The Riksbank's seigniorage and the e-krona

Peter Gustafsson and Björn Lagerwall*

The authors work in the Monetary Policy Department of the Riksbank

Seigniorage has historically been an important source of profits for the Riksbank. In recent years, the use of cash in Sweden has declined rapidly, and a future possibly cashless society could have important consequences for the Riksbank's financial independence. This article contains a discussion and some numerical examples of how the introduction of an e-krona could affect the Riksbank's ability to generate profits. Several factors affect the results: whether the e-krona would be regarded as a substitute for cash or bank deposits, how high the demand for the e-krona would be, and the level of the interest rate. As a final part of this article, we address the question of how high the demand for an e-krona would have to be to cover the Riksbank's current expenses.

1 Background

Seigniorage has historically been an important source of profit for the Riksbank, being instrumental in securing the Riksbank's financial independence. In recent years, the use of cash in Sweden has declined rapidly and a cashless society no longer appears distant. The decline is a result of both technological advances and agents preferring other means of payment, where physical cash has been substituted for private account-based services. If no measures are taken to secure the Riksbank's profits in an environment with low or no seigniorage, the financial independence of the Riksbank could eventually be threatened.

The role of seigniorage in generating profits for the Riksbank is discussed in detail in Kjellberg and Vestin (2019), henceforth K&V (2019). Using their analysis as a starting point, this article contains a discussion and some numerical examples of how the introduction of an e-krona could affect the Riksbank's ability to generate profits.

2 A cashless society might require new ways of funding the Riksbank

In principle, seigniorage could be defined as the share of the Riksbank's interest income that is financed by the issuance of cash. As discussed in K&V (2019), historically, the Riksbank's balance sheet has been constituted of a foreign exchange reserve financed by cash and, to a smaller extent, equity. However, the balance sheet has changed in recent years, partly by a considerable amount of government bonds, following the Riksbank's QE programme, and partly by the recent large asset purchases during the Corona crisis. In both cases, the purchases have been financed by bank reserves; see Sveriges Riksbank (2020). The fact that equity has remained roughly unchanged and demand for cash is lower implies that the Riksbank has less access to interest-free funding than before, lowering its seigniorage.

Earlier official inquiries into the Riksbank's balance sheet and financial independence, known as the Bonde (SOU 2007:51) and Flam (SOU 2013:9) inquiries, primarily investigated the amount of equity necessary to secure financial independence, taking a certain demand for cash as given. These inquiries were less concerned with the consequences of lower demand for cash and its effects on the Riksbank's ability to generate profits.[1] The Riksbank Committee, which consisted of representatives of all the parties in the Riksdag (the Swedish Parliament), presented its final report, 'A new Riksbank Act', to the Government in November 2019; see SOU 2019:46. Chapters 28–31, 'The Riksbank's institutional and financial independence' discuss issues regarding the Riksbank's balance sheet and financial independence. Once again, the focus is on the amount of equity. One of the proposals is the introduction of an indexed target level for the Riksbank's equity, meaning profits are only transferred to the Treasury if the target level is exceeded. Further, it is proposed that a procedure is prescribed in law for restoring the Riksbank's equity if it falls below a certain level.

According to recent annual reports from the Riksbank, cash is now a very small part of the balance sheet and seigniorage constitutes a minor share of the Riksbank's annual profits. This can largely be explained by the Riksbank's purchases of government bonds for monetary policy purposes in recent years. These bond purchases have led to a rapid growth in the balance sheet and, as the bond portfolio has been financed by central bank reserves, the relative role of cash in financing the Riksbank's assets has decreased. Thus far, the bond portfolio has generated higher-than-expected profits as the repo rate has turned out to be lower than was expected at the time of the bond purchases. As a consequence of the Corona crisis, the Riksbank has purchased additional government bonds, in combination with other securities, such as covered bonds and commercial paper, and the purchases have been financed by central bank reserves. Future profits from the asset portfolio are uncertain, which may affect the relative importance of seigniorage.

If the trend of declining cash demand continues and demand approaches zero, the lack of seigniorage would then raise the question of how the Riksbank should be funded in order to preserve its financial independence. K&V (2019) conclude that it may be difficult for the Riksbank itself to accumulate sufficient equity and discuss different sources of earnings in detail. These include (i) return on equity, (ii) return on long-term bonds financed by monetary policy debt and (iii) bank fees, such as revenues from interest-free reserve requirements.[2]

If the Riksbank decides to introduce an e-krona, another potential source of earnings arises. The importance of this source depends on numerous factors. In the rest of this article, we will look more closely at this issue.

3 How would the introduction of an e-krona affect the profits of the Riksbank?

At this point in time, no decision has been made to introduce an e-krona. This means that little is known about its specific design and features. When assessing the potential consequences for the Riksbank's profits of introducing an e-krona, it is necessary to consider both the potential level of demand and the profit per issued e-krona. The exact determinants of the demand for an e-krona are of course highly uncertain, but are likely to involve several

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1   In SOU 2013:9 (2013), it is stated (our own translation from Swedish): 'Should the amount of outstanding cash become so small that the targeted level of cost-free capital is not achieved, this should be regulated by profits being withheld at the Riksbank and transferred to equity.'

2   The financing model of reserve requirements is currently used by the Bank of England. Banks that benefit from central bank services such as liquidity supply are obliged to hold a certain amount of interest-free reserves at the BoE, increasing the central bank's amount of interest-free capital. Fees are differentiated on the basis of the risk the bank poses to financial stability. Seigniorage is passed on to the government.

factors related to its design. On the one hand, demand could be expected to depend positively on the return on the e-krona. On the other hand, regarding the profit per issued e-krona, an interest-free e-krona gives a profit similar to that of cash, while it is lower for an interest-bearing e-krona. In this section, we define seigniorage as profits from issuing cash or e-krona, interest-bearing or not, contrasting slightly to the traditional definition.

If e-krona were easier to transfer than regular cash, it would be reasonable to expect the same amount of transactions to require fewer e-krona, thus increasing the velocity of money. However, in the following examples, we assume that the introduction of the e-krona will not affect velocity. According to the quantity theory of money, this leaves the total money stock unchanged.[3]

3.1 Would the e-krona replace cash, deposits or both?

The current demand for cash amounts to about SEK 60 billion. As a baseline for the analysis, we therefore consider the following, extremely simplified Riksbank balance sheet, before the issuance of the e-krona. This could also be viewed as the 'seigniorage-generating part' of the balance sheet.

Assets		Liabilities	
Government bonds	60	Cash	60

First, assume that the nominal return of the Riksbank's assets is 3 per cent. This would yield a baseline seigniorage of 60 × 0.03 = SEK 1.8 billion. In the examples below, we assume that the Riksbank issues 60 billion e-krona, roughly equal to the outstanding value of cash.

Example 1: Assume that the introduction of the e-krona would cause agents to substitute all of the outstanding cash (SEK 60 billion) for e-krona.

Assets		Liabilities	
Government bonds	60	E-krona	60

In the case of an interest-free e-krona, seigniorage is unchanged at SEK 1.8 billion. If, in contrast, we assume an interest-bearing e-krona with an interest rate 0.5 per cent lower than the return on the Riksbank's assets, i.e. the government bond yield, this would see seigniorage fall by 60 × (0.03 − 0.005) = SEK 1.5 billion, eliminating more than 80 per cent of the seigniorage.[4]

Example 2: A fundamental question concerns the motivation for holding e-krona. For illustrative purposes, we could make the extreme assumption that the introduction of an e-krona would not affect the demand for cash, with agents instead viewing the e-krona primarily as a substitute for bank deposits. The question then arises why agents would be willing to switch from bank deposits to the e-krona. If the e-krona is interest-free or has an interest rate lower than the bank deposit rate, this could be motivated by agents wanting to pay a premium to avoid costs associated with future bank defaults, or agents viewing the

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3   According to the theory, M × v = P × Y, which means that M = P × Y/v.
4   Alternatively, we could assume that money velocity increases and agents substitute cash amounting to SEK 60 billion for 40 billion e-krona. In this case, the balance sheet shrinks by SEK 20 billion and seigniorage decreases even more than if money velocity were to be unchanged. The introduction of an interest-free e-krona would, in this case, cause seigniorage to decrease by (60 − 40) × 0.03 = SEK 600 million. If the e-krona instead were to yield interest, seigniorage would fall by (60 × 0.03) − (40 × 0.005) = SEK 1.6 billion.

e-krona as a more convenient and safe form of money than bank deposits, for example. If agents substitute SEK 60 billion of their bank deposits for the same amount of e-krona, the balance sheet of the Riksbank would be expanded to 120 billion.[5]

Assets		Liabilities	
Government bonds	120	Cash	60
		E-krona	60

In the case of an interest-free e-krona, seigniorage would double compared to the baseline as it increases by 60 × 0.03 = SEK 1.8 billion. If the e-krona instead were to yield interest, the additional seigniorage would amount to 60 × 0.005 = SEK 300 million.

Example 3: Assume instead that agents substitute *equal amounts* (SEK 30 billion) of their cash and bank deposits for e-krona. In this case, the balance sheet of the Riksbank would be expanded to 90 billion.

Assets		Liabilities	
Government bonds	90	Cash	30
		E-krona	60

In the case of an interest-free e-krona, seigniorage would increase by (90 − 60) × 0.03 = SEK 900 million compared to the baseline. If the e-krona instead were to yield interest, seigniorage would decrease by (30 × 0.03 + 60 × 0.005) − (60 × 0.03) = SEK 600 million.

3.2 How high would the demand for an e-krona be?

Segendorf (2018) has estimated the potential demand for the e-krona, in order to meet the need for transactions, to be in the region of 1–2 per cent of Swedish GDP, roughly equal to the outstanding value of cash, in line with the stylised examples above. Juks (2018) estimates the potential demand from a savings and investment perspective, and arrives at a number amounting to approximately 2.5 per cent of GDP. Adding these numbers together, an estimation of the total demand for the e-krona would be higher than in the previous examples and amount to about 3.5–4.5 per cent of GDP.

Example 4: As a sensitivity analysis, one could assume that the demand turns out to be twice as high, i.e. 7–9 per cent of GDP. The mid-point of this interval, 8 per cent of GDP, corresponds to about SEK 400 billion. For simplicity, assume that agents substitute *equal shares* of their cash and bank deposits for e-krona. As the total value of household bank deposits currently amounts to roughly SEK 1,500 billion and the total value of cash amounts to 60 billion, the sum of the two is about SEK 1,560 billion. This means that the share of cash and deposits replaced is 400/1560, which is about 25 per cent. The remaining cash demand would thus amount to 75 per cent of current demand, i.e. SEK 45 billion.


Assets		Liabilities	
Government bonds	445	Cash	45
		E-krona	400

In the case of an interest-free e-krona, seigniorage would increase by (400 + 45 − 60) × 0.03 = SEK 11.6 billion compared to the baseline. If the e-krona instead were to yield interest, seigniorage would increase by (45 × 0.03 + 400 × 0.005) − (60 × 0.03) = SEK 1.6 billion. A very high demand for the e-krona would thus mean a considerable increase of the Riksbank's balance sheet and the holdings of government bonds. If the Riksbank is assumed to provide the amount of e-krona demanded by the public, this is an inevitable consequence. Nevertheless, the interest rate risk on the balance sheet would increase, which is a factor that needs to be recognized. Flodén (2018) discusses this issue in relation to the Riksbank's large purchases of government bonds in recent years. If a significant portion of bank deposits is being substituted for e-krona, there will also be consequences for the banks' funding models; deposits will be substituted for market funding. See Juks (2018) for an analysis of this question.

3.3 How would e-krona seigniorage depend on the interest rate?

Example 1 above illustrates the broad question of how much the Riksbank's seigniorage would be reduced if all cash were to be replaced by e-krona with interest. We have assumed a bond interest rate of 3 per cent and interest differential or spread of 0.5 percentage points between the bond and e-krona rate. Figure 1 contains a sensitivity analysis, illustrating the effect on seigniorage in SEK billion for different levels of the interest rate and spread. The red and blue areas correspond to the change in seigniorage being negative and positive, respectively. The line dividing the red and blue areas denotes the introduction of an interest-free e-krona without any change in seigniorage. For an interest-bearing e-krona, the most negative impact on seigniorage would take place in an environment with high interest rates and a low spread. This is because cash, with an implicit interest rate equal to zero, would constitute much cheaper financing than the e-krona. In contrast, if the e-krona were to be introduced in an environment with negative interest rates, an increase in seigniorage could occur, as cash would constitute relatively expensive financing compared to the e-krona. A higher spread would amplify this effect.

Figure 1. Change in seigniorage if cash is replaced by an e-krona for different levels of the interest rate
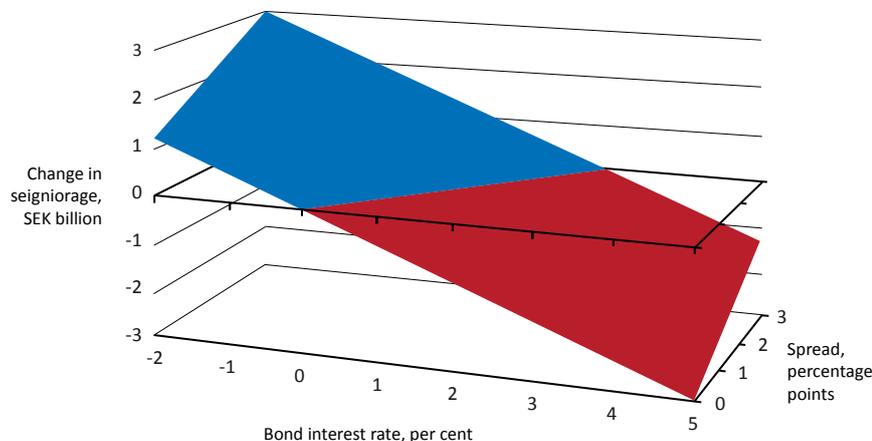
Source: Own calculations

3.4 How high demand for e-krona is necessary to cover the Riksbank's current expenses?

Another question regarding the replacement of cash by an e-krona is the following: Given the current funding model and demand for cash, what demand for the e-krona would be needed to maintain stable, long-term funding for the Riksbank? According to K&V (2019), assuming a steady-state nominal interest rate of 3 per cent, the cash demand required to generate a revenue roughly corresponding to the Riksbank's costs (SEK 900 million), amounts to approximately SEK 30 billion.[6] If the e-krona were to be interest-free, the necessary demand would be the same as for cash, that is, SEK 30 billion. If we maintain our initial assumption of an interest rate differential between the bond rate and the interest-bearing e-krona of 0.5 percentage points, the demand required to cover the costs would amount to 900/0.005 = SEK 180 billion. This represents three times the value of today's outstanding cash of approximately SEK 60 billion, but only about a tenth of household bank deposits.

4 Conclusion

Given that very little is known about the specific features of a future e-krona, its effects on seigniorage are thus uncertain. Relying on a set of simple assumptions, we have arrived at some preliminary conclusions. One conclusion is that it is important to understand whether the public would view the e-krona as a substitute for cash or bank deposits. If an interest-bearing e-krona were simply to replace cash, a significant reduction of seigniorage would be likely. However, varying the assumptions of the level of the interest rate and the spread of the bond rate over the e-krona rate could yield different results. Naturally, an interest-free e-krona replacing the current cash would leave seigniorage unchanged.

If cash demand instead remains the same as today and agents substitute a fraction of current bank deposits for the e-krona, additional seigniorage could be extracted, even if it is interest bearing. However, all things being equal, this would require an expansion of the Riksbank's balance sheet.

K&V (2019) estimate that the necessary cash demand to secure the long-term financing needs of the Riksbank amounts to half of the currently outstanding cash. Our calculations indicate that, under the baseline assumptions, demand for an interest-bearing e-krona needs to be in the order of three times current outstanding cash, representing about 10 per cent of households' current bank deposits and just over 3 per cent of GDP.

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6   A more detailed discussion is provided in section 4.4 in K&V (2019).

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