary has aimed to describe schematically what economic theory says about how purchases of government bonds affect the expansiveness of monetary policy. Such rationale of principle can be supplemented with quantitative estimations of the effect of bond purchases on financial prices and interest rates. Such findings

15. The repo rate is currently negative, so the banks pay to the Riksbank.
16. This loss will, in terms of accounting technicalities, be distributed over the years depending on the details of how large the coupon payouts are, the future direction of interest rates (marking-to-market of the bond) and the Riksbank's use of revaluation accounts to even out the profit and loss account. However, all of this does not affect the actual losses (or gains), i.e. the change in equity as a result of the purchase, once the bond has actually matured.

are presented in the economic commentary "Effects on financial prices from the Riksbank's purchases of government bonds". Therein, indications can be found of the Riksbank's purchases of government bonds having caused lower bond rates, and that this has occurred through the very channels described in this paper.

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