

Effects on financial markets of the Riksbank's government bond purchases 2015–2017

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To ensure that Swedish interest rates would remain low and thus stimulate the economy and support the return of inflation to the target, the Riksbank started to purchase government bonds in February 2015. The scope for cutting the repo rate had started to become increasingly restricted and several other central banks had already used complementary measures such as purchases of government bonds. The Riksbank then expanded its purchases on several occasions. In this article, I describe how such purchases of government bonds work according to economic theory and which effects the Riksbank's purchases have had on financial markets. To analyse the effects of the purchases, I study announcement effects on interest rates and other financial prices. I focus on announcements in the period from February 2015 to April 2017, as it is difficult to identify the effects of later announcements. The empirical analysis shows that the Riksbank's purchases of government bonds have made monetary policy more expansionary by contributing to lower interest rates and a weaker exchange rate via various channels. In this way, the bond purchases have formed a complement to cutting the repo rate. In conjunction with announcements of purchases, real interest rates have fallen more than nominal interest rates, which indicates that inflation expectations have risen. One important conclusion is thus that the effect of the Riksbank's bond purchases is greater than a more limited analysis of its effects on nominal interest rates indicates.

1 Introduction

By autumn 2014, inflation in Sweden had been below the target of 2 per cent for several years. To ensure that inflation would rise towards the target rapidly enough and that inflation expectations would remain anchored, the Riksbank cut the repo rate to zero in October 2014. The Riksbank also announced that it could use other monetary policy tools than the repo rate if necessary. Several other central banks had already used such complementary measures, such as purchases of government bonds, in a situation where the scope for cutting the policy rate had started to become increasingly limited. In January 2015, the European Central Bank (ECB) announced bond purchases aimed at making monetary policy more expansionary.¹ In the short term, the ECB's measures risked leading to a weaker euro and thereby a stronger krona, which, in turn, would lead to lower import prices and even lower

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¹ Other central banks that have bought government bonds for monetary policy purposes include the Federal Reserve (the US central bank), the Bank of England (the UK central bank) and the central banks of Japan and Switzerland.

inflation in Sweden. To ensure that Swedish interest rates would remain low and thus stimulate the economy and support the return of inflation to the target, the Riksbank chose to make monetary policy more expansionary. In February 2015, the Riksbank decided to cut the repo rate and initiate purchases of government bonds. The Riksbank then expanded its purchases of government bonds on several different occasions.

In this article, I describe how purchases of government bonds work according to economic theory and which effects the Riksbank's purchases have had on financial markets.² Through which channels can bond purchases make monetary policy more expansionary? What effects have the Riksbank's purchases had on different financial prices? I analyse announcement effects on interest rates and other financial prices, as has been done in many earlier studies of the effects of central bank bond purchases. While earlier analyses of the Riksbank's bond purchases have primarily focused on effects on nominal interest rates, I also study effects on real interest rates and inflation expectations.³ I analyse the effects of net purchases of government bonds announced in the period February 2015–April 2017, as it is difficult to identify the effects of later announcements.

In section 2, I first give an overall description of the Riksbank's purchases of government bonds. In section 3, I then describe the channels through which bond purchases can make monetary policy more expansionary. In section 4, I analyse the announcement effects the Riksbank's bond purchases have had on interest rates and other financial prices. In section 5, I compare the total announcement effects for a number of important variables with the total changes in each variable over the entire period January 2015–June 2017 to gain a perspective on how large the announcement effects have been. I finish by presenting a few conclusions in section 6.

2 The Riksbank's purchases of government bonds

The Riksbank started purchasing government bonds in a situation where the Executive Board deemed that the lower bound of the repo rate had not been reached. The Riksbank also came to cut the repo rate further. However, negative interest rates were untested and could potentially lead to negative side effects on the financial system and economy. By starting to purchase government bonds despite the lower bound for the repo rate not yet having been deemed to have been reached, the Riksbank could later evaluate the effects of gradual cuts of the repo rate at the same time as bond purchases could start to be implemented and have an effect.

In conjunction with the monetary policy decision in February 2015, the Riksbank announced that it would be buying government bonds for SEK 10 billion, with the aim of making monetary policy more expansionary. When making the announcement, the Riksbank also announced that purchases could be expanded if necessary.⁴ This happened on several different occasions in 2015, 2016 and 2017, and, by the end of June 2017, the Riksbank's total decided net purchases of government bonds amounted to a nominal amount of SEK 290 billion; see Figure 1.⁵ From April 2016, purchases were broadened from nominal government bonds to also include real government bonds. Figure 1 shows the Riksbank's decided net purchases, both at specific monetary policy decisions and cumulatively. In addition, the Riksbank started to reinvest principal and coupon payments in the government bond portfolio in February 2016. Without reinvestments, the Riksbank's holdings of government bonds would gradually have decreased in relation to the decided purchases.

2 For analyses of the effects of negative interest rates, see, for example, Erikson and Vestin (2019) and Sveriges Riksbank (2017a). For a discussion of the side effects of the Riksbank's expansionary monetary policy, see, for example, Sveriges Riksbank (2017b).

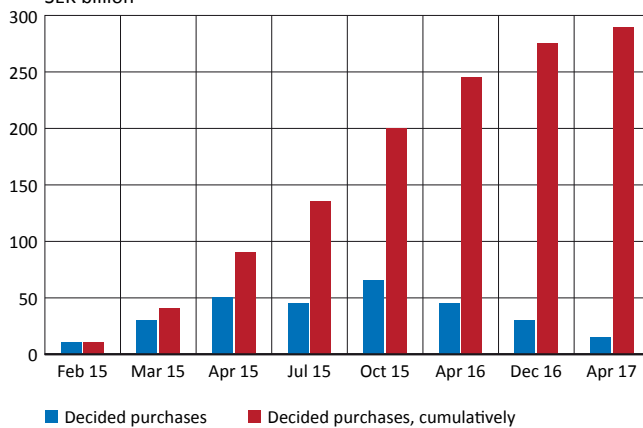
3 De Graeve and Lindé (2015) argue that the effect on real rates is even more important to analyse than the effect on nominal rates.

4 At the same time, the Riksbank also cut the repo rate to -0.10 per cent. See Sveriges Riksbank (2015).

5 This amount excludes reinvestments of principal and coupon payments in the government bond portfolio.

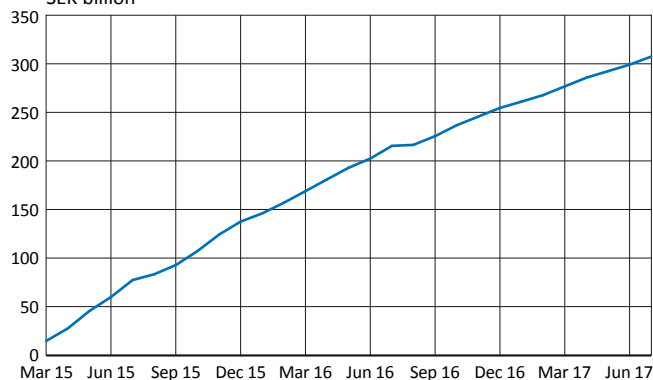
Other central banks that have purchased bonds have similarly reinvested principal payments on bonds. Figure 2 shows how the Riksbank's bond holdings, including reinvestments, have developed over time. The reinvestments meant that the holding of just over SEK 300 billion at the end of June 2017 was greater than the decided net purchases of SEK 290 billion; see Figure 2.

Figure 1. Net purchases of government bonds decided by the Riksbank, February 2015–April 2017
SEK billion



Note. Decided purchases of nominal and real government bonds, excluding reinvestments. Nominal amount.
Source: The Riksbank

Figure 2. The Riksbank's bond holdings in the period February 2015–June 2017
SEK billion



Note. Holdings of nominal and real government bonds. Nominal amount.
Reinvestments of principal and coupon payments mean that the holding at the end of the period is larger than the decided purchases. Note that the Riksbank already in early February 2015 had a bond holding of SEK 10 billion. In 2012, the Executive Board decided to set up a bond portfolio to ensure that the Riksbank would have the necessary systems, agreements and knowledge on hand to be able to implement bond purchases rapidly if needed in the future.
Source: The Riksbank

In addition, the Riksbank also announced reinvestments of principal and coupon payments in December 2017, and purchases of government bonds to maintain its holding in April 2019. In conjunction with the monetary policy decision in April 2019, the Riksbank started to communicate in terms of total purchases over a certain period, instead of in terms of reinvestments. The announcements in December 2017 and April 2019 are therefore not completely comparable with earlier announcements. In addition, the Riksbank announced purchases of government, municipal, housing and corporate bonds in March 2020. Expanded purchases were announced in November 2020 when the Riksbank also communicated that

securities purchases would also include treasury bills and green government and municipal bonds.⁶ The distribution between different bonds was not communicated in conjunction with the decisions. As part of a package of measures in March 2020, the Riksbank also announced expanded loans to the banks on favourable terms. This makes it difficult to separate the effects of purchases of government bonds from the effects of other measures in this period.⁷

In Sweden, there are only about ten issues of nominal government bonds and these mature at an interval of about 18 months. When the Riksbank purchases bonds at an even rate, it can be difficult to separate reinvestments from decided net purchases that increase the long-term holdings. In conjunction with the monetary policy decision in April 2019, the Riksbank therefore started to report total purchases over a certain period instead of reinvestments. Since then, the Riksbank has also communicated how the decided purchases and principal payments will affect the Riksbank's holdings of government bonds over the period to which the decision refers.⁸

Having presented the Riksbank's purchases of government bonds in this section, I describe, in the next section, how purchases of government bonds through different channels can make monetary policy more expansionary.

3 Effects of the purchase of government bonds according to economic theory

Monetary policy mainly affects the economy through the effects it has on interest rates in the financial markets. The repo rate has a direct effect on short government rates. Expectations of future monetary policy affect yields on government bonds and other bonds with longer maturities. According to what is known as the expectations hypothesis, the yield on a government bond with a long maturity is determined by the average expected short-term yield over the bond's maturity period. This is because investors can choose between purchasing a bond with a long maturity and ongoing investments at a short maturity. For investors to want to own bonds with different maturities, they must expect to receive the same expected return over the period as a whole.

But the expectations hypothesis cannot fully describe rate-setting. This is because, in practice, the yield on a government bond with long maturity also includes a term premium that, among other things, provides compensation for interest rate risk and also can be affected by investors' preferences for bonds with different maturities. The term premium means that the expected return may differ between investments with different maturities. All in all, the expectations hypothesis and term premiums mean that the yield on a bond with a long maturity can be described as:

$$(1) \quad \textit{Long rate} = \textit{average expected short rate} + \textit{term premium}$$

Normally, the term premium is greater than zero. The price of a bond with a long maturity falls when long-term interest rates rise, which affects any investor who is unwilling to hold the bond until it matures. Investing at a long maturity thus entails a greater risk than investing at a short maturity. Investors therefore normally demand compensation for investing in a bond with a long maturity. This compensation is made up of the term premium.

6 The green bonds issued by the Swedish state only differ from other government bonds with regard to the investor's opportunity to follow the government expenditures to which the bond is linked and what environmental and climate effects they help attain. The same difference applies to green municipal bonds in relation to other municipal bonds.

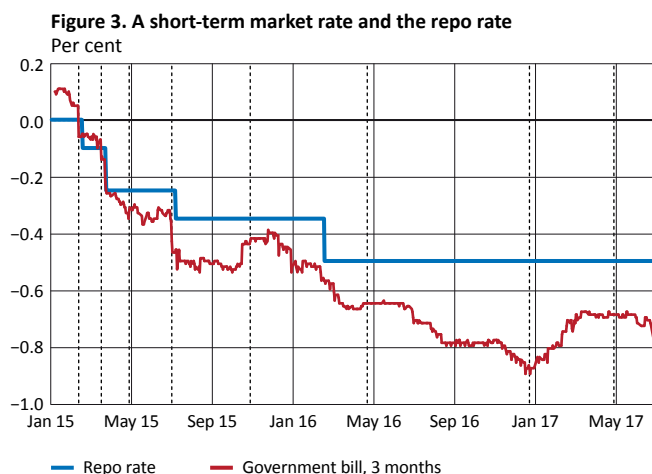
7 See Gustafsson and von Brömsen (2021) for a description of the Riksbank's measures and developments on the financial markets in the spring and summer of 2020.

8 See Sveriges riksbank (2021) for a more detailed description and a current assessment of how the Riksbank's securities holdings will develop.

However, there are also factors that contribute to lower premiums and sometimes the term premium can even fall below zero. There are several reasons why investors may be prepared to accept a lower return for owning certain government bonds; see Alsterlind et al. (2015). One important explanation is that insurance companies with long-term commitments may wish to hold assets with longer maturities and low credit risk, even if they have a lower expected return. Investors may also want to own government bonds to be able to lend them on the repo market and thereby convert bonds to liquidity. Banks can also use government bonds as collateral when making transactions with each other and with the Riksbank.

The Riksbank's purchases of government bonds can have an effect on financial prices via several channels. The purchases can affect long-term interest rates through their effects on the expected short-term interest rate (the signalling channel) and through their effects on the term premium (the premium channel). Bond purchases can also affect other market rates (the portfolio balance channel), the exchange rate (the exchange rate channel) and liquidity in the banking system (the liquidity channel).⁹ Below, I describe how these channels function according to economic theory.¹⁰

In addition to these five channels, there is one more channel that could be more relevant in Sweden compared with other countries, namely the effect on short-term interest rates. In Sweden, most mortgages are at variable interest rates and short-term interest rates therefore have a greater impact on the economy in Sweden than in many other countries. Since the Riksbank started purchasing government bonds in February 2015, short-term market rates have usually been significantly lower than the repo rate. When the outstanding stock of government bonds decreases due to the Riksbank's purchases, the value of government bonds as collateral in various transactions rises. This contributes to market rates for short-term loans with government bonds as collateral falling. Lenders become prepared to accept a lower yield as the government bonds have a greater value as collateral. This effect can also be seen for other yields with short maturities, such as the yield on treasury bills for example; see Figure 3.¹¹



Note. Dashed lines show announcements of the Riksbank's government bond purchases.

Sources: Macrobond and the Riksbank

9 The channels are usually presented as isolated and separate, but there can also be interactions between the different channels.

10 Alsterlind et al. (2015) describe in a similar manner how the channels function in theory.

11 See also 'Government bond purchases push down long- and short-term rates' in Sveriges Riksbank (2016).

3.1 The signalling channel: signal of a low repo rate for a longer period

Through the *signalling channel*, bond purchases can affect market participants' expectations of the level of repo rate that the Riksbank will set in the future. The market participants may interpret the Riksbank's purchases as a signal that the repo rate will be held low for longer, as the Riksbank will probably not raise the policy rate as long as it is carrying out net purchases of bonds.

In addition, purchases of bonds affect the Riksbank's balance sheet in the longer term and can be interpreted as a more long-term commitment to an expansionary monetary policy than cutting the repo rate. The repo rate can, of course, rapidly be raised again if the economic situation changes, but it is unlikely that the Riksbank would sell bonds rapidly.

If market participants deem that the central bank wants to avoid losses, a larger holding of bonds may lead them to expect the policy rate to be held low for a longer period. When a central bank purchases government bonds, new money is created in the banks' accounts in the central bank, which increases the banking system's surplus against the central bank. As the central bank pays interest on the surplus, a higher policy rate leads to increased funding costs for the bond holding. If the policy rate is raised enough over the maturity of the bonds, this may even give rise to losses in the central bank's profit and loss account. The larger the bond holding is, the greater the effect of a raised policy rate will be on the central bank's financial result.

The signalling channel is a complement to the other ways for the Riksbank to communicate its future monetary policy. Other central banks have sometimes communicated that interest rates will be held low, at least until a certain point in time or until certain conditions have been fulfilled, for example unemployment falling below a certain level. Such communication is sometimes called forward guidance. The Riksbank normally uses the repo rate path to provide guidance for how the repo rate can be expected to develop. Through the signalling channel, the repo rate can strengthen expectations of a low policy rate going forward and thereby increase the credibility of a low repo rate path.¹²

3.2 The premium channel: lower term premium on government bonds

Through the *premium channel*, bond purchases can lead to higher prices and lower term premiums on government bonds. Bond purchases can thus lead to long-term interest rates becoming lower, given the expected short-term interest rate. Normally, the term premium is greater than zero for bonds with longer maturities to compensate investors for the price of such bonds being more sensitive to interest rate adjustments than the price of bonds with short maturities. The premium channel works because different assets vary in terms of credit risk and liquidity, for example, thus being what are known as imperfect substitutes.¹³ Some investors prefer to own bonds with specific maturities, while others invest in bonds with many different maturities; see, for example, Andres et al. (2004), Vayanos and Vila (2009), Chen et al. (2012) and Harrison (2012). Hence some investors' demand for bonds with a specific maturity is less price sensitive. When the Riksbank purchases government bonds with a certain maturity, the price for these rises as there are investors who wish to avoid having to sell bonds with this specific maturity and instead having to invest in other assets. When the price of the bonds rises, the term premium falls, pushing down the yields. If the Riksbank purchases government bonds with different maturities, the term premiums and yields can thereby be pushed down for many different maturities.

¹² See Söderström and Westermark (2009) and De Graeve and Lindé (2015) for a more detailed discussion.

¹³ The idea that assets are imperfect substitutes originates with James Tobin. See, for example, Tobin (1969).

3.3 The portfolio balance channel: spillover effects give lower market rates

Through the *portfolio balance channel*, bond purchases can also lead to higher prices and lower interest rates for other assets than government bonds. Like the premium channel, the portfolio balance channel is based on different assets being imperfect substitutes. When the Riksbank purchases government bonds, the sellers receive money that they can use to invest in other assets, such as mortgage bonds or corporate bonds. If the investors did not purchase any other bonds after having sold their government bonds, their portfolios would no longer be balanced. They would have too large a proportion of money and too small a proportion of securities. When demand for other bonds increases, the price of these rises and yields fall.

3.4 The exchange rate channel: lower interest rates lead to a weaker exchange rate

If the Riksbank's purchases of government bonds lead to lower short-term and long-term interest rates, through the channels I have described above, the purchases should also lead to a weaker krona through the *exchange rate channel*. According to the theory of interest rate parity, investments in bonds in different currencies are to have the same expected return; see, for example, Engel (1996). Government bond purchases that cause interest rates to fall in Sweden mean that investors can expect lower returns on bonds in Swedish kronor. If investments in Swedish and foreign bonds are to continue to have the same expected yield, investors need to expect the krona to develop more strongly in the future in comparison with earlier expectations. An expected krona appreciation would then compensate for the lower expected yield on the Swedish bond. If the krona is to be expected to appreciate in the period ahead, it must depreciate when the purchases of government bonds are announced and yields fall, for a given level of the expected future exchange rate.

3.5 The liquidity channel: increased liquidity in the banking system can lead to increased lending

Unlike the channels I have described above, the *liquidity channel* acts through the amount of money or liquidity in the banking system, rather than through effects on interest rates and financial prices. When the Riksbank purchases a bond, new money is created in the account with the Riksbank for the bank selling the bond. This increases the banks' total surplus against the Riksbank, which is to say the liquidity in the banking system. To a certain extent, this can reduce the risk of individual banks encountering liquidity problems, which may lead the banks to increase their lending to households and companies.¹⁴ However, how an increase in the amount of liquidity in the banking system affects lending by the banks also depends on other factors such as demand for credit in the economy.¹⁵

It cannot be ruled out that the liquidity channel has contributed towards making monetary policy even more expansionary than the effects via the channels above indicate. But the liquidity channel is significantly more difficult to analyse than other channels, as effects on the banks' willingness to lend money to households and companies cannot be observed in the same way as effects on prices in financial markets.

The liquidity channel is closely related to other channels that also act through the liquidity in the banking system. When the central bank increases the liquidity in the banking system, the average maturity for the banks' assets decreases, as the banks' reserves with the

¹⁴ A related channel is the bank lending channel, according to which the central bank's policy rate adjustments can affect the banks' lending through their effects on the amount of liquidity in the banking system (see Bernanke and Blinder 1988). The bank lending channel is based on the central bank implementing policy rate adjustments through securities transactions with the banks, which is not the case in Sweden.

¹⁵ See Armelius, Claussen and Vestin (2020) for a review of how government bond purchases affect different definitions of money.

central bank have very short maturities. To restore the average maturity of their assets, the banks then need to purchase other assets with longer maturities, which in turn contributes to higher prices and lower yields for bonds with long maturities.¹⁶ Empirically, however, it is not possible to distinguish such an effect, which is a result of increased liquidity in the banking system, from the effect through the normal portfolio balance channel, which is a result of the central bank buying government bonds. In practice, the liquidity in the banking system increases at the same time as the central bank purchases government bonds.¹⁷

As the liquidity channel acts through the banks' lending, rather than through effects on financial prices, we cannot analyse it by studying announcement effects. However, in an earlier study, Hallsten (1999) finds that companies' bank loans decrease more than other financing after monetary policy tightening, which, in turn, contributes to further decreases in GDP growth apart from the direct effect of the policy rate increase. This is consistent with channels that act through the liquidity in the banking system. Another possible explanation is that smaller companies, which largely obtain funding through bank loans, are affected more by monetary policy tightening than larger companies and that smaller companies therefore find it more difficult to obtain both bank loans and other external funding. In such cases, bank loans fall more than other funding does as a result of funding to smaller companies decreasing more than funding to larger companies. However, this is a result of a broader credit channel with different effects on different companies and is not due to general credit tightening from the banks; see Bernanke and Gertler (1995) and Bernanke et al. (1996). Melander et al. (2017) find support for such a broader credit channel in Sweden.

3.6 More expansionary financial conditions lead to higher growth and inflation

The channels I have described above all contribute to conditions on the financial markets becoming more expansionary when the central bank purchases government bonds. In this section, I briefly describe how monetary policy measures such as policy rate adjustments and bond purchases affect the economy through their effects on financial markets.¹⁸

Expansionary monetary policy measures lead to falling interest rates and a weakened exchange rate. Lower market rates and a weaker exchange rate mean more expansionary conditions on the financial markets.¹⁹ Lower bond yields result in lower funding costs for banks and mortgage institutions and ultimately lead to lower borrowing costs for households and companies. In addition, higher asset prices lead to an increase in the value of investors' bond holdings.

As prices are sluggish, lower nominal interest rates lead to lower real interest rates, and a weaker nominal exchange rate leads to a weaker real exchange rate. When real interest rates fall, economic growth increases and employment rises due to households and companies increasing consumption and investment. When the real exchange rate depreciates, Swedish goods become cheaper compared to foreign goods, meaning that demand for Swedish products increases. A weaker krona also leads to higher inflation as import prices rise.

Ultimately, it is the effects on growth and inflation that are key, although, as monetary policy acts through the financial markets, investigating how bond purchases affect financial prices is also of great interest. In the next section, I study the effects of the Riksbank's announcements of bond purchases on the financial markets.

¹⁶ See Christensen and Krogstrup (2016a) for a more detailed description of this channel, which the authors call the reserve-induced portfolio balance channel.

¹⁷ However, in 2011, the Swiss National Bank took measures that increased the liquidity in the banking system without purchasing government bonds. Christensen and Krogstrup (2016b) studied the effects and found that the increased liquidity contributed to lower yields for bonds with long maturities.

¹⁸ See Hopkins et al. (2009) for a description of how monetary policy, via adjustments to the repo rate, affects the economy and De Graeve and Lindé (2015) for a discussion of the effects various monetary policy measures have in a small, open economy.

¹⁹ See Alsterlind et al. (2020) and Fransson and Tysklind (2017) for examples of methods of measuring the degree of expansiveness in the financial conditions in Sweden.

4 Effects of the Riksbank's government bond purchases on financial prices

In this section, I study the announcement effects of the Riksbank's bond purchases via the signalling channel, the premium channel, the portfolio balance channel and the exchange rate channel.²⁰ Effects via the liquidity channel are significantly more difficult to measure for the reasons I have discussed in the section above. I therefore focus on channels that can be studied by measuring the announcement effects of bond purchases on financial prices, like earlier studies of the effects of central bank bond purchases.²¹ I study not just the effects on nominal interest rates but also effects on inflation expectations and real interest rates, as has been done in earlier studies of experiences in other countries; see, for example, Williams (2014) and Haldane et al. (2016). Earlier studies of the Riksbank's bond purchases have primarily focused on the effects on nominal interest rates.²²

When studying announcement effects, it is important to control for expected announcements. As financial prices are based on all available information, including expectations of future announcements of bond purchases, an announcement that is completely expected should not have any effects on financial prices at the actual time of announcement. Instead, prices should have been adjusted at an earlier stage, when the market participants raised their expectations of future bond purchases by the central bank. In contrast, announcements of unexpected purchases should affect financial prices as the prices need to be adjusted to take account of the new information.

If we do not control for such expected announcements, we risk underestimating the effects of bond purchases. For example, let us assume that market participants expect the central bank to announce bond purchases of SEK 50 billion in conjunction with a monetary policy decision. Instead, however, the central bank announces significantly larger purchases of SEK 100 billion. The change in financial prices upon announcement will then be a result of the unexpected part of the announcement. But if we do not control for the expected part of SEK 50 billion, we will interpret the change in financial prices as a result of the total announcement of SEK 100 billion. This would mean that the actual effect of these bond purchases is twice as large as the effect we can measure without controlling for expected purchases.

One way of controlling for expected announcements is to use expectations according to the market newsletters published ahead of the Riksbank's monetary policy decisions as a starting point. Table 1 shows how the total announcement in conjunction with a specific monetary policy decision can be divided into the expected announcement according to the market newsletter and the unexpected announcement, see De Rezende and Ristiniemi (2018). For example, according to this measure, the announcement in February 2015 was completely unexpected, while the announcement in December 2016 was completely expected. In total, the unexpected announcements only amount to SEK 130 billion, which is to say less than half of the total announced purchases of SEK 290 billion.

As the announcement of expected bond purchases should not affect financial prices, it is reasonable to interpret the price effects upon announcement as a result of the unexpected

20 In this article, I focus on the effects of net purchases of government bonds announced over the period February 2015 to April 2017. In addition to this, the Riksbank also announced reinvestments in December 2017, purchases of government bonds in April 2019, purchases of government, municipal, housing and corporate bonds in March 2020 and expanded purchases of securities in November 2020.

21 However, this article does not analyse the effects of the Riksbank's bond purchases on macroeconomic variables such as inflation and unemployment. De Rezende and Ristiniemi (2018) measure how expansive the Riksbank's monetary policy is by using a 'shadow interest rate' that includes the effects of bond purchases. According to their analysis, the purchases have contributed to inflation being about 0.5 percentage points higher in October 2017 than it would otherwise have been. The corresponding effect on unemployment in October 2017 was about 0.75 percentage points. See also Di Casola (2021) for an overview of empirical research on the macroeconomic effects of bond purchases in the euro area, the United States and the United Kingdom.

22 For example, De Rezende et al. (2015) study the announcement effects of the bond purchases decided in the period February–July 2015. While they discuss effects on inflation expectations, they mainly study effects on nominal interest rates.

bond purchases. Less than half of the announcements were unexpected, so participants on the financial markets had already adjusted their expectations of future bond purchases, and so the financial prices should have been adjusted at an earlier stage. If we assume that adjusted expectations affect financial prices in the same way as the unexpected announcements of purchases, the total effects of the Riksbank's bond purchases on financial prices may be slightly more than twice as large as the effects according to the analysis in this section.

Table 1. Expected and unexpected announcements of the Riksbank's government bond purchases

Date	Total announcement	Nominal bonds	Real bonds	Expected announcement	Unexpected announcement
12-02-2015	10	10	0	0	10
18-03-2015	30	30	0	0	30
29-04-2015	50	50	0	30–40	10–20
02-07-2015	45	45	0	0	45
28-10-2015	65	65	0	35	30
21-04-2016	45	30	15	60	–15
21-12-2016	30	15	15	30	0
27-04-2017	15	7.5	7.5	0	15

Note. The measure of unexpected announcements has been constructed by subtracting the expected announcement (according to market newsletters) from the announced purchases ('total announcement').
Source: De Rezende and Ristinieni (2018)

Before moving on to studying the effects of the Riksbank's announcements, it is worth noting that we may not capture effects that arise gradually as previously announced purchases are being implemented. In particular, yields for high-risk assets may be gradually affected via the portfolio balance channel if portfolio rebalancing occurs gradually. Hence we may to some extent underestimate the effects of purchases of government bonds on more risky assets, such as mortgage and corporate bonds.

At the same time, effects of unexpected repo rate cuts could mistakenly be interpreted as effects of bond purchases. In conjunction with several of the announcements, the repo rate was also cut and some of the changes in financial prices are due to the repo rate cut instead of the announcement of bond purchases. However, De Rezende (2017) shows that both interest rate cuts and bond purchases had effects on yields.

4.1 The signalling and premium channels

I start by studying how the Riksbank's announcements affected yields on government bonds. This can take place both via effects on the expected short-term interest rate through the signalling channel and through effects on term premiums through the premium channel.

Government bond yields fell by 30–50 basis points

With a few isolated exceptions, yields fell when the Riksbank announced further purchases of government bonds. Table 2 shows how yields on government bonds with different maturities developed, both at different announcement dates and in total over all announcement dates. The columns show changes in different yields at a specific announcement date, measured as the difference between the closing figure on announcement day and the closing figure on the previous day, while the final column shows the total change in each yield for all announcement dates. In total, the nominal yields fell by approximately 30–50 basis points (hundredths of a percentage point), depending on maturity. The difference between yields for Swedish and German government bonds also

decreased by 30–50 basis points, which indicates that the lower yields in Sweden were not the result of lower international yields. Figure 4 shows how Swedish government bond yields developed over the period from January 2015 to June 2017. For example, the 10-year yield fell by about 10 basis points and the 2-year yield fell by about 60 basis points over the entire period. The changes on the announcement dates are thus significant in relation to the total changes over the period.

Table 2. Changes in government bond yields upon announcement of government bond purchases
Basis points

	12-02-2015	18-03-2015	29-04-2015	02-07-2015	28-10-2015	21-04-2016	21-12-2016	27-04-2017	Total
Government bond, 2 years	-12	-10	+5	-11	-2	0	+3	-3	-31
Government bond, 5 years	-16	-12	+7	-13	-8	+4	-1	-7	-45
Government bond, 10 years	-11	-15	+7	-9	-8	+8	-2	-7	-37
Yield differential, Sweden-Germany, 2 years	-12	-9	+3	-10	-1	-2	3	-2	-31
Yield differential, Sweden-Germany, 5 years	-16	-10	+3	-15	-5	-1	0	-6	-49
Yield differential, Sweden-Germany, 10 years	-11	-15	+1	-16	-3	+2	+1	-6	-47

Note. The changes refer to the difference between the closing figure on the announcement day and the closing figure on the previous day. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields.

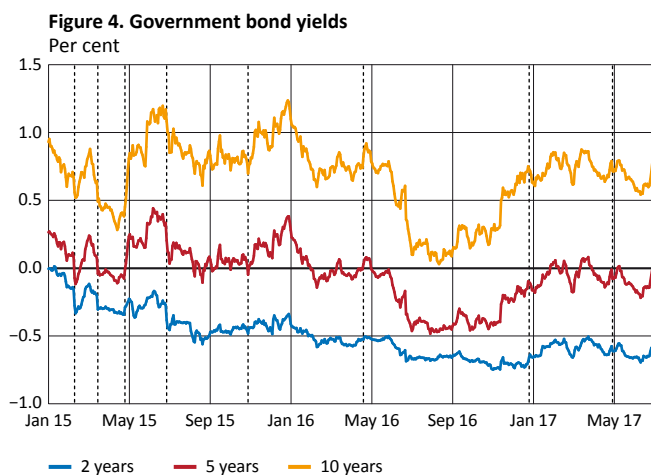
Sources: Macrobond and the Riksbank

De Rezende (2017) analyses the effects of the Riksbank's government bond purchases in 2015 by studying historical correlations between repo rate changes and government bond yields. Over the period 2003–2014, no purchase of government bonds were announced, so movements in government bond yields upon monetary policy decisions in that period are due to unexpected adjustments to the repo rate, changes to the repo rate path and foreign yield changes. De Rezende then uses these historical correlations to develop a measure of how much of the changes in government bond yields upon monetary policy decisions in 2015 *cannot* be explained by changes in the repo rate, the repo rate path or foreign yields. This unexplained movement in government bond yields can be interpreted as the effect of government bond purchases.

According to this analysis, a significant part of the decrease in government bond yields in conjunction with the monetary policy decisions in 2015 derives from government bond purchases. About half of the decrease in the yield on 2-year government bonds in conjunction with the monetary policy decisions is due to the Riksbank's bond purchases. For 5- and 10-year government bonds, about two-thirds of the decrease in yields is due to bond purchases. In total, bond purchases in 2015 contributed to the 2-year yield falling by 15 basis points, the 5-year yield by 29 basis points and the 10-year yield by 27 basis points.

As Table 2 shows, government bond yields changed significantly more in conjunction with the announcements in 2015 than they did in conjunction with the announcements in 2016 and 2017. The unexpected announcements of bond purchases were also greater in 2015 than in 2016–2017 (see Table 1). Overall, the announcements in 2016 and 2017 were fully expected and it is therefore natural that the changes in financial prices in conjunction with

these announcements were smaller than during 2015 when the announcements were to a larger extent unexpected. Hence it is reasonable to assume that the result of De Rezende's analysis for 2015 also applies to the period 2015–2017 as a whole.



Note. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields. Dashed lines show announcements of the Riksbank's government bond purchases.

Sources: Macrobond och the Riksbank

De Rezende (2017) also studies how bond purchases in 2015 affected estimates of the two different components in the government bond yields – the average expected short-term yield over the bond's maturity and the term premium. The results show that the bond purchases had clear announcement effects on both components. The expected short-term yield was affected for most maturities, while the term premium was primarily affected for longer maturities. The total effect on the expected short-term yield was about 10 basis points for maturities between 2 and 10 years, while the total effect on the term premium was almost 20 basis points for maturities between 5 and 10 years. De Rezende's (2017) results indicate that the Riksbank's bond purchases contributed to lower bond yields through both the signalling channel and the premium channel.²³

De Rezende and Ristiniemi (2018) construct a 'shadow interest rate' that is intended to measure the degree of expansiveness in the Riksbank's monetary policy, including effects of purchases of government bonds. The difference between the shadow interest rate and the repo rate can be interpreted as the total effect of the Riksbank's bond purchases measured in terms of the repo rate. According to the results, unexpected bond purchases of SEK 10 billion give rise to an expansionary effect corresponding to a repo rate cut of 3.3 basis points. Assuming that the effects are linear, this means that the Riksbank's total bond purchases of SEK 290 billion would correspond to a repo rate cut of just over 95 basis points, which is to say almost one percentage point.

4.2 The portfolio balance channel

To analyse how the Riksbank's announcements of government bond purchases have affected financial prices via the portfolio balance channel, we now study how yields on mortgage and corporate bonds and share prices have developed following the Riksbank's announcements.

²³ De Rezende (2017) only studies the effects of announcements in 2015. However, as the changes to government bond yields upon announcements in 2016 and 2017 were significantly smaller than the changes upon announcements in 2015, it is nevertheless possible to draw conclusions for the period 2015–2017 as a whole.

Mortgage and corporate bond yields fell by 25–30 basis points

We start by studying yields on mortgage and corporate bonds. Table 3 shows how yields on mortgage and corporate bonds changed, both at different announcement dates and in total over all announcement dates.

Table 3. Changes in mortgage and corporate bond yields following announcements of government bond purchases
Basis points

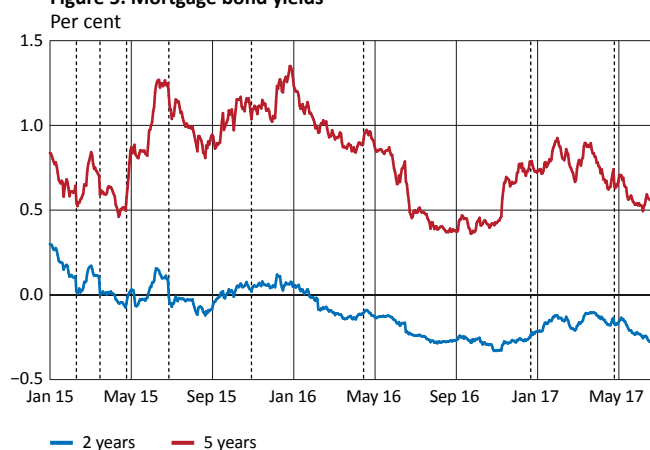
	12-02-2015	18-03-2015	29-04-2015	02-07-2015	28-10-2015	21-04-2016	21-12-2016	27-04-2017	Total
Mortgage bond, 2 years	-9	-10	+3	-11	-1	+1	+1	-3	-30
Mortgage bond, 5 years	-10	-11	+8	-7	-5	+3	0	-10	-33
Corporate bond, 2 years	-7	-11	+5	-9	-2	+2	0	-5	-26
Corporate bond, 5 years	-8	-9	+7	-6	-2	+4	-4	-7	-25

Note. The changes refer to the difference between the closing figure on the announcement day and the closing figure on the previous day. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields.

Sources: Macrobond and the Riksbank

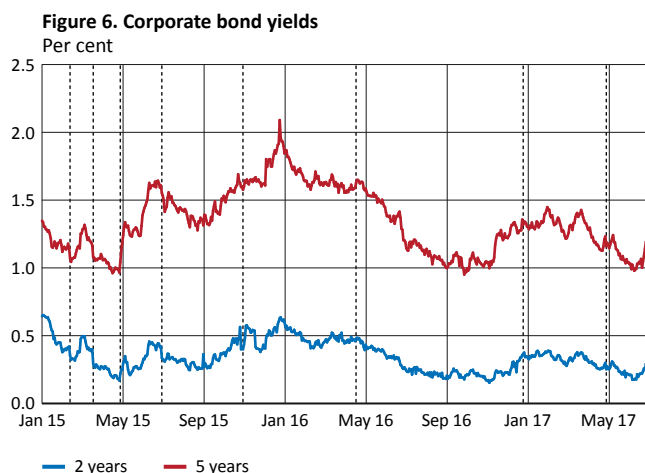
We can see that yields on mortgage bonds moved in line with or slightly less than yields on government bonds, depending on maturity; see Table 2. For mortgage bonds with a 2-year maturity, the total movements were as large as the movements for the equivalent government bond, about 30 basis points. The movements were slightly smaller for mortgage bonds with a 5-year maturity than they were for the equivalent government bond, just over 30 basis points compared with 45 basis points. Yields on corporate bonds fell slightly less than yields for mortgage bonds, in total about 25 basis points. In comparison, yields on mortgage and corporate bonds fell by about 10–50 basis points, depending on the maturity over the period from January 2015 to June 2017. Figures 5 and 6 show how yields on mortgage and corporate bonds respectively developed over the period as a whole.

Figure 5. Mortgage bond yields



Note. The changes refer to the difference between the closing figure on the announcement day and the closing figure on the previous day. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields. Dashed lines show announcements of the Riksbank's government bond purchases.

Sources: Macrobond and the Riksbank



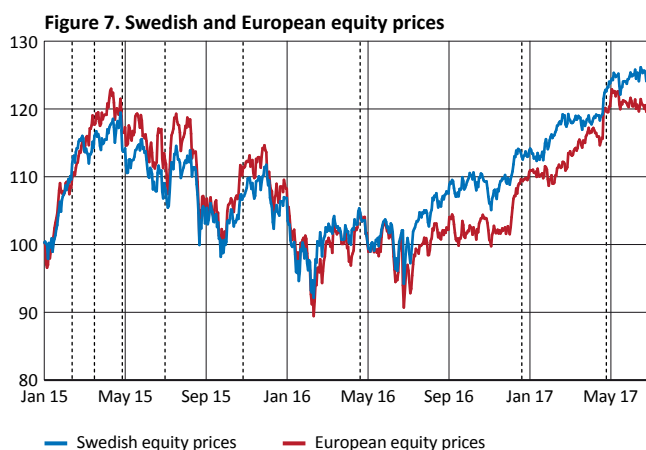
Note. The changes refer to the difference between the closing figure on the announcement day and the closing figure on the previous day. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields. Dashed lines show announcements of the Riksbank's government bond purchases.
Sources: Macrobond and the Riksbank

The Riksbank's monetary policy decisions on lower repo rates and further purchases of government bonds have thus contributed to lower yields on mortgage and corporate bonds. However, it is difficult to know how much of the yield changes are due to repo rate cuts and how much are due to bond purchases.²⁴

Equity prices rose in line with or more than equity prices in the rest of Europe

In this section, we study how Swedish equity prices developed on announcement days in comparison with European equity prices. The comparison is important if we are to avoid the risk of interpreting a broad, general upswing in Swedish and European equity prices as an effect of the Riksbank's bond purchases. Figure 7 shows how Swedish and European equity prices developed over the period from January 2015 to June 2017. Seen over the entire period, Swedish equity prices rose slightly more than European equity prices. However, as differences in the development of equity prices outside announcement days may be due to a number of different factors, we focus here on changes in equity prices in conjunction with the Riksbank's announcements of bond purchases.

²⁴ One possible way of attempting to distinguish the effects of repo rate adjustments and government bond purchases would be to study historical correlations between repo rate adjustments and other financial prices, as De Rezende (2017) did for yields on government bonds. The historical correlations could then be used to produce a measure of how much of the changes in financial prices in conjunction with announcements of purchases of government bonds that cannot be explained by changes in the repo rate, the repo rate path or foreign yields. The residual could be interpreted as the effect of government bond purchases.



Note. OMXS is a broad Swedish share index and EuroSTOXX is a broad European share index. Equity prices are measured in domestic currency. Dashed lines show announcements of the Riksbank's government bond purchases.

Source: Macrobond

Table 4 shows how Swedish and European equity prices changed, both at different announcement dates and in total over all announcement dates. We can see that, on most announcement dates, Swedish equity prices moved in line with other European stock exchanges, but that, on a few occasions, the upswings were greater in Sweden than in other countries. Upon the announcement of bond purchases in February 2015, Swedish equity prices rose by 2.1 per cent, while European equity prices only rose by 1.4 per cent. Upon the announcement in March 2015, Swedish equity prices rose by 1.5 per cent, while European equity prices fell by 0.1 per cent.

Overall, the Riksbank's bond purchases thus seem, to some extent, to have contributed to higher equity prices.

Table 4. Changes in Swedish and European equity prices following announcements of government bond purchases
Percentage change

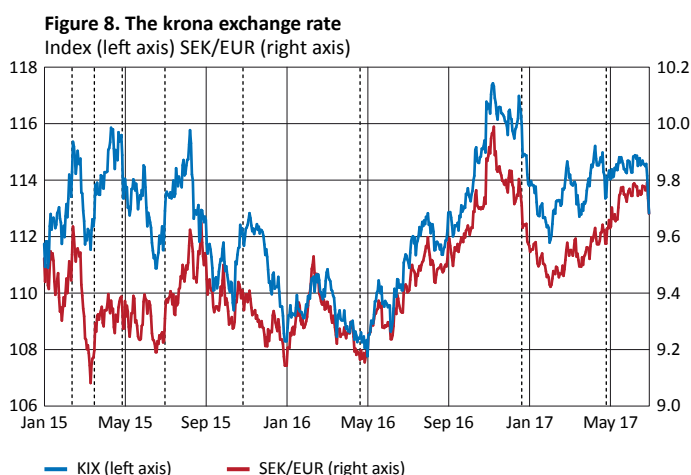
	12-02-2015	18-03-2015	29-04-2015	02-07-2015	28-10-2015	21-04-2016	21-12-2016	27-04-2017	Total
Swedish equity prices	+2.1	+1.5	-2.5	-0.7	+0.5	-0.6	-0.5	-0.2	-0.3
European equity prices	+1.4	-0.1	-2.7	-0.9	+1.1	-0.1	-0.1	-0.4	-1.8

Note. The changes refer to the difference between the closing figure on the announcement day and the closing figure on the previous day. Swedish equity prices are measured using the OMXS index and European equity prices are measured using the EuroSTOXX index.

Sources: Macrobond and the Riksbank

4.3 The exchange rate depreciated

In this section, I analyse the effects of bond purchases through the exchange rate channel by studying how the krona exchange rate developed on announcement days. Seen over the entire period of 2015–2017, the krona weakened slightly, both in trade-weighted terms and against the euro; see Figure 8.



Note. The KIX (krona index) is a weighted average of the currencies in 32 countries that are important for Sweden's international trade. A higher value indicates a weaker exchange rate. Dashed lines show announcements of the Riksbank's government bond purchases.
Source: Macrobond

The krona also weakened in conjunction with the Riksbank's announcement of government bond purchases. Table 5 shows how the krona exchange rate changed at different announcement dates and in total over all announcement dates. For example, the krona depreciated in trade-weighted terms by about 1–1.5 per cent after the announcements in February, March and July 2015. On other occasions, the krona appreciated slightly in conjunction with the announcements. Overall, the krona depreciated by about 3 per cent over all announcements.

Table 5. Changes in exchange rates following announcements of government bond purchases
Percentage change

	12-02-2015	18-03-2015	29-04-2015	02-07-2015	28-10-2015	21-04-2016	21-12-2016	27-04-2017	Total
Exchange rate, krona index (KIX)	+1.7	+1.7	-0.7	+0.8	-0.2	-0.3	-0.5	+0.5	+3.0
Exchange rate, SEK per EUR	+1.7	+1.7	-0.7	+0.7	-0.3	-0.3	-0.5	+0.5	+2.9
Exchange rate, SEK per USD	+1.7	+1.9	-0.7	+0.9	-0.2	-0.2	-0.4	+0.5	+3.3
Exchange rate, SEK per GBP	+1.7	+1.9	-0.7	+0.8	-0.2	-0.3	-0.7	+0.6	+3.0

Note. The changes refer to the difference between the exchange rate 30 minutes after announcement and 30 minutes before announcement. Positive exchange rate fluctuations entail a depreciation of the krona. The KIX (krona index) is a weighted average of the currencies in 32 countries that are important for Sweden's international trade. A higher value indicates a weaker exchange rate.

Sources: Macrobond and the Riksbank

De Rezende and Ristiniemi (2018) analyse the effects on exchange rates of unexpected adjustments of the policy rate and other unexpected monetary policy measures, including bond purchases. They study monetary policy measures by the Riksbank, ECB, Federal Reserve and Bank of England. Other monetary policy measures include bond purchases and adjustments of the repo rate path. The measure of the effect of these other measures also includes the effect of other news that affect bond yields in conjunction with monetary policy announcements.

For all the central banks they study, adjustments of the policy rate have a greater effect on the exchange rate than other monetary policy measures. An unexpected cut to the policy

rate of 10 points entails a depreciation of the currency of just over 1 per cent. Other monetary policy measures corresponding to a cut of 10 points in policy rate terms according to the shadow interest rate calculations made by De Rezende and Ristiniemi (2018) lead to a depreciation of 0.35 per cent. According to the authors' analysis, the Riksbank's total bond purchases of SEK 290 billion give rise to an expansionary monetary policy effect corresponding to the effect of a repo rate cut of just over 95 basis points (see section 4.1). If we assume that the effects are linear, the bond purchases according to these estimates should have led to a depreciation of about 3.3 per cent.²⁵ Such a depreciation is of the same magnitude as the total change in the KIX krona index of 3 per cent, as seen in Table 5. Similarly, the foreign central banks' announcements of bond purchases have also led to depreciations of the respective currency and corresponding appreciations of the Swedish krona.

De Rezende's and Ristiniemi's (2018) results thus indicate that the Riksbank's bond purchases have contributed to weakening the krona, just as other central banks' bond purchases have contributed to weakening other currencies. However, policy rate adjustments seem to have had a greater effect on the exchange rate than bond purchases have. At the same time, it is impossible to know how the krona exchange rate would have developed if the Riksbank had not purchased government bonds. However, in light of the ECB's bond purchases, it is possible that the krona would have strengthened significantly faster than it did. The bond purchases may have had their main effect on the exchange rate by preventing an excessively rapid appreciation of the krona, rather than by actively weakening the krona.

4.4 Real interest rates fell more than nominal ones and inflation expectations rose

In this section, I study how real interest rates and measures of inflation expectations developed in conjunction with announcements of bond purchases. Earlier analyses of the effect of the Riksbank's bond purchases have primarily focused on nominal interest rates. But it is at least as important to study the effects on real interest rates and inflation expectations.

$$(2) \quad \textit{Nominal interest rate} = \textit{real interest rate} + \textit{expected inflation}$$

According to economic theory, it is primarily real interest rates that affect economic activity and inflation expectations are an important measure of confidence in the inflation target. An analysis of the effects of bond purchases that solely focuses on nominal interest rates may underestimate the effects of the bond purchases.

Real rates fell more than nominal ones

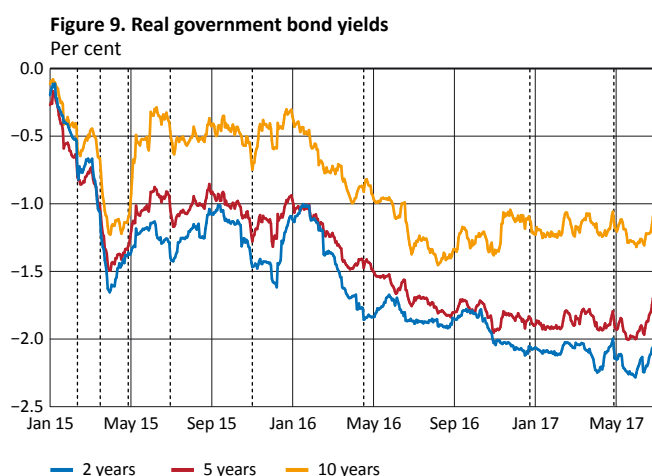
Through the premium channel, bond purchases lead to lower term premiums on government bonds, which means lower nominal yields on government bonds with longer maturities. Lower nominal yields mean that real yields also fall, if prices are assumed to be rigid in the short term. According to economic theory, it is real rates rather than nominal rates that affect household consumption and corporate investment. Lower real interest rates therefore entail higher future economic activity and higher future inflation, which in turn means that the average expected policy rate rises.

As yields on bonds with longer maturities may be divided into term premiums and average expected short-term yield, bond purchases thus have two different effects on yields on government bonds with longer maturities. These effects counteract one another. If the bond purchases have the desired effect, the term premium falls as a *direct* result of the bond

²⁵ Bond purchases corresponding to a rate cut of 10 basis points lead to a depreciation of 0.35 per cent. Bond purchases corresponding to a rate cut of 95 basis points then lead to a depreciation of 3.3 per cent (as $95/10=9.5$ multiplied by 0.35 per cent equals 3.3 per cent).

purchases. But the expected short-term yield rises as an *indirect* result of the positive effect of the bond purchase on inflation expectations and the expected policy rate. If, hypothetically, the term premium falls exactly as much as the expected short-term yield rises, the effects offset one another and the nominal yield is unchanged. Hence, an incorrect conclusion of merely studying the effect on nominal yields could be that bond purchases do not have any effect. As pointed out by De Graeve and Lindé (2015), it is therefore important not to study the effect on nominal yields alone – the effect on real yields is more important when the bond purchases are to be evaluated.

The yield on a real government bond is a measure of the risk-free real interest rate for a particular maturity. Figure 9 shows that yields on real government bonds fell from almost 0 in January 2015 to between –1 and –2 per cent in June 2017. As this measure is based on financial prices, it is available day by day and can be used to study the announcement effect on real yields. One possible disadvantage of this individual measure of the real yield is that bond purchases can substantially affect the price of a particular asset, for instance, because of a shortage of liquidity, without any significant contagion effects to other assets, see Altavilla et al. (2015). It could then be problematic to use the yield on a real government bond as a measure of the real yield. Correspondingly, using the yield spread between nominal and real government bonds as a measure of inflation expectations could be problematic. However, other measures of inflation expectations have developed in a similar manner to the measure of inflation expectations that comprises the difference between nominal and real government bonds, see Figures 10 and 11. Different measures of inflation expectations and different measures of real interest rates thus provide a similar picture and the conclusions are not dependent on the specific measure used.



Note. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields. Dashed lines show announcements of the Riksbank's government bond purchases.

Sources: Macrobond and the Riksbank

Table 6 shows how yields on real government bonds with maturities of 2, 5 and 10 years developed, both at different announcement dates and in total over all announcement dates. In total, real yields fell by 67, 45 and 49 basis points, respectively. This can be compared with the corresponding falls in nominal yields of 31, 45 and 37 basis points. For two of the maturities, real yields thus fell significantly more than the corresponding nominal yields. This indicates that inflation expectations rose in connection with the announcements. Real yields fell in connection with all announcements, with the exception of that in April 2015, when they rose by a few basis points. The bond purchases the Riksbank then announced were largely expected and many market participants had expected that the Riksbank would cut the repo rate. Both nominal and real yields rose when the expected rate cut failed to materialise.

Table 6. Changes in real yields following announcements of government bond purchases

Basis points

	12-02-2015	18-03-2015	29-04-2015	02-07-2015	28-10-2015	21-04-2016	21-12-2016	27-04-2017	Total
Real government bond, 2 years	-24	-15	+2	-11	-3	-9	0	-8	-67
Real government bond, 5 years	-13	-8	+3	-10	-5	-6	-1	-6	-45
Real government bond, 10 years	-16	-10	+4	-7	-6	-3	-2	-8	-49

Note. The changes refer to the difference between the closing figure on announcement day and the closing figure on the previous day. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields.

Sources: Macrobond and the Riksbank

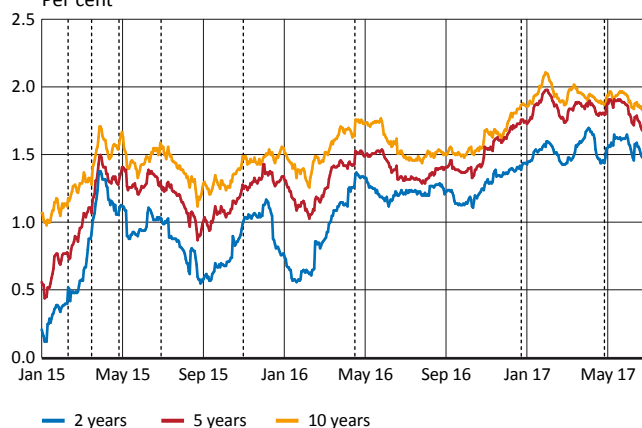
Inflation expectations rose

As the purchases of government bonds are intended to make monetary policy more expansionary, inflation expectations should rise when further purchase are announced. But if market participants believe that the Riksbank has better information on future economic developments than other forecasters, extended government bond purchases may cause analysts to revise down their forecasts for growth and inflation. This will then have a negative effect on inflation expectations, see Campbell et al. (2012). As purchases of government bonds are aimed at ensuring confidence in the inflation target, the effect of announcements on inflation expectations is an important empirical question.

One measure of inflation expectations is the spread between yields on nominal and real government bonds with a particular maturity. This measure is sometimes called 'inflation compensation'. The advantage of this measure is that it is available day by day and can therefore be used to study announcement effects. Figure 10 shows how inflation compensation rose from January 2015 to June 2017.

Figure 10. Inflation compensation

Per cent



Note. Inflation compensation is defined as the difference between yields on nominal and real government bonds with the same maturity. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields. Dashed lines show announcements of the Riksbank's government bond purchases.

Sources: Macrobond and the Riksbank

Following the Riksbank's announcements of further purchases of government bonds, inflation compensation rose for 2- and 10-year maturities, while inflation compensation for 5-year maturities was unchanged. In total, the 2-year inflation compensation rose by 36 basis points, and the 10-year inflation compensation by 12 basis points, see Table 7.

Table 7. Changes in inflation compensation following announcements of government bond purchases
Basis points

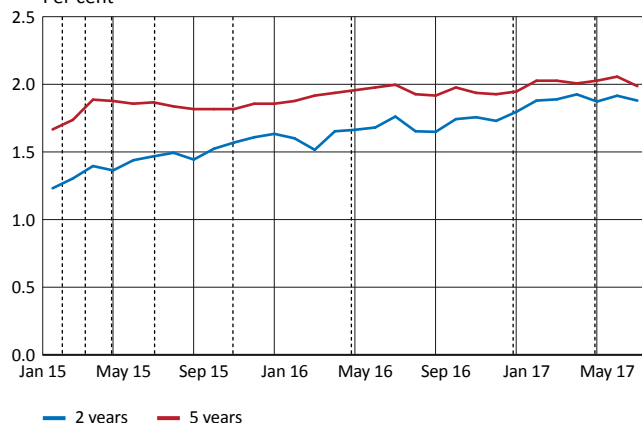
	12-02-2015	18-03-2015	29-04-2015	02-07-2015	28-10-2015	21-04-2016	21-12-2016	27-04-2017	Total
Inflation compensation, 2 years	+12	+5	+3	-1	+1	+8	+3	+4	+36
Inflation compensation, 5 years	-3	-4	+4	-3	-3	+9	0	0	0
Inflation compensation, 10 years	+5	-5	+3	-2	-2	+11	0	0	+12

Note. Inflation compensation is defined as the difference between yields on nominal and real government bonds with the same maturity. The changes refer to the difference between the closing figure on the announcement day and the closing figure on the previous day. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields.

Sources: Macrobond and the Riksbank

Inflation expectations according to the Prospera survey show a similar development over time and confirm the picture of rising inflation expectations during the period February 2015 to June 2017, see Figure 11. However, the survey measure is only available month by month and therefore cannot be used to study the announcement effects.

Figure 11. Inflation expectations according to questionnaire
Per cent



Note. The mean of inflation expectations (CPI) for money market participants according to Prospera's survey. Dashed lines show announcements of the Riksbank's government bond purchases.

Source: Kantar Sifo Prospera

In conjunction with announcements of purchases, real interest rates have fallen more than nominal interest rates have, which indicates that inflation expectations have risen. Different measures of inflation expectations have risen in similar ways, which indicates that this conclusion is general and not dependent on any specific measures of inflation expectations and real interest rates being used. One important conclusion of this analysis is that the effect of the Riksbank's bond purchases is greater than a more limited analysis of its effects on nominal interest rates shows.

5 Perspectives on the announcement effects

The analysis of announcement effects on financial prices shows that the Riksbank's bond purchases have had an effect on interest rates and other financial prices. To put the total announcement effects in perspective, we can compare them with the total changes in financial prices during the period from 1 January 2015 to 30 June 2017. Table 8 below provides such a comparison for a number of important variables. For most of them, the announcement effect comprises a significant part of the total change. This applies in

particular to different nominal interest rates and exchange rates. The announcement effect is often actually larger for these variables than the total change during the period. When it comes to inflation expectations, the announcement effect accounts for around 30 per cent of the total change in inflation expectations 2 years ahead and around 15 per cent of the total change 10 years ahead. With regard to real interest rates, the announcement effect comprises a large share of the total change – just over one third for the maturities 2 and 5 years and just over a half for the maturity 10 years.

Table 8. Total announcement effects in relation to total changes during the period 1 January 2015–30 June 2017
Basis points (*percentage change)

	Total announcement effect	Total change during period
Government bond, 2 years	-31	-56
Government bond, 5 years	-45	-24
Government bond, 10 years	-37	-12
Mortgage bond, 2 years	-30	-54
Mortgage bond, 5 years	-33	-13
Corporate bond, 2 years	-26	-34
Corporate bond, 5 years	-25	-17
Exchange rate, krona index (KIX)*	+3.0	+1.0
Exchange rate, SEK per EUR*	+2.9	+1.6
Exchange rate, SEK per USD*	+3.3	+8.1
Inflation compensation, 2 years	+36	+128
Inflation compensation, 5 years	0	+112
Inflation compensation, 10 years	+12	+79
Real government bond, 2 years	-67	-183
Real government bonds, 5 years	-45	-136
Real government bonds, 10 years	-49	-90

Sources: Macrobond and the Riksbank

6 Conclusions

Many other studies have analysed announcement effects to study the effects of central banks' bond purchases on financial markets. By studying how financial variables move after announcements, it is possible to identify the effects of bond purchases without capturing the effects of other news that also affects financial prices.

But there are factors that mean analyses of announcement effects could potentially overestimate or underestimate the effects of bond purchases. One factor that could lead to overestimation of the effects of the purchases is that the Riksbank on several announcement days also cut the repo rate, which makes it difficult to fully distinguish the effects of extended bond purchases from the effects of a lower repo rate. There are also factors that could lead to underestimation of the effects. The analysis only captures the effects of unexpected purchases, although financial prices should also have been adjusted when market participants changed their expectations of coming bond purchases at an earlier stage. In addition, effects may arise gradually while previously announced purchases are being implemented.

This article shows that the Riksbank's purchases of government bonds have made monetary policy more expansionary by contributing to lower interest rates and a weaker

exchange rate via various channels. The purchases have contributed to lower government bond yields, both by affecting market participants' expectations of the future repo rate (the signalling channel) and by pushing down term premiums on government bonds (the premium channel). Through the portfolio balance channel, the purchases have also contributed to lower yields on other assets, such as mortgage bonds and corporate bonds, and to higher equity prices. In this way, the bond purchases have formed a complement to cutting the repo rate. The bond purchases have also meant that the exchange rate has been weaker than it would otherwise have been. It is not possible to rule out the possibility that monetary policy also became more expansionary through the liquidity in the banking system increasing when the Riksbank purchased bonds, which can have increased the banks' lending. However, such effects are much more difficult to measure.

In conjunction with announcements of bond purchases, real interest rates have fallen more than nominal interest rates have, which indicates that inflation expectations have risen. The effect on the real interest rates is important, as according to economic theory, real interest rates affect consumption and investment. The effect on inflation expectations is also important, as the bond purchases were initiated to anchor inflation expectations and retain confidence in the inflation target. One important conclusion is thus that the effect of the Riksbank's bond purchases is greater than a more limited analysis of its effects on nominal interest rates indicates.

The overall conclusion of this study is that the Riksbank's government bond purchases have contributed to more expansionary conditions on the financial markets. The expansionary effects of the bond purchases on financial markets indicate that the bond purchases have also had expansionary effects on macroeconomic developments in Sweden.

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