



Staff memo

# **An event study of the effects of asset purchases on financial prices during the pandemic**

Peter Gustafsson

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## **Staff Memo**

A Staff Memo provides members of the Riksbank's staff with the opportunity to publish advanced analyses of relevant issues. It is a publication for civil servants that is free of policy conclusions and individual standpoints on current policy issues. Publication is approved by the appropriate Head of Department. The opinions expressed in staff memos are those of the authors and are not to be seen as the Riksbank's standpoint.

# Summary<sup>1</sup>

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The coronavirus pandemic led to a historically significant decline in global economic activity and sharp price movements in financial markets over the course of a few months in spring 2020. Economic policy-makers worldwide, including the Riksbank, took measures to prevent a financial crisis and mitigate the real economic effects of the lockdowns. The Riksbank's measures, like several other central banks, included significant purchases of assets. Interest rates and risk premiums stopped rising, and in Sweden they fell to lower levels in many cases than before the pandemic.

Using a well-established method, this staff memo examines how the Riksbank's asset purchases during the pandemic affected financial prices. The purchases included both public and private assets and were announced as an envelope for total purchases over a longer period of time. The results of the analysis indicate that the purchases contributed to more expansionary financial conditions via lower interest rates, in particular on municipal bonds and covered bonds, a somewhat weaker krona and slightly higher equity prices.

The estimated effects are uncertain, partly because the asset purchases were announced at the same time as other measures, and because the effects probably did not just arise at the time of the announcements. The analysis also takes no account of the fact that asset purchases were aimed at reducing the risk of a financial crisis and can thus underestimate the significance of what would have happened if the Riksbank had not purchased any assets.

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<sup>1</sup> The author would like to thank Johan Almenberg, Mikael Apel, Meredith Beechey, Vesna Corbo, Henrik Erikson, Mattias Erlandsson, Jesper Hansson, Jens Iversen, David Kjellberg, Stefan Laséen, Åsa Olli Segendorf and Tamás Vasi for valuable comments.

# Asset purchases to counteract a credit crunch

Between spring 2015 and spring 2020, the repo rate was zero per cent or lower at the same time as the Riksbank purchased significant amounts of government bonds. During this period, the Executive Board of the Riksbank deemed that there was scope to hold the repo rate slightly lower, but the purchase of government bonds was considered to be a well-functioning complement to the repo rate in order to achieve the inflation target.

When the pandemic broke out in spring 2020, the economic outlook deteriorated sharply. This caused major price movements in financial markets and, over the course of a few weeks in March, the risk of a financial crisis and a severe credit crunch was imminent. In order to prevent such developments and ensure low interest rates in key financial markets for banks, companies and households, governments and central banks worldwide implemented powerful measures. As in previous crises, some of the central banks' more urgent crisis measures consisted of various forms of liquidity support to banking systems. In several financial markets, investors moved away from risky assets and, as a result, the market situation tightened. Many central banks, including the Riksbank, chose to take over some of the risks in this situation by purchasing risky assets.

Asset purchases can affect financial prices in several ways.<sup>2</sup> They can affect long-term interest rates via their effects on the expected short-term rate (signalling channel) and as a result of effects on the term premium (premium channel). The purchase of bonds can also affect other market rates and asset prices by investors starting to demand other asset classes (portfolio rebalancing channel). For small, open economies such as the Swedish economy, a significant part of the effects can also arise via an exchange rate channel. By increasing the volume of central bank reserves and increasing the banking system's liquidity surplus, the Riksbank can also increase banks' lending to households and companies (liquidity channel).<sup>3</sup> All these channels contribute to making the financial conditions more expansionary. In addition, asset purchases can contribute to lower short-term interest rates by increasing the value of bonds as collateral in various transactions.<sup>4</sup>

In Sweden, the Riksbank decided on an asset purchase programme which, after being expanded in two stages, eventually amounted to SEK 700 billion. Purchases included government, municipal, mortgage and corporate bonds, as well as assets with shorter maturities in the form of treasury bills and commercial paper (see Figure 1). As a

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<sup>2</sup> For an overview and discussion, see Alsterlind et al. (2015).

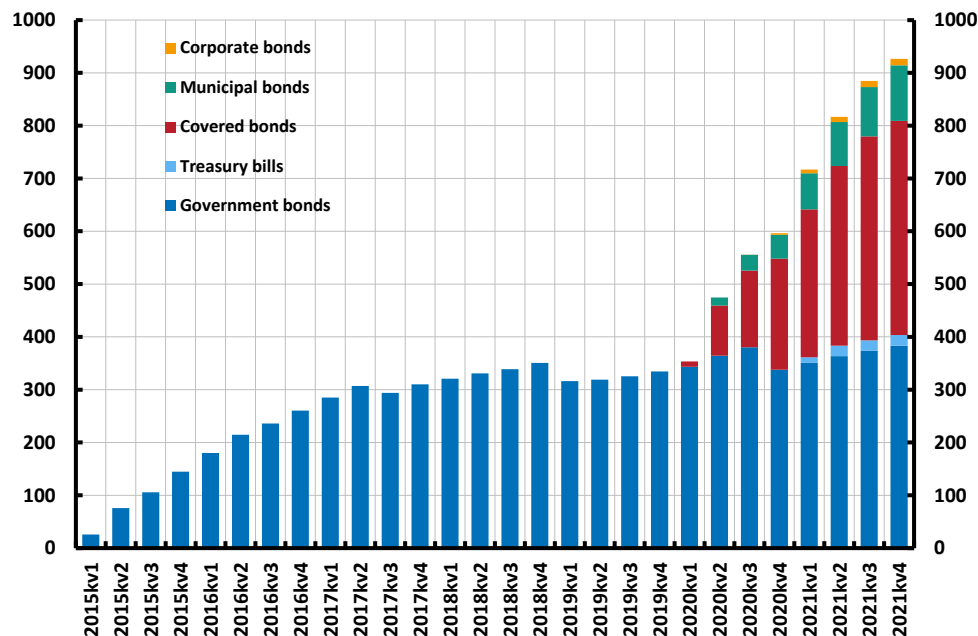
<sup>3</sup> In practice, however, this may imply a portfolio rebalancing with effects on prices. This is because banks' reserves at the central bank have very short maturities and banks may therefore want to shift their demand towards assets with longer-term maturities in order to restore the average maturity of their assets, see Christensen and Krogstrup (2018).

<sup>4</sup> For a more detailed discussion on how the Riksbank's asset purchases affected shorter government bond yields during the period 2015-2017, see Erikson (2021).

share of GDP, the Riksbank's balance sheet increased from just under 20 per cent to just over 30 per cent between March 2020 and the end of 2021.<sup>5</sup>

**Figure 1. The Riksbank's asset purchases, 2015- 2021**

SEK billions, nominal amount



Source: The Riksbank

The scope of asset purchases suggests that the Riksbank will have to consider the asset portfolio when formulating monetary policy in the years to come. It is therefore important to understand how purchases have so far affected prices in financial markets. This memo complements previous analysis by estimating the impact of purchases on a selection of financial prices during the pandemic.<sup>6</sup>

In the next section I will describe and discuss the changes in a selection of financial prices in connection with the Riksbank's announcements of its asset purchases. The section also discusses how the aggregate effects of asset purchases can be estimated and how they relate to previous analyses and price developments during the period. Uncertainty factors are then discussed that may have had a bearing on the effects, before the final section summarises.

<sup>5</sup> The asset purchase program was terminated at the end of 2021, after which purchases were made solely to compensate for maturing bonds in the Riksbank's holdings, see Sveriges Riksbank (2021).

<sup>6</sup> The Riksbank's purchases of commercial paper and corporate bonds are excluded from the analysis in this staff memo. This is because an estimation of effects imposes higher demands on data access/data management and the analysis needs to take greater account of the heterogeneity of these asset classes.

## Effects of asset purchases on financial prices

A common strategy for examining the effects of asset purchases is to divide the effects on prices into so-called stock and flow effects.<sup>7</sup> A stock effect is a persistent change in prices that occur as a result of changes in expectations of the future supply of the asset. The flow effect is the effect on prices that occur when the purchases are made and may, for example, reflect the fact that purchases counteract liquidity shortages in the financial system. To the extent that investors are forward-looking and markets are working well, this indicates that the measures lead mainly to stock effects. This view is also supported in the economic literature where studies find that the flow effects are smaller and more transitory.<sup>8</sup>

Event studies, which compare prices in financial markets immediately before, or after the central bank has announced a measure, have been a common way of estimating stock effects.<sup>9</sup> The analysis in this memo builds on previous event studies of the Riksbank's pre-pandemic government bond purchases.<sup>10</sup> One advantage of the method is that it can be used regardless of the channel through which the measures operate. The focus of this memo is therefore on the magnitude of the effects rather than how the measures transmitted to financial prices.

### Three announcements on the envelope for asset purchases

In this study, we assume that a major part of the effects of asset purchases can be estimated based on the price movements at the three points in time when the Riksbank launched and adjusted the size of the maximum amount for asset purchases<sup>11</sup>:

- The announcement following the extraordinary monetary policy meeting on 16 March 2020, where the Riksbank decided to purchase assets for a maximum of SEK 300 billion. These would include, if necessary, nominal and real government bonds, municipal bonds and covered bonds during the period

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<sup>7</sup> See, for example, D'Amico and King (2013).

<sup>8</sup> See, for example, D'Amico and King (2013). In contrast to these findings, Vissing-Jørgensen (2021) finds that flow effects from the asset purchases by the US Federal Reserve were important for understanding developments when the US government bond market was functioning poorly in spring 2020.

<sup>9</sup> Event studies capture the effects that operate exclusively via pricing, in line with the main channels identified in the literature and generally follow the approach taken in Fama et al. (1969), who make three critical assumptions: (i) the event is unexpected (ii) there are no other factors influencing the asset prices studied (iii) the markets are efficient.

<sup>10</sup> See Melander (2021), De Rezende (2017) and De Rezende, Kjellberg and Tysklind (2015).

<sup>11</sup> According to market indicators and comments, the markets did not expect any change in the purchasing envelope in other ordinary monetary policy decisions when the envelope was left unchanged, so these are not discussed in detail. Unlike the bond purchases the Riksbank conducted prior to the pandemic, the pandemic-related bond purchases in March 2020 were expanded to several different bond types. This involved new forms of announcements, including about the distribution of purchases among different asset classes. However, it is very difficult to form an opinion on the effects of how the purchases were distributed over different assets, partly because it is difficult to know what expectations the market had.

March-December 2020.<sup>12</sup> It is worth noting that in addition to the asset purchases, the Riksbank announced decisions on a number of other measures that may have affected pricing in the financial markets.<sup>13</sup>

- The announcement on 1 July 2020 after the ordinary monetary policy meeting when the asset purchase programme was extended to mid-2021 and the purchasing envelope was expanded by a further SEK 200 billion.
- The announcement on 26 November 2020 after the ordinary monetary policy meeting when the programme was extended until 31 December 2021, and the envelope was expanded by a further SEK 200 billion to a total nominal amount of up to SEK 700 billion.<sup>14</sup>

In view of the fact that various agents in Sweden and abroad launched many measures at approximately the same time, the choice of time window to identify effects could be expected to be important, particularly with regard to the announcement on 16 March.<sup>15</sup> This announcement took place four days after the European Central Bank, the ECB, announced the expansion of its Asset Purchase Programme (APP) and one day after the US Federal Reserve announced extensive purchases of US government and mortgage bonds. The following day, the ECB also announced its Pandemic Emergency Purchase Programme (PEPP) with a further EUR 750 billion in asset purchases. The development of the spread of infection, the combined measures and risk appetite on the markets had already helped to alleviate the situation when the announcements were made on 1 July and 26 November. Yields and yield spreads between risky and risk-free assets had also gradually decreased.

In this memo, like many other events studies on the effects of asset purchases, I focus on daily price movements in connection with announcements, more precisely on prices when the market is closed immediately after the announcement compared to the corresponding prices at closure immediately prior to the announcement.<sup>16</sup> Since Swedish yields normally follow foreign yields, I also compare the development in Swedish financial prices with the development in corresponding German prices in order to be able to identify the effect of the Riksbank's announcements.<sup>17</sup> This is particularly

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<sup>12</sup> A few days later, on March 19, commercial paper and corporate bonds were also included in the asset purchases.

<sup>13</sup> The Riksbank increased the flexibility with regard to which collateral the banks could use when they borrowed Swedish kronor from the Riksbank, announced weekly market operations at longer maturities and lowered the interest rate on the Riksbank's standing lending facility. Overall, these measures helped banks to access very large amounts of liquidity, and a ceiling for their funding costs was established at the equivalent to 0.2 percentage points above the repo rate, see also Gustafsson and Von Brömsen (2021).

<sup>14</sup> All decisions regarding asset purchases are available on the Riksbank's website.

<sup>15</sup> The choice of number and length of windows implies a balance between bias and efficiency. Fewer events/shorter time windows can lead to bias in the estimate, since there is a risk that the price adjustment to the changed expectations will not be fully captured, while a larger choice/longer time window can capture effects that are not derived from asset purchases and thus introduce noise into the effect estimate.

<sup>16</sup> See e.g. Gagnon et al. (2011) and Rebucci et al. (2021)

<sup>17</sup> An alternative would of course be to shrink the time window within which we identify effects and study intraday data, which requires more extensive access to data but would probably be a valuable complement to my analysis.

important for the announcement in March, when uncertainty in global financial markets was high and many asset prices varied considerably.

## Effects at the time of the Riksbank's announcements

I study the changes in a selection of financial prices and Table 1 summarises the results.<sup>18</sup> The movements in Swedish financial prices were greatest after the Riksbank's first announcement on the evening of 16 March when Swedish yields fell on a broad front. However, the fact that global yields varied very substantially during this period creates some uncertainty as to how the fall in yields shall be interpreted. Swedish yields usually follow German yields and it is therefore worth noting that foreign yields, in contrast to Swedish yields, rose significantly on 17 March. While the decline in the Swedish 10-year yield remained at 7 basis points, the decline in the yield spread to Germany was greater, 21 basis points, and in Norway, which did not purchase bonds to any significant extent during the pandemic, yields also rose slightly.<sup>19</sup> The spread to shorter German yields also decreased, but not as much. If international driving forces are taken into account, the effect on Swedish yields may have been greater than the 7 basis points that can be observed.<sup>20</sup>

The fact that the Riksbank announced for the first time purchases of asset classes other than government bonds may also have surprised the markets and caused yields on riskier assets such as covered bonds and municipal bonds to decrease slightly more than government bond yields with the corresponding maturity.<sup>21</sup> Although Swedish equity prices rose slightly, the increase was smaller than in Europe. The fact that purchases appear to have contributed to lower Swedish interest rates may also have been an explanation for the krona's depreciation. Overall, the announcement on 16 March seems to have contributed to more expansionary financial conditions, particularly in relation to several other economies where interest rates increased.

The expansions of the programme were more expected at the time of the Riksbank's announcements in July and November and the movements in financial prices on these occasions were considerably smaller than in March. Sentiment in financial markets had also normalised in several respects. Government bond yields even rose slightly in connection with the announcement in July and the yield spread to Germany fell only by one basis point at the time of the announcements in July and November. At the same time, yields on government bonds and covered bonds fell slightly further. The

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<sup>18</sup> Changes for a slightly larger selection of financial prices are shown in the Appendix.

<sup>19</sup> In contrast to this, the announcement effects on Swedish yields often had an impact of close to one-to-one on the yield spread to Germany at the time of announcements of government bond purchases in 2015-2017, see Melander (2021). If I identify the effect of the Riksbank's announcement on 16 March on the basis of the yield spread to German yields, an aggravating circumstance is that the pricing of German yields may have been affected by changes in market expectations concerning the ECB's subsequent measures.

<sup>20</sup> Given that asset purchases were announced in order to prevent a more negative scenario with higher interest rates and credit tightening, it is also not self-evident that foreign yields are relevant comparative figures when these effects are estimated, as discussed later in this memo.

<sup>21</sup> This can be compared with the fact that the markets were to a great extent surprised by the Riksbank's announcements of government bond purchases in the spring of 2015, which led to price movements that were relatively large in relation to subsequent announcements.



krona was largely unaffected and equity prices increased slightly faster than corresponding European equity prices.

**Table 1. Changes in financial prices at the time of the Riksbank's announcements**

Daily change, basis points and percentage change, respectively

	17 March	1 July	26 November
Government bond, 2 years	-1	-1	0
Government bond, 5 years	-5	2	-1
Government bond, 10 years	-7	3	-1
Expected interbank rate (swap rate), 5 years	-5	1	-2
Government bond, Germany, 2 years	4	1	0
Government bond, Germany, 5 years	10	3	0
Government bond, Germany, 10 years	14	4	0
Government bond, United States, 10 years	33	3	-4
Government bond, Norway, 10 years	3	6	0
Yield spread, Secured-swap, 5 years	-7	-3	-3
Yield spread, Kommuninvest-swap, 5 years	-6	-4	-3
Inflation compensation, years 6-10	-1	-3	3
Forward rate (expected repo rate in 2 years)	3	1	-1
Swedish equity prices, OMXS (%)	1.8	0.8	0.2
European equity prices, Euro STOXX (%)	2.4	0.0	0.0
Nominal effective exchange rate, KIX (%)	1.0	-0.1	0.0
Nominal exchange rate, SEK/EUR (%)	-0.3	0.0	0.0
Nominal exchange rate, SEK/USD (%)	1.3	-0.2	0.0

Note. All bond yields are interpolated to fixed maturities and calculated as zero coupon yields. Note that the Riksbank's announcement on 16 March took place after the markets had closed, which is why the day-to-day change relates to 17 March. 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

## Expectations on financial markets

If market expectations match the Riksbank announcement exactly, prices do not change. Neither is it then possible to use event studies to see whether the announced measure has had any effect. This does not mean, however, that the purchases had no effect, but only that these effects were reflected in financial market prices prior to the announcement. In the second extreme case, the whole announcement is unexpected and the measured price movement in Table 1 would then be the effect of the new purchases announced. However, in order to ascertain the size of the effect of asset

purchases, it will therefore in practice be necessary to identify how much of the announcement was unexpected.<sup>22</sup> Next, I will therefore discuss estimates of market participants' expectations at the time of the three announcements, in order to then link them to the measured price movements in Table 1.

### Market participants was most surprised by the announcement in March

It is difficult to assess market participants' expectations of asset purchases and it is often necessary to rely on analyses in market newsletters at the time of the announcements.<sup>23</sup> It is very difficult to know from this type of source what the market was expecting when asset purchases were launched on 16 March. The Riksbank's announcement of extended purchases seems to have been expected, but it is much more difficult to determine the type and size of purchases that were expected. However, the volumes mentioned by market analysts stretched over a wide interval – see Appendix for details.

To support an estimate of expectations, the size of the asset purchase programmes that had already been launched in other countries during the pandemic can be studied. The average size of the envelopes for the programmes already announced by the ECB and the Federal Reserve was approximately 1% and 3% respectively of GDP.<sup>24</sup> Based on this and the market newsletters indicating possible volumes for the Riksbank's asset purchases, I assume that the market pricing reflected expected asset purchases equivalent to SEK 100 billion, or about 2 per cent of Swedish GDP, at the time of the announcement on 16 March. According to market analysts' communication, however, there seems to have been a greater consensus on somewhat less surprising announcements in July and November.<sup>25</sup> Table 3 gives the assumptions about market participants' expectations of asset purchases that I use in the next step to estimate the total effects of asset purchases.

**Table 2. Market expectations at the time of the announcements**

SEK billions, nominal amounts

	16 March	1 July	26 November	Total
Announcement	300	200	200	700
Expected announcement	100	150	100	

Source: The Riksbank, own assumptions

<sup>22</sup> Since all the announcements studied included an unexpected component, we can thus obtain information about the effects of the purchases on all these occasions.

<sup>23</sup> It is of course difficult to explain market pricing on the basis of a very limited sample of market analysts' expectations, especially if expectations differ greatly between the participants. In addition, pricing takes greater account of risks and reflects a more unbiased forecast compared to expectations communicated in market newsletters.

<sup>24</sup> The ECB increased its asset purchases under the APP programme by EUR 120 billion, while the Federal Reserve announced purchases of USD 700 billion. GDP refers to the annual GDP for 2019.

<sup>25</sup> The respondents in SEB's investor survey expected an average increase of SEK 160 billion in the asset purchase programme in [July](#) and SEK 100 billion in [November](#). For quotations from market newsletters, see also Appendix.

## Estimates and perspectives on the effects of the asset purchases

Using market expectations estimates, we can extrapolate the effects identified in connection with the announcements in order to estimate the effects of asset purchases. This is assuming that expected and unexpected changes in asset purchases affect financial prices in the same way. This way of extrapolating the measured effects thus implicitly also gives an estimate of the effect already internalised by the markets prior to each announcement.

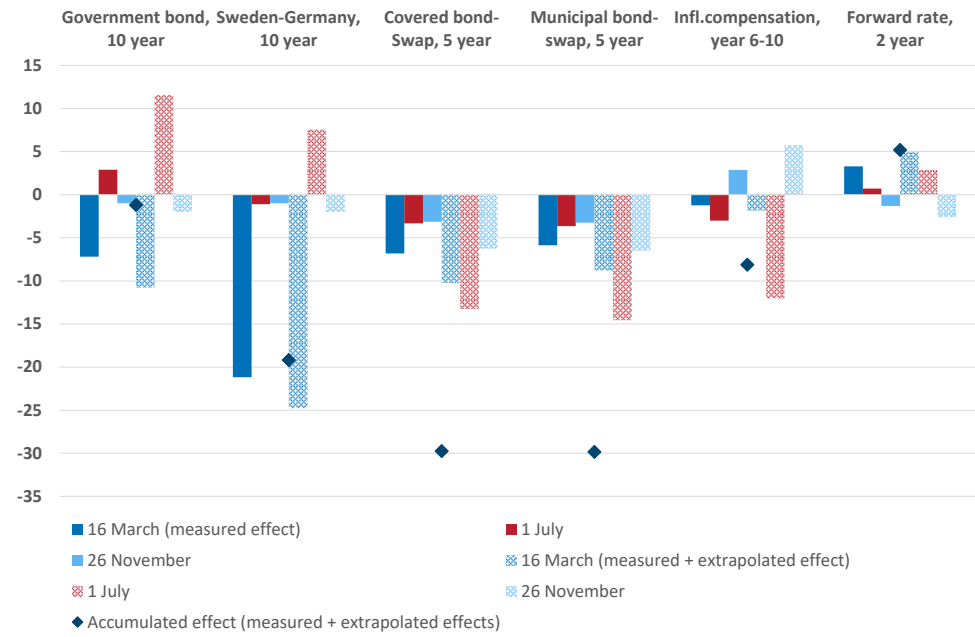
Figures 2 and 3 show the measured effects at the time of the announcements along with the estimated total effects of each announcement and a summary of the effects of the three announcements for a sample of financial prices.<sup>26</sup> Since all the announcements examined were to some extent expected, the estimated total effects of the Riksbank's bond purchases will be greater than the price movements measured in the window around the announcement. Compared to the announcement in March, the surprises were less on 1 July and 26 November (see Table 2).

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<sup>26</sup> An example of how I calculate total effects: In March, SEK 200 billion of the announced SEK 300 billion are expected to have been unexpected and the yield spread between covered bonds and swap decreased by 7 basis points at the time of the announcement. If expected and unexpected changes in asset purchases affect financial prices in the same way, we can extrapolate the measured effect so that the total effect is  $7/(2/3) = 10$  basis points. The markets had thus already internalised 3 basis points of the impact of the measure before the announcement. The effects on a larger sample of financial prices and a sensitivity analysis are presented in the Appendix.

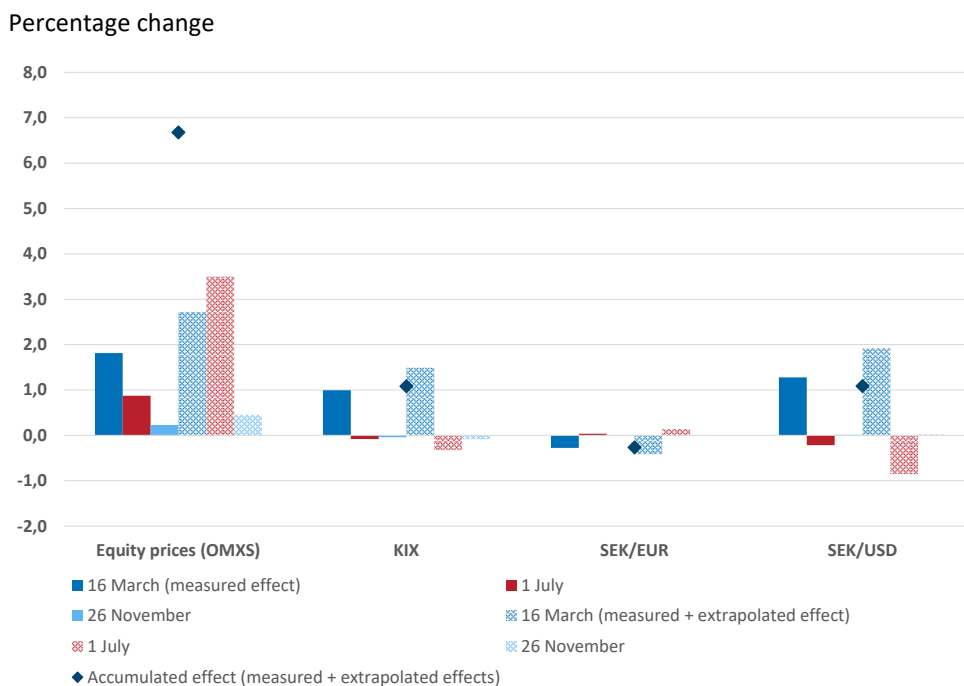
**Figure 2. Effects of asset purchases on bond markets**

Basis points



Note. The extrapolated effect on the yield spread between Sweden and Germany is calculated as the difference between the extrapolated effect on Swedish government bonds and the measured interest rate movement for German government bonds at the time of the announcement.

Sources: Macrobond, the Riksbank and own calculations

**Figure 3. Effects of asset purchases on the stock market and foreign exchange market**

Note. The extrapolated effects on Swedish equity prices can be compared to European equity prices, which rose by 2.4 per cent on 17 March and remained almost unchanged on 1 July and 26 November. KIX, SEK/EUR and SEK/USD refer to measures of nominal exchange rates.

Sources: Macrobond, the Riksbank and own calculations

In Figure 2, the total effect of the asset purchases on the 10-year government bond yield is less than the sum of the measured effect at the time of the three announcements. This is due to the fact that the announcement on 1 July led to slightly higher government bond yields despite the fact that the announcement was slightly larger than the market is judged to have expected. The price movement on 1 July has a relatively large impact on the cumulative effect, thereby counteracting the measured falls in yield on 17 March and 26 November.

There are several possible explanations for the yield increase on 1 July. A smaller sample of intraday data on government bond yields shows that yields rose slightly in the morning before the announcement on 1 July, in line with foreign yields. Alternatively, market participants expected larger asset purchases than the Riksbank announced or a different distribution of purchases, with relatively larger future government bond purchases compared with what the Riksbank announced.

### Difficult to compare the effects of purchases with previous experiences

The extensive asset purchases by central banks after the financial crisis mean that there is a wealth of studies on how the purchases have affected pricing in financial markets and, in particular, long-term government bond yields. A general conclusion in the academic literature has been that government bond purchases corresponding to 10% of GDP have contributed to a fall in yield on 10-year government bonds of

around 50 basis points.<sup>27</sup> At the same time, there are good reasons to expect that it is the size of the outstanding stock of government bonds rather than the size of the economy that has a bearing on the magnitude of the effects. Since Sweden's government bond market is relatively small, purchases corresponding to 10 per cent of GDP would represent a relatively large proportion of outstanding bond stock, which suggests that the effects of government bond purchases will be greater when purchases are measured as a percentage of GDP. This picture is also confirmed by estimates of the effects of the government bond purchases in 2015–2017 in De Rezende, Kjellberg and Tysklind (2015) and Melander (2021).<sup>28</sup>

Assuming that the effects are linearly related to the size of purchases as a percentage of GDP, I can standardise the effects of the Riksbank's asset purchases during the pandemic. However, the composition of purchases during the pandemic was very different from before since covered bonds and municipal bonds together accounted for about 85% of purchases.<sup>29</sup> The results in Table 4 should therefore not be compared with previous effects of government bond purchases, but rather roughly represent the effects of municipal and private bond purchases corresponding to 10 per cent of GDP. By this measure, Swedish government bond yields fell in relation to German yields (-14 basis points). Yields on covered bonds/municipal bonds decreased by a further 20 basis points.

**Table 3. Standardised effects of the Riksbank's asset purchases during the pandemic, corresponding to 10 per cent of annual GDP**

Basis points and percentage change, respectively

	Effect of purchases equivalent to 10% of GDP
Government bond yields, 10 years	-1
Yield spread Sweden– Germany, 10 years	-14
Yield spread covered bonds – swap, 5 years	-21
Yield spread municipal bonds – swap, 5 years	-22
Nominal effective exchange rate, KIX (%)	0.8
Equity prices, OMXS (%)	4.8

Note. GDP for 2019. Municipal bonds refer to bonds issued by Kommuninvest i Sverige AB. The KIX (krona index) is a weighted average of the currencies in 32 countries that are important for Sweden's international trade.

Sources: Macrobond, the Riksbank and own calculations

<sup>27</sup> Gagnon (2016) brings together 26 studies of different characteristics that stretch across the United States, the United Kingdom, the euro area, Japan and Sweden and standardise the effects of purchases equivalent to 10 percent of GDP. The median estimate of these studies is 50 basis points. The US, UK and euro area median estimates are all in the range of 45–55 basis points.

<sup>28</sup> I calculate the standardised effects of government bond purchases in Melander (2021) in the same way as in this memo. The calculations are shown in the Appendix.

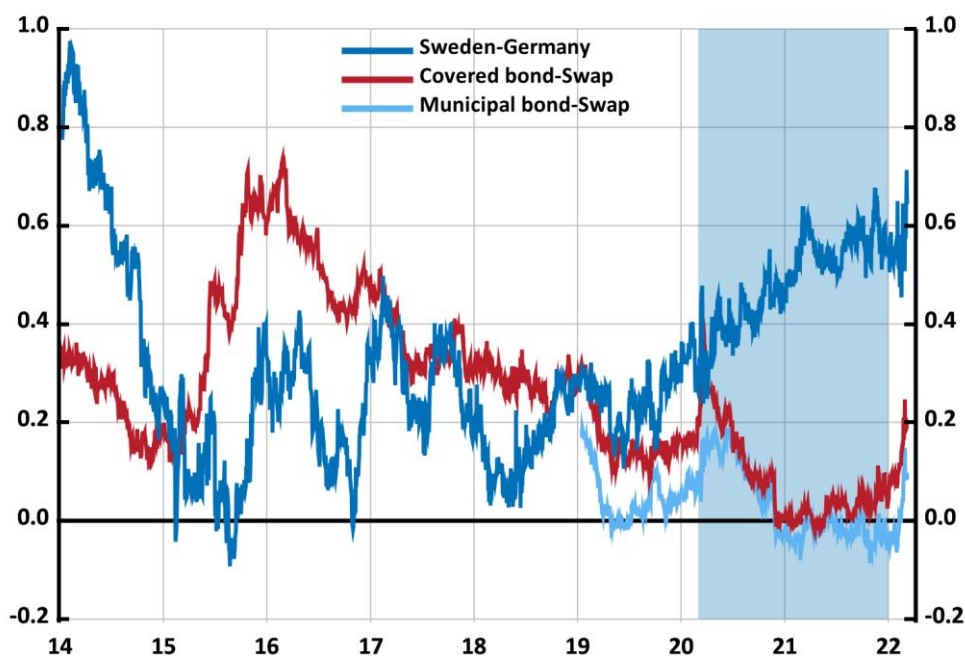
<sup>29</sup> If the Riksbank's purchases of treasury bills and commercial paper are not taken into account, purchases were divided as follows: covered bonds (67%), municipal bonds (17%), government bonds (14%) and corporate bonds (2%).

There are still very few studies of the effects of asset purchases by various central banks during the pandemic. However, Rebucci et al. (2021) study, among other things, the effects of announcements by 21 central banks in March and April 2020. An overall conclusion is that asset purchases remained effective in order to depress longer yields in advanced economies.<sup>30</sup>

In order to add more perspective to the effects, we can also compare the estimated effects with how financial prices developed when the Riksbank built up its asset holdings during the pandemic. For example, the effects on yield spreads between covered/Kommuninvest and swap (both 30 basis points, see Figure 3) appear in such a comparison to be significant. However, it is important to bear in mind that although the estimated effects on these yield spreads largely correspond to the observed decline in 2020, this does not mean that asset purchases *explain* the entire decline. For example, the yield spread between Sweden and Germany has risen significantly despite the fact that the Riksbank's asset purchases have, according to the analysis in this memo, resulted in a smaller yield spread (see Figure 4).

**Figure 4. Yield spreads**

Percentage points



Note. Swap rate refers to the expected interbank rate (STIBOR).

Sources: Macrobond and the Riksbank

<sup>30</sup> The study covers central banks in both advanced and emerging economies. It is notable that the authors have made a mistake about the exact time for the Riksbank's announcement and are therefore studying the change in the Swedish 10-year yield on 16 March, the day before the announcement.

## The estimated effects are uncertain

The results presented in this memo are based on the assumption that the daily price movements that followed the announcements in March, July and November clearly represent the effects of the announced asset purchases and that I have managed to identify market expectations at the time of the announcements. However, there are further grounds for interpreting the estimated effects with caution.

Firstly, asset purchases were aimed at preventing a credit crunch with higher interest rates and reduced lending. An accurate estimate of the effects would therefore have to be made on the basis of a comparison with a counterfactual scenario in which the Riksbank has refrained from announcing asset purchases, which would probably have resulted in higher yields, less lending and possibly also disruptions to market functionality. Such an analysis would probably indicate greater effects than those described here.

Secondly, the situation in financial markets was very uncertain in March when the Riksbank launched asset purchases. The uncertainty was, of course, due to the spread of infection, but also because the response of economic-policy makers was not yet known. This made prices very volatile, making it genuinely difficult to identify the specific effects of the Riksbank's announcements. For example, the Swedish Government proposed short-time work compensation schemes and opportunities for companies to defer tax payments on 16 March, the same day as the Riksbank launched asset purchases.

Thirdly, it is also more difficult to measure the effects when an increasing share of them do not occur when asset purchases are announced. This is because market participants increasingly identify a systematic approach in central banks' asset purchases and change prices in response to macroeconomic news rather than central bank announcements.<sup>31</sup> The effects will then to a higher degree be estimated on a sample of smaller surprises and smaller price movements, making them more uncertain.

A further, more specifically Swedish, complicating factor is that the Riksbank announced its asset purchases during a period when the Riksbank's monetary policy operational framework was undergoing reform.<sup>32</sup> Together with the announcements on 16 March and 1 July on changes to the terms and conditions of the operational framework, this enabled the banks to obtain cheaper funding (against collateral) from the Riksbank. This could explain part of the decline in yields on covered bonds.

The analysis also assumes that the measured announcement effects reflect more persistent effects as a result of changed expectations among market participants. At the same time, there is empirical support for the fact that the market pricing of longer-term government bond yields partly overreacts to announcements, which would indicate that some of the effects have been overestimated.<sup>33</sup>

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<sup>31</sup> See, for example, discussion in Bhattacharai and Neely (forthcoming).

<sup>32</sup> See Sveriges Riksbank (2020).

<sup>33</sup> See Hanson et al. (2021).



The Riksbank's purchases of different asset classes were announced at the same time, which means that I cannot distinguish the effects of purchases of the individual asset classes. The measured effects are therefore based on the assumption that unexpected announcements were evenly distributed among the different assets. This is doubtful, especially at the launch of asset purchases in March, when the Riksbank announced that it intended to buy asset classes that had not purchased previously.

## Concluding remarks

There is a relatively strong international consensus that asset purchases, both before and during the pandemic, have been effective in making financial conditions more expansionary. During the pandemic, asset purchases were also used to prevent the slowdown in economic activity from becoming a full-scale financial crisis. Such a development would probably have had severe real economic consequences and made it considerably more difficult for the Riksbank to meet the inflation target.

In this event study, I have examined how the Riksbank's announcements of asset purchases affected financial prices during the pandemic. The method is well documented, but it is difficult for several reasons to distinguish the effects of the asset purchases during the pandemic and the estimates should be interpreted with caution. The results indicate that the purchases contributed to more expansionary financial conditions through lower interest rates, weaker exchange rates and higher equity prices. The purchases during the pandemic did not primarily involve government bonds, but included large purchases of covered bonds and municipal bonds. We have no previous Swedish experience of such purchases, but the results of this analysis still suggest that purchases clearly affected the yields in these markets.

In addition to refining the event study by studying intraday data, a counterfactual analysis would be of interest to gain an understanding of the preventive effect of the asset purchases. More work on more detailed data can also be done to better understand the transmission channels through which purchases operated, which would probably also contribute to a more certain assessment of the effects. In order to ultimately calibrate the use of monetary policy tools, it is of course very important to also understand the transmission from the financial markets to the resource utilisation of the economy and inflation, an issue which has not been discussed in this memo.

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# APPENDIX

Quotes from a sample of market newsletters that preceded the announcements on 16 March, 1 July and 26 November.

## **Announcement 16 March 2020:**

Nordea: "We expect further action from the Riksbank. First of all, more measures to support companies, and in specific via the corporate bond market, can't be ruled out. Moreover, we expect the Riksbank to announce an extension of the QE programme. The bank will buy government bonds at an annual pace of SEK 60bn, up from the pure program of approximately SEK 30bn as planned for the second half of this year.

SEB: "...much more aggressive than our revised forecast from earlier today that the Riksbank would increase purchases by SEK 150-200bn."

SHB: "...we expect the Riksbank to release a new QE programme of SEK 90bn and include government and municipal bonds."

## **Announcement 1 July 2020:**

Bloomberg Economics: "...we now expect the Riksbank to stagger a total of 450-500 billion kronor of purchases through mid-2021".

NatWest: "A realistic scenario could involve the SEK 300bn asset purchase ceiling being raised to SEK 400-500bn and extension through H1:21".

Nordea: "We believe that the purchase programme will be expanded but that this will not be announced until September or November".

SEB: "The Executive Board announces an extension of the QE programme from the end of this year to mid-2021 and expands the size of bond purchases from SEK 300 billion to SEK 500 billion".

SHB: "We believe that the Riksbank will increase this amount to SEK 500 billion and extend the period until the end of June 2021".

Swedbank: "We expect asset buying to eventually be expanded (from today's approved framework of SEK 300 billion) and extended into next year".

## Announcement 26 November 2020:

Bloomberg Economics: “We expect asset purchases may be expanded by at least SEK 100 billion through December 2021.”

SEB: “We believe that the QE programme will be extended by another SEK 100 billion and will be extended until the end of 2021”.

SHB: “Our call is that the Riksbank extends the framework for asset purchases from SEK 500 to SEK 600 billion, while also extending the period for purchases from June 30 to end 2021”.

Swedbank: “We think the Riksbank will announce as soon as this meeting that it wants to expand asset purchases by between SEK 100–150 billion and extend them through the second half of 2021”.

## Effects on a larger sample of financial prices

**Table 4. Measured, extrapolated and cumulative effects on financial prices**

Basis points and percentage change, respectively

	Measured effect			Measured and extrapolated effect			Total
	16/3	1/7	26/11	16/3	1/7	26/11	
Government bond, 2 years	-1	-1	0	-2	-3	1	-5
Government bond, 5 years	-5	2	-1	-8	7	-2	-2
Government bond, 10 years	-7	3	-1	-11	12	-2	-1
Government bond, Germany, 2 years	4	1	0				
Government bond, Germany, 5 years	10	3	0				
Government bond, Germany, 10 years	14	4	0				
Yield spread Sweden-Germany, 2 years	-5	-2	0	-6	-4	1	-10
Yield spread Sweden-Germany, 5 years	-15	-1	-1	-18	4	-2	-15
Yield spread Sweden-Germany, 10 years	-21	-1	-1	-25	8	-2	-19
Swap rate, 2 years	-2	-2	-1	-3	-9	-1	-13
Swap rate, 5 years	-5	1	-2	-8	4	-3	-7
Covered bond, 2 years	-6	-2	-1	-9	-7	-2	-19
Covered bond, 5 years	-12	-2	-5	-18	-9	-9	-36
Yield spread covered-government, 2 years	-5	-1	-2	-7	-4	-3	-14
Yield spread covered-government, 5 years	-7	-4	-4	-10	-16	-7	-34
Yield spread, covered-swap, 2 years	-4	0	-1	-6	2	-1	-6
Yield spread, covered-swap, 5 years	-7	-3	-3	-10	-13	-6	-30
Yield, Kommuninvest, 5 years	-11	-3	-5	-16	-11	-9	-36

	Measured effect			Measured and extrapolated effect			Total
Yield spread, Kommuninvest-government, 5 years	-6	-4	-4	-9	-18	-8	-34
Yield spread, Kommuninvest-swap, 5 years	-6	-4	-3	-9	-15	-6	-30
Inflation-indexed bond, 2 years	-2	0	-2	-3	-2	-4	-9
Inflation-indexed bond, 5 years	-6	2	-4	-9	7	-8	-9
Inflation-indexed bond, 10 years	-7	4	-4	-10	18	-8	-1
Inflation compensation, 2 years	1	0	2	1	-2	5	4
Inflation compensation, 5 years	1	0	3	1	0	6	7
Inflation compensation, 10 years	0	-2	3	0	-6	6	-1
Inflation compensation, years 6-10	-1	-3	3	-2	-12	6	-8
Forward rate (rate in) 1 year	0	0	0	0	2	-1	1
Forward rate (rate in) 2 years	3	1	-1	5	3	-3	5
Forward rate (rate in) 3 years	3	2	-2	4	7	-4	7
Swedish equity prices (OMX) (%)	1.8	0.9	0.2	2.7	3.5	0.5	6.7
European equity prices (Euro STOXX) (%)	2.4	0.0	0.0				
Nominal effective exchange rate, KIX (%)	1.0	-0.1	0.0	1.5	-0.3	-0.1	1.1
Nominal exchange rate, SEK/EUR (%)	-0.3	0.0	0.0	-0.4	0.1	0.0	-0.3
Nominal exchange rate, SEK/USD (%)	1.3	-0.2	0.0	1.9	-0.9	0.0	1.1
Nominal exchange rate, SEK/GBP (%)	-1.0	0.6	-0.4	-1.5	2.4	-0.7	0.1

Note. The extrapolated effect on the yield spread between Sweden and Germany is calculated as the difference between the extrapolated effect for Swedish government bonds and the measured movement for German government bonds at the time of the announcement. The KIX (krona index) is a weighted average of the currencies in 32 countries that are important for Sweden's international trade.

Sources: Macrobond, the Riksbank and own calculations

## Sensitivity analysis, market expectations

**Table 5. Effects at different market expectations**

Basis points and percentage change, respectively

	Estimated effects	Smaller share of expected asset purchases	Larger share of expected asset purchases
Expected announcements (Mar/Jul/Nov)	100/150/100	50/100/100	200/200/150
Government bond, 10 years	-1	-5	-26
Sweden-Germany, 10 years	-19	-23	-39
Covered-Swap, 5 years	-30	-21	-33
Municipal-swap, 5 years	-30	-21	-31
Inflation compensation, years 6-10	-8	-2	8

	Estimated effects	Smaller share of expected asset purchases	Larger share of expected asset purchases
Forward rate, 2 years	5	3	5
Share prices (OMXS) (%)	6.7	4.4	6.4
Nominal effective exchange rate, KIX (%)	1.1	0.9	2.8
Nominal exchange rate, SEK/EUR (%)	-0.3	-0.3	-0.8
Nominal exchange rate, SEK/USD (%)	1.1	1.1	3.9

Sources: Macrobond, the Riksbank and own calculations

Note. Note that the entire July announcement is assumed to be expected in "Larger share of expected asset purchases", which means that the July announcement cannot be used to identify effects in this set of market expectations. The KIX (krona index) is a weighted average of the currencies in 32 countries that are important for Sweden's international trade.

## Calculation of effects in Melander (2020)

**Table 6. Measured, extrapolated and cumulative effect of asset purchases in 2015-2017**

SEK billion and basis points respectively

	12 February 2015	18 March 2015	29 April 2015	2 July 2015	28 October 2015	21 April 2016	21 December 2016	27 April 2017	Total
<b>Announcement</b>	10	30	50	45	65	45	30	15	290
<b>Expected announcement</b>	0	0	35	0	35	60	30	0	
<b>Change in 10-year government bond yield</b>	-11	-15	7	-9	-8	8	-2	-7	
<b>Surprise as a percentage of announcement</b>	1.0	1.0	0.3	1.0	0.46	-0.33	No id.	1.0	
<b>Effect</b>	-11	-15	23	-9	-17	-24	No id.	-7	-60
<b>Effect per 10% of GDP</b>									-107

Note. Note that the calculation of the total effect excludes the announcement on 21 December 2016, when the announcement is judged to have been fully expected. Since 10 per cent of GDP in 2017 amounts to SEK 463 billion, the standardised effect is  $-60/(290-30)*463 = -107$  basis points.

Sources: Melander (2021), Statistics Sweden and own calculations



**SVERIGES RIKSBANK**

Tel +46 8 - 787 00 00

[registratorn@riksbank.se](mailto:registratorn@riksbank.se)

[www.riksbank.se](http://www.riksbank.se)

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