

The Riksbank's balance sheet and financial independence

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Financial independence prevents the Riksbank's financial position from having a negative impact on its tasks concerning price stability, financial stability and payments. There have been a substantial change in the Riksbank's earning capacity during the last ten years, also changing the prospects for financial independence. This article reviews how the Riksbank's balance sheet is structured, how it has changed over time and how the Riksbank's earning capacity has developed. Historically, the volume of banknotes in circulation has formed the basis of stable earnings for the Riksbank. Recently, however, the combination of decreasing banknote volumes and low interest rates has contributed to reduced earnings. If this trend continues, it will eventually increase the need for more equity to ensure satisfactory financial independence. In a scenario with declining earnings, it will be difficult for the Riksbank to build up more equity itself. Our conclusion is that, if we want to avoid the a need to recapitalise the Riksbank a contingency plan will be needed so that other sources of earnings are available, such as fees of some sort or a flexible framework for the level of equity. This would allow the Riksbank to be able to manage both losses in its asset portfolio and changed macroeconomic conditions in the form of low interest rates and decreasing banknote volumes.

1 Introduction

In this article, we investigate the development of the most important items on the Riksbank's balance sheet and examine how these affect the Riksbank's ability to fund its operations with its own earnings. We conclude by discussing how the Riksbank's solvency can reasonably be measured and by illustrating how a number of current balance sheet issues affect earning capacity and the exposure to financial risks.

There have been major changes to the Riksbank's balance sheet and earnings in recent decades. The size of the balance sheet has quadrupled over the last ten years and currently amounts to just over SEK 900 billion. On the asset side, the Riksbank has increased the size of its foreign exchange reserves and has purchased a larger quantity of Swedish government bonds, and is now borrowing money from the banks instead of lending it. At the same time, the number of banknotes and coins in circulation has fallen substantially. Historically, this item has been the most important source of revenue for the Riksbank – the so-called seigniorage.

This development affects both the Riksbank's revenue and expenditure over time, as well as the financial risks to which the Riksbank is exposed. Macroeconomic trends also affect the

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Riksbank's earnings. For example, interest rates have gradually declined over an extended period, which probably does not just reflect the downturn during the financial crisis. This has had a negative effect on the Riksbank's earnings, which can be seen in the form of lower profits in recent years.

According to the applicable legislation, which is guided by EU law, the Riksbank must be independent in its exercise of monetary policy. To create good conditions for this independence, the Riksbank should also be financially independent by being able to fund its operations by itself (see, for example, ECB (2018), pp. 34–35, and further references therein). The development of the Riksbank's balance sheet thus becomes relevant, as it affects both average earnings and the financial risks to which the Riksbank is exposed.

This article is structured so that we open section 2 by constructing a fictitious central bank balance sheet with a starting point in which all assets and liabilities equal zero. After this, we study the Riksbank's balance sheet to understand how it has developed in recent years and why it looks like it does. Section 3 describes financial independence and the links between the Riksbank's balance sheet, sources of income, costs for conducting policy tasks, policy measures, financial risks and equity. Finally, in Section 4, we describe the most important risks for the Riksbank's financial independence.

2 The balance sheet

The central bank has several tools at its disposal to be able to carry out its statutory remit within monetary policy, financial stability and payments. Several of these tools, including, for example, the payment system and the operational framework for monetary policy, directly affect the central bank's balance sheet. The balance sheet is also important to the financial independence of the central bank. We will illustrate the attributes of the balance sheet by starting a fictitious central bank. The structure of this bank's balance sheet helps us to understand the rudiments of how a balance sheet changes, what its various components are, and how it is linked to the central bank's financial results and risks. After having illustrated the factors that influence the size and composition of the balance sheet, we can look more closely at the Riksbank's balance sheet in order to understand why it looks like it does today.

2.1 Building up a central bank's balance sheet

To understand how a central bank's balance sheet works, it is helpful to study how it originates. We therefore start by assuming we have a 'new-born' central bank with no balance sheet at all, that is, entirely without assets and liabilities. First of all, this new central bank creates a payment system – which we can call RIX, the name of the Riksbank's payment system. The private banks and central government are each given an account in the system, initially with balance of zero. In the payment system, there is also a contra account, which, by definition, is the sum of the other accounts with inverse signs, and reflects the central bank's aggregated position in relation to all participants. To differentiate different forms of liquidity, we call the banks' funds in these accounts 'central bank reserves'.¹ If the banking system as a whole has a deficit of central bank reserves, the banking system has a liability to the central bank, which is an asset for the central bank. If, on the other hand, the banking system has a surplus of central bank reserves, the central bank has a liability to the banking system. We assume that the central bank implements its monetary policy primarily by setting the interest rate for central bank reserves, regardless of whether it is a question of a liability or an asset

¹ This concept is linked to the fact that central banks sometimes force the banks to keep funds in these types of account, also referred to as reserve requirements or required reserves. Funds held over and above the required reserves are referred to as 'non-required' reserves. This is why deposits at central banks are often referred to as central bank reserves, without it necessarily being a question of deposits made by virtue of a reserve requirement.

for the central bank.² Finally, we assume that banknotes issued by the central bank can be exchanged for central bank reserves, at an exchange rate of one.

We assume that there is a private banking system, where the banks' balance sheets consist of lending on the asset side and deposits on the liability side, and that there is a national debt owned by the private sector.

Given these conditions, we will now see how the central bank's issuing of banknotes and receipt of equity from central government provides the central bank with good conditions for making profits. We will then see how the central bank can reallocate its assets and acquire a foreign exchange reserve. Finally, we look at how the central bank can finance a larger asset portfolio via interest-bearing funding.

2.1.1 The central bank issues banknotes – creating seigniorage

A classic function for a central bank is to provide the economy with means of payment. We therefore assume that there is a demand for banknotes among the general public and that the central bank wants to issue them. It is the private banks that manage their customers' demand for cash. If customers wish to withdraw their money in cash, the banks contact the central bank, which supplies banknotes and debits the banks' RIX accounts by the corresponding amount. Conversely, the central bank offers the banks the option of exchanging banknotes for central bank reserves, which turns the banknotes into promissory notes issued by the central bank. Outstanding cash is therefore an item on the central bank's liability side, just like central bank reserves.

Let us assume that the banks' customers wish to withdraw SEK 60 billion in cash. The central bank prints the banknotes and debits the banks' accounts in RIX with SEK 60 billion, from their previously aggregated balance of zero. At the end of the day, the banking system as a whole will have SEK –60 billion in its accounts in the payment system, as illustrated in Table 1a.

Table 1a. Effect on accounts in the payment system when the central bank issues banknotes
SEK billion

Accounts in the RIX payment system			
The banking system	0	→	–60
Central government			0
Total central bank	0	→	+60

At the end of the day, we can assume that the central bank pays interest to those banks that have a surplus in the payment system and charges interest to those banks that have a deficit. Simplified for our purposes, we can assume that the central bank makes both types of transaction at the repo rate. We enter the total of all the accounts in the payment system, which in this case will be negative and therefore seen as lending to the banks and will be an asset item on the balance sheet (Table 1b). In this example, an increase in cash results in an equally large increase of the asset side.³

Table 1b. Balance sheet effect when the central bank issues banknotes
SEK billion

Assets		Liabilities	
Lending to banks	0 → 60	Banknotes and coins	0 → 60
TOTAL	0 → 60	TOTAL	0 → 60

² See Elmér et al. (2012) for a detailed description of how the Riksbank's operational framework for monetary policy works, that is, how the Riksbank steers the overnight rate so that it is close to the desired level for monetary policy.

³ If the Riksbank initially has a liability to the banking sector, there will instead be a reallocation, in which the liability decreases and the cash increases.

The returns from the asset side, arising from the issuance of banknotes and coins, is normally referred to as seigniorage. In textbooks, seigniorage is normally defined as the one-off income for central government from printing money for almost no cost, which it then uses to buy goods and services. Thus, the seigniorage will be equal to the increase in the amount of cash in circulation. In the case we describe in Table 1b, seigniorage instead arises from the issuance of an amount of cash, M , giving the central bank a claim on the banking system of the same size, which is in line with how it works for the Riksbank. This claim is an asset that provides interest income equal to the policy rate i multiplied by M for a given period.^{4,5} We can note that if the policy rate is negative, the seigniorage will be negative in this case, which leads to an erosion of equity.

We can also note that if the central bank were to issue non-remunerated central bank reserves, which, for example, would be the case with a non-interest-compensated reserve requirement, these reserves would also give an interest-bearing asset similar to what cash does. Under the current operational framework for monetary policy, the Riksbank pays interest on all central bank reserves, which leads to them not giving rise to any seigniorage income.

2.1.2 Central government provides the central bank with equity

The next important balance sheet item we wish to study is equity. We assume that central government wants to build up equity in the central bank to increase its financial independence. We assume that central government borrows from or imposes taxes on its citizens to the tune of SEK 130 billion, which is paid in by lenders or citizens instructing private banks to transfer funds from their deposit accounts at the banks to central government. This means that the banks' account balances in RIX decrease by SEK 130 billion while central government's account balance in RIX increases by the same amount (Table 2a).

Table 2a. Effect on accounts in the payment system when central government borrows from or imposes taxes on its citizens

SEK billion

Accounts in the RIX payment system			
The banking system	-60	→	-190
Central government	0	→	+130
Total central bank			+60

Central government then transfers SEK 130 billion to the central bank, which affects the balances in RIX (Table 2b).

Table 2b. Effect on accounts in the payment system when the central bank receives equity

SEK billion

Accounts in the RIX payment system			
The banking system			-190
Central government	+130	→	0
Total central bank	+60	→	+190

On the Riksbank's balance sheet, the asset item Bank lending increases and equity totalling SEK 130 billion will be a new item on the liability side (Table 2c).

⁴ In some circumstances, the discounted present value of this future seigniorage will coincide with the textbook definition.

⁵ If the central bank makes the choice to obtain assets with more risk, the expected return of the invested capital is higher. This extra return should reasonably be called risk compensation instead of seigniorage, but in this article, we are not making that distinction to any great extent.

Table 2c. Balance sheet effect when the central bank receives equity
SEK billion

Assets				Liabilities			
Lending to banks	60	→	190	Banknotes and coins			60
				Equity	0	→	130
TOTAL	60	→	190	TOTAL	60	→	190

As neither equity nor banknotes and coins lead to any direct costs for the central bank, these two added together can be called ‘interest-free capital’. The income from the assets will therefore be pure profit for the central bank, which can be used to finance regular expenses, build up more equity or be distributed to central government.

With the balance sheet in Table 2c and a positive policy rate, the central bank will receive interest on its lending to banks and the central bank can therefore be said to have ‘invested’ all its interest-free capital in its bank lending.

2.1.3 The central bank acquires a foreign exchange reserve

The new central bank now has assets of SEK 190 billion. Assume that the central bank sees a need to hold foreign currency to be able to perform its statutory remit. This could for example be to be able to offer loans in foreign currency to the country’s banks in a scenario of financial stress, or to be able to intervene on the foreign exchange market to influence the exchange rate for monetary policy reasons. Therefore, the central bank buys foreign government bonds and gold for SEK 190 billion from the private sector. This is done, for example, by the central bank using the local currency to buy US dollars on the foreign exchange market, which it then uses to buy US government bonds. The exchange is paid for by the central bank crediting the RIX accounts of those banks whose customers sold the foreign currency (Table 3a). The central bank has now transferred back SEK into the RIX system and the balance sheet item for lending is zero. This is a major foreign exchange transaction that can be expected to influence the exchange rate.⁶

Table 3a. Effect on accounts in the payment system when the central bank acquires a foreign exchange reserve
SEK billion

Accounts in the RIX payment system			
The banking system	-190	→	0
Central government			0
Total central bank	+190	→	0

As the sum of the two purchased assets, SEK 190 billion, is precisely the same as the sum of the central bank’s equity and banknotes and coins, the central bank has therefore reallocated its asset portfolio from lending in SEK to securities in foreign currency and gold – a foreign exchange reserve (Table 3b). Now, the income valued in SEK will depend on the return from the foreign exchange reserve, which depends on both how the SEK exchange rate develops against other currencies, and how foreign yields develop.

⁶ The Riksbank’s foreign exchange reserve has been built up over a long period of time and has also grown due to returns in foreign currency.

Table 3b. Balance sheet effect when the central bank acquires a foreign exchange reserve
SEK billion

Assets				Liabilities	
Lending to banks	190	→	0	Banknotes and coins	60
FX reserves and gold	0	→	190	Equity	130
TOTAL			190	TOTAL	190

Which financial assets the Riksbank chooses to buy affects expected return and risk. Bonds with longer maturities, for example, tend to give higher returns than short-term bonds. However, the price of such bonds varies more than the price of short-maturity bonds, which is usually referred to as interest-rate risk.

2.1.4 The central bank expands the size of the balance sheet

As the liabilities must add up to the same value as the assets, the sum of the central bank's equity and banknote volume forms a lower limit for the size of the balance sheet. However, the central bank's remit can sometimes imply a need to expand the balance sheet over and above this lower limit, for example, if the appropriate size of the foreign exchange reserve exceeds the equity and cash added together. Other examples of measures that can expand the balance sheet are the central bank buying assets for monetary policy purposes, or providing liquidity support in the form of lending to private banks during a financial crisis.

Let us assume that the central bank decides, for monetary policy reasons, to buy government bonds for SEK 300 billion. The central bank buys the bonds on the government bond market and pays, once again, by crediting the RIX accounts for those banks whose customers sold the bonds. As the central bank supplies SEK to the payment system, the banking system as a whole receives a total surplus of SEK 300 billion in its accounts (Table 4a). We note here that the central bank creates the money that is deposited in the banks' accounts in the payment system, as the total volume of money in the payment system has increased.

Table 4a. Effect on accounts in the payment system when the central bank buys government bonds
SEK billion

Accounts in the RIX payment system			
The banking system	0	→	+300
Central government			0
Total central bank	0	→	-300

The bond holdings is then added to the balance sheet in Table 4b as an asset item, and an item is added on the liability side for the central bank reserves which we call *deposits from banks*. The deposits refer to the banks' surplus in RIX in relation to the central bank (Table 4b). Sometimes, this liability item is also referred to as the monetary policy debt, as the central bank pays the monetary policy rate on deposits to stabilise short market rates at levels close to the decided policy rate (see Elmér et al., 2012).⁷ An open question is what share of the reserves has to be rate-compensated in order to attain an efficient operational framework. For example, the Swiss Central Bank excludes large parts of the reserves from negative rates. Non-remunerated reserve requirements would exclude some of the reserves from compensation, which would reduce the central bank's interest costs, at the expense of the banks.

⁷ In the current situation, however, the policy rate is negative, which means that banks pay interest to the Riksbank (entered as interest income in the financial statement). This may sound favourable, but the return on several of the bonds is at the same time negative. The net profit over a certain period depends on the difference between the return on assets and the policy rate during this period.

Table 4b. Balance sheet effect when the central bank buys government bonds
SEK billion

Assets				Liabilities			
Lending to banks			0	Banknotes and coins			60
FX reserves and gold			190	Equity			130
Government bonds SEK	0	→	300	Deposits from banks	0	→	300
TOTAL	190	→	490	TOTAL	190	→	490

Now the central bank has created a balance sheet in which some of the assets are financed via interest-bearing debt. Interest-bearing debt implies a financial cost in the form of the interest paid by the central bank for banks' deposits, if the central bank's policy rates are positive.⁸ It can also imply increased financial risk in the form of greater variation in the central bank's results (see Section 4).

Let us further assume that the central bank sees it as appropriate to strengthen its foreign exchange reserve by the sum of SEK 250 billion. It can do this, for example, by buying foreign assets financed by interest-bearing loans in foreign currency. In this case, the central bank then asks the national debt office to borrow foreign currency equivalent to about SEK 250 billion on overseas markets and then loan this on to the central bank, which in turn invests the money in foreign government securities. In this way, no exchange from SEK to foreign currency need take place and as a result, there will be no effect on the RIX accounts. However, the size of the balance sheet increases by SEK 250 billion (see Table 4c).

Table 4c. Balance sheet effect when the central bank strengthens the foreign exchange reserve via loans from central government
SEK billion

Assets				Liabilities			
Lending to banks			0	Banknotes and coins			60
FX reserves and gold	190	→	440	Equity			130
Government bonds SEK			300	Deposits from banks			300
				Loans from central government	0	→	250
TOTAL	490	→	740	TOTAL	490	→	740

2.1.5 The central bank's balance sheet and financial income statement

Typically, a central bank's primary objective is not to make a profit but to perform its remit within monetary policy, financial stability and payments. As long as it does not affect these primary tasks, however, it is reasonable for the central bank to try to perform its operations as cost-effectively as possible, which includes the bank's financial management.

The connection between the balance sheet and the income statement is normally that assets generate financial income and interest-bearing liabilities generate financial expenditure.⁹ The difference between this income and expenditure can be referred to as a financial net result and is a measure of the central bank's earning capacity. The combination of banknotes and coins constituting an interest-free liability and central government not having an explicit required rate of return on its capital investment in the central bank often

⁸ Note that if the volume of banknotes were to increase in this situation, the size of the balance sheet would not change. Instead, there would only be a reallocation on the liability side, in contrast with the example above, in which the issuance of cash increased the size of the balance sheet. The difference is due to the fact that when the central bank initially has a liability to the banking system, this liability decreases at the same time as the volume of banknotes increases, leading only to a reallocation on the liability side.

⁹ However, if the repo rate is negative, as it currently is, the interest on the monetary policy debt will be interest income rather than an interest expenditure.

provides the right conditions for positive and relatively stable earnings.¹⁰ Any profits from the central bank can be distributed to central government if they are not needed to safeguard the central bank's operations and financial independence.

2.2 The Riksbank's balance sheet

Based on the fundamental reasoning above regarding how a central bank's balance sheet emerges and is determined, we can now discuss why the Riksbank's balance sheet looks like it does at present. In Table 5, you see the Riksbank's balance sheet as of 31 December 2018.

Table 5. The Riksbank's balance sheet as of 31 December 2018

SEK billion

Assets		Liabilities	
Gold reserve	46	Banknotes and coins	62
Foreign exchange reserve	457	Deposits SEK	457
Securities SEK	396	Foreign currency loans (Swedish National Debt Office)	256
Other	36	Other	32
		Revaluation accounts	67
		Equity	57
		Result 2018	4
TOTAL	935	TOTAL	935

Source: Sveriges Riksbank

We will discuss the various asset and liability items on the balance sheet, and finally the size of the balance sheet. Where appropriate, we will also include a historical perspective and compare the Riksbank's balance sheet with other central banks. The size and composition of the balance sheet reflects both the degree to which the Riksbank uses it as a tool to achieve its objectives, and the conditions for the Riksbank's earning capacity.

2.2.1 Asset items

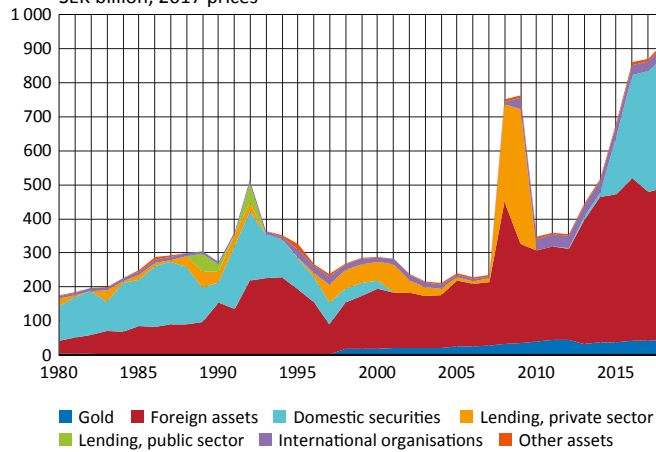
The central bank's assets are often invested in safe securities with a high credit rating, such as government bonds in domestic and foreign currencies, and in gold. The assets are usually chosen based on a policy perspective but sometimes also from a financial management perspective. In the first case, it may be a question of a small open economy needing a foreign exchange reserve in order to be able to rapidly provide banks with liquidity support in foreign currency, or to have the readiness to make foreign currency interventions. Sometimes, the choice of assets is primarily motivated by the need to manage the interest-free capital that a central bank has in the form of banknotes and coins and equity. As far as the Riksbank is concerned, policy needs are most important, but in the more detailed allocation of assets, there are also elements of considering asset risk and return in a financial management perspective.

Figure 1 illustrates the Riksbank's recorded assets since 1980 in 2017 prices. The Riksbank's recorded assets have mainly consisted of the gold and foreign exchange reserve and holdings of Swedish government bonds. Normally, the assets are in the form of liquid assets with a high credit rating. Sometimes, however, the assets can also consist of direct lending to banks, for example. Thus, the assets are mainly some form of interest-bearing

¹⁰ However, some countries, including the United Kingdom, have chosen to let the seigniorage go directly to central government. In the United Kingdom, the central bank is instead financed by private banks depositing a certain amount of money in non-interest-bearing accounts at the Bank of England, which is invested with positive return, and the net interest income finances the cost of both financial oversight and monetary policy.

asset, but also physical assets like gold bars to some extent. The Riksbank also has some other assets, which include its real property, but these constitute a relatively small part of the bank's total asset value.

Figure 1. The Riksbank's financial assets
SEK billion, 2017 prices



Note. The currency category includes both the foreign exchange reserve and any lending in foreign currency.

Sources: Sveriges Riksbank and Statistics Sweden

The foreign exchange reserve

The Riksbank's foreign exchange reserve played a key role in monetary policy when Sweden had a fixed exchange rate regime. At that time, the Riksbank needed to hold foreign currency to be able to support Swedish krona when the exchange rate threatened to depreciate. With the current inflation target regime, with a floating exchange rate, a foreign exchange reserve is not normally needed to be able to make currency interventions of this kind as often. There are, however, examples of countries with inflation target regimes where currency interventions are used. Both Switzerland and the Czech Republic have experimented in recent years with a floor for the exchange rate. In Switzerland, this was done in order to prevent further appreciation of the currency and in the Czech Republic it was to weaken it. In both cases, the objective was to bring inflation closer to the inflation target. The result was that both central banks purchased large volumes of foreign currency and sold their own currency, which led to bulging foreign exchange reserves and balance sheets.

Recently, the foreign exchange reserve has been given a different role, in which it can be used to provide liquidity support in foreign currency for financial stability reasons. As Swedish banks fund their lending in foreign currency to a relatively large extent by borrowing foreign currency at short maturities, they can encounter problems if they have difficulty renewing their funding in a situation with financial stress. Furthermore, the Swedish banking sector is large, with an aggregate total balance sheet of almost 300 per cent of GDP, which makes this a question of potentially large amounts of foreign currency. As Swedish banks are, by and large, not considered to be systemically important in other countries, they cannot count on borrowing foreign currency from foreign central banks in a crisis situation (see Sveriges Riksbank, 2019a). Neither can the Riksbank count on being rapidly able to borrow foreign currency from other central banks. The Riksbank therefore holds a foreign exchange reserve that can be used as a last resort to provide liquidity support in foreign currency to Swedish banks (see Sveriges Riksbank, 2019a).

An alternative to having a foreign exchange reserve on the balance sheet is for the Swedish National Debt Office only to borrow currency when a need arises. The advantage with this alternative is that the Riksbank then avoids paying the interest rate spread that a loan-financed foreign exchange reserve often involves if the Swedish state's funding

costs are slightly more expensive than the return that the Riksbank can obtain from the enlarged foreign exchange reserve. The disadvantage is that it is uncertain how quickly the Swedish National Debt Office can borrow currency in stressed scenarios when banks require immediate liquidity support. Ultimately, it will be a question of judgement as regards how much currency it is appropriate to hold in advance and how much can be borrowed if the prospects deteriorate or the risks increase.

In addition to preparedness for currency interventions and liquidity support in foreign currency, the Riksbank also has commitments in relation to the International Monetary Fund (IMF), which adds to the need for a foreign exchange reserve (see Sveriges Riksbank, 2019a).¹¹

In Figure 2, we can see how the value of the foreign exchange reserve and foreign currency lending have grown since the 1980s up until the present day. Note that the value of the foreign exchange reserve is also affected by the market value of the foreign assets and exchange rate movements. To be able to be ready to provide liquidity support in foreign currency, the Riksbank has increased the size of the foreign exchange reserve over the last ten years. The foreign exchange reserve was increased twice, in 2009 and 2012, by a value of SEK 100 billion each time. These enlargements were funded by loans in foreign currency from the Swedish National Debt Office.¹²

The foreign exchange reserve has also grown gradually over a number of years as a result of much of the return being reinvested, as the profit distribution to the state, management costs and interest expenses in SEK have mostly been disbursed directly in the RIX payment system, without drawing on the return in foreign currency from the foreign exchange reserve. Thus, the Riksbank has not needed to sell foreign currency and buy SEK in the currency market in order to convert the profits in foreign currency into SEK. However, this reduces the Riksbank's net balance in RIX and causes the interest-bearing liability to increase.

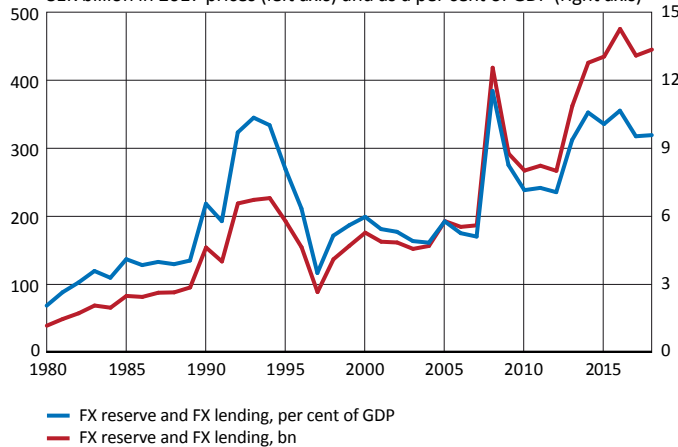
The foreign exchange reserve has grown at approximately the same pace as GDP over the last five years and now amounts to just over 10 per cent of GDP, which can be seen in Figure 2. If we compare the central banks in Figure 3, we can see that this is quite a normal level, especially bearing in mind that the Swedish banking system is relatively large in relation to GDP. In March 2019, the Riksbank decided that the need for the foreign exchange reserve had decreased slightly and that the Riksbank shall therefore pay back parts of the currency loans from the Swedish National Debt Office (Sveriges Riksbank, 2019b). This illustrates how the size of the foreign exchange reserve is driven by the policy needs identified by the Riksbank to achieve its objectives.

11 Irrespective of monetary policy regime, the foreign exchange reserve also has an important purpose in the event of serious crises in society, for example in times of war.

12 The total sum of currency assets increased substantially during the global financial crisis in 2008 and 2009, which was due to the Riksbank, together with a few other selected central banks, being given the opportunity to provide liquidity support in US dollars thanks to an agreement with the US Federal Reserve. In this way, the Riksbank was able to provide liquidity support during the crisis without having to use the entire foreign exchange reserve, which at the time was significantly smaller than it is now. However, this was to be considered a one-off occurrence and not something to be relied on in the future.

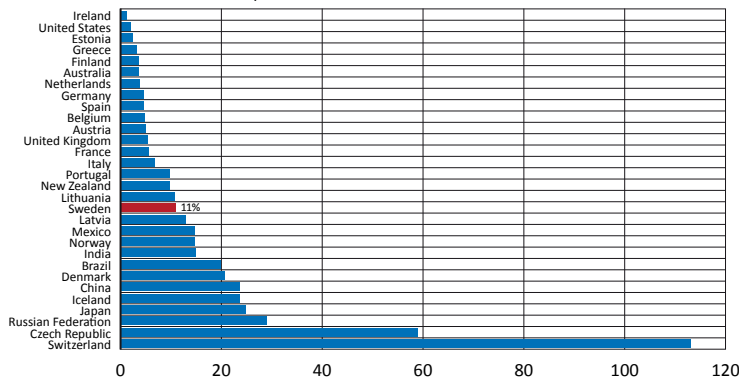
Figure 2. The size of the foreign exchange assets

SEK billion in 2017 prices (left axis) and as a per cent of GDP (right axis)



Note. Value of currency assets in SEK. Note that fluctuations may be due to exchange rate changes.
Sources: Sveriges Riksbank and Statistics Sweden

Figure 3. The Riksbank's foreign exchange reserve compared with other central banks
Per cent of GDP, 2018

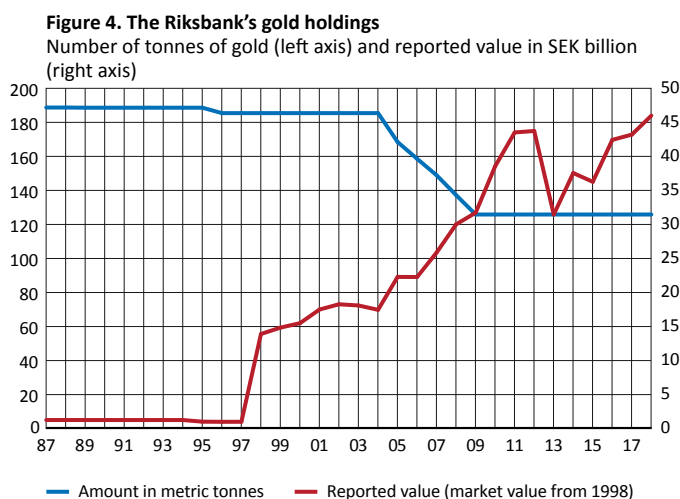


Source: IMF

The gold reserve

Many central banks have some of their assets invested in *gold*. Historically, this was needed during the era of the gold standard as central banks undertook to exchange banknotes on request for a certain amount of gold.¹³ Gold can also be used as a means of payment in turbulent times, which is one of several reasons why central banks have elected to retain this asset on their balance sheets. The Riksbank's holdings are currently 125.7 tonnes of gold and Figure 4 illustrates how the holdings have developed, both in tonnes and in reported value in SEK. Recently, the Riksbank upgraded some of its gold so that it meets a standard called London Good Delivery (LGD). Among other things, this has increased the tradability of the holdings in case gold needed to be quickly sold for some kind of policy reason.

13 See Wetterberg (2009) for a description of how the gold standard worked.



Source: Sveriges Riksbank

Securities in SEK

Just like most other central banks from time to time, the Riksbank has earlier had securities in domestic currency, but it had zero holdings between 2001 and 2012. As a lesson learnt from the financial crisis of 2008–2009, the Riksbank reintroduced, in 2012, a smaller holding in government bonds in SEK of a maximum of SEK 10 billion in order to have better preparedness to act on the market. The Riksbank's holdings of securities in SEK has grown rapidly since 2015. At that time, the Executive Board of the Riksbank took a monetary policy decision to start purchasing government bonds in order to make monetary policy more expansionary in a situation where the repo rate was starting to approach a lower bound. At the end of 2018, the holdings were worth about SEK 400 billion and the purchases have been funded by increased central bank reserves. The current holdings are expected to be a temporary monetary policy measure and their size is expected to decrease in the long run, as new purchases are stopped and the bond holdings mature (Sveriges Riksbank, 2017).

Other assets

The Riksbank also has a number of other assets including its claims on the IMF, accrued interest income, the bank's real property, etc.

Finally, we can note that the asset item *lending to banks* currently is zero. Lending SEK to banks is not occurring frequently at present within the current operational framework for monetary policy implementation, as banks have claims on the Riksbank in RIX due, among other things, to the large volumes of Swedish government bonds purchased by the Riksbank. Instead, the Riksbank is inviting banks to invest their surpluses at the Riksbank and this is being booked as deposits, which is a liability item (see below). However, the Riksbank is currently considering adjusting the operational framework, see Sveriges Riksbank 2019c.

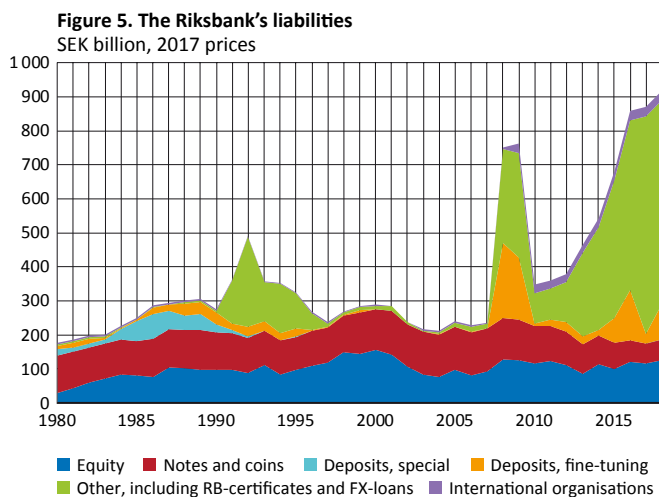
During the financial crisis, from October 2008 to November 2010, the Riksbank provided liquidity support in the form of lending to banks, both in SEK and in foreign currency. The aim of the lending was to mitigate the effects of negative developments on several key markets for liquidity management and funding, including the negative macroeconomic effects to which the financial crisis contributed. The Riksbank's lending in SEK led to the sum of the balances of the counterparties' RIX accounts increasing by the same amount as the total lending sum. Consequently, the liquidity support led to an increase in both the Riksbank's lending and deposits in SEK, as this extra liquidity was injected into the payment system for SEK.

2.2.2 Liability items

The Riksbank's interest-free capital, in the form of equity and banknotes and coins, can be

seen as the basic foundation of the liability side of the Riksbank's balance sheet. Interest-free funding invested in interest-bearing assets contributes to favourable net interest income. During periods in which the Riksbank has little need to use the balance sheet to implement its objectives, the interest-free capital will constitute the greater part of the liability side's items.

At present, the Riksbank's objectives have led to larger asset holdings, funded by interest-bearing liability items. The interest-bearing liabilities in the form of currency loans and deposits in SEK thus fund parts of the foreign exchange reserve and the monetary policy-motivated holdings of Swedish government bonds. In Figure 5, you can follow the Riksbank's liabilities since 1980, in 2017 prices, and there we can see that interest-bearing liability items in particular have varied considerably over time.

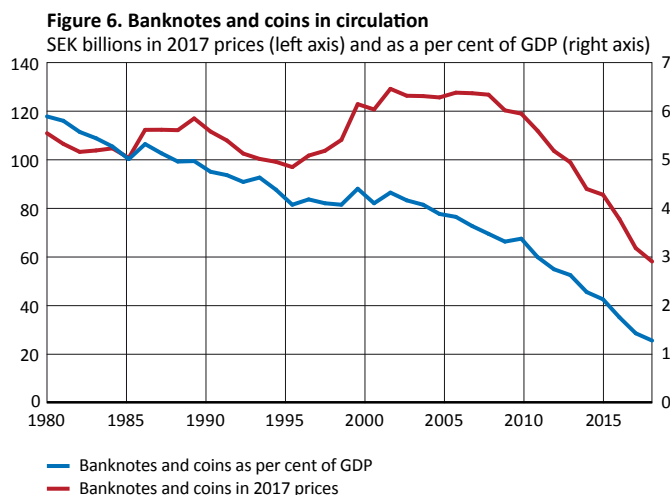


Note. Here, equity also includes unrealised gains.
Source: Sveriges Riksbank

Banknotes and coins

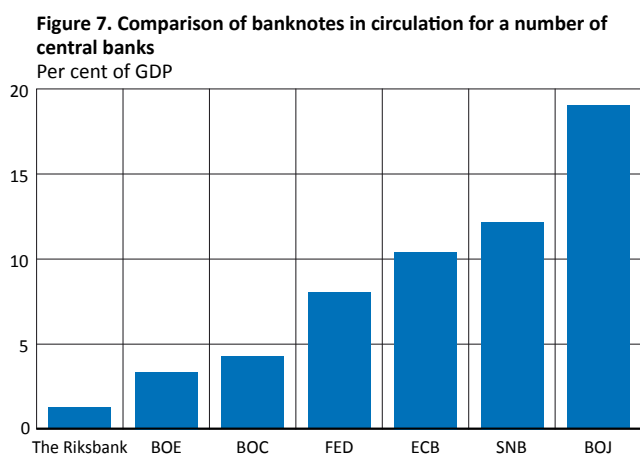
Banknotes and coins in circulation constitute interest-free capital for the Riksbank and are booked as a liability, as we have described above. In the short term, the Riksbank has no independent control over the volume of banknotes and coins in circulation as the Riksbank only supplies the volume in demand. The value of banknotes and coins can obviously be affected by the Riksbank's actions and how advantageous it is for households and companies to use banknotes and coins.

There has been a clear change of direction in the use of cash in Sweden over the last decade, resulting in a decline in the value of banknotes and coins in circulation, see Figure 6. The reduced interest in cash is also evident from the Riksbank's survey on payment patterns (Sveriges Riksbank, 2018), in which, for example, the proportion who say their last purchase was made using cash has fallen from 39 per cent in 2010 to 13 per cent in 2018. The reduction in banknotes and coins in circulation seems to be greater than can be explained by any cyclical effects. One cause of the reduction is said to be the decline in the demand for cash as the payment market has developed increasingly efficient electronic payment solutions (Erlandsson and Guibourg, 2018). Furthermore, the number of bank branches handling cash has decreased sharply since 2010, which may also have contributed to the declining interest in cash among both households and companies (Engert et al., 2019). A complicating factor is that much of the decline is due to a sharp reduction in the volume of the SEK 1000-banknotes in circulation, which now constitute only a small part of total cash in circulation. As the volume of the SEK 1000-banknotes cannot decrease much more, it is difficult to estimate whether the trend of sharply reduced cash will continue over the next few years.



Sources: Sveriges Riksbank and Statistics Sweden

If we measure the size of the banknote stock as a percentage of GDP and compare with other central banks, it is clear that we have a relatively small banknote volume, which we can see in Figure 7.¹⁴ Bank of Japan (BOJ) and Swiss National Bank (SNB) have issued large volumes, but even the Federal Reserve (Fed), the European Central Bank (ECB) and Bank of Canada (BOC) have significantly larger volumes of banknotes in circulation than the Riksbank. Bank of England (BOE) also has a larger banknote volume than the Riksbank but banknote seigniorage goes in full to the central government. The larger value of outstanding banknotes in some of the larger economies partly reflect their 'reserve currency' status, meaning that citizens in other countries also choose to hold their cash in these currencies for different purposes. The relatively low value of Swedish cash in circulation leads to little seigniorage, which can affect the Riksbank's earning capacity and financial independence in the longer term.



Sources: Annual reports for each central bank respectively (for year 2017), and the OECD

All else equal, fewer banknotes and coins automatically leads to an increase in deposits from banks if the payment system as a whole is in surplus in relation to the Riksbank, as the Riksbank credits the banks' RIX accounts with an amount equal to the reduction in the volume of cash. Thereby the size of the Riksbank's balance sheet remains unchanged. If,

¹⁴ Note that in several countries only banknotes are on the central bank's balance sheet, whereas as far as the Riksbank is concerned, both banknotes and coins are a liability item on the balance sheet.

instead, the banking system as a whole is in deficit in relation to the Riksbank, so that the item 'lending to banks' is positive, this item instead decreases as does the size of the balance sheet.

Central bank reserves

The sum of *deposits from banks* and *Riksbank Certificates* measures the size of the aggregated banking system's surplus in relation to the Riksbank in the RIX payment system. Banks must ensure that they balance their accounts in RIX overnight and, when they have positive balances, they can choose to deposit these at the Riksbank or invest them in Riksbank Certificates, which are interest-bearing securities with a one-week maturity. Banks' surplus in the payment system can also be referred to as central bank reserves and, in Sweden, this type of liability is interest bearing, where the interest rate is linked to the Riksbank's monetary policy rates. Consequently, this liability is also called the monetary policy debt.

In Figure 8, you can see how the total net balance for the banks in the payment system has developed since 1994, and how this position has been distributed among different types of deposits and lending with the Riksbank. From 1994 and 1998, the banks had a surplus in RIX, which was largely a consequence of the defence of the Swedish krona a few years previously.¹⁵ Between 1998 and 2008, deposits via fine-tuning deposit operations and Riksbank Certificates were zero or very close to zero, as the aggregated banking system had a structural deficit in the payment system in relation to the Riksbank. A deficit for banks, for example a surplus for the Riksbank, was then booked as the asset item *lending to banks* instead (see above)

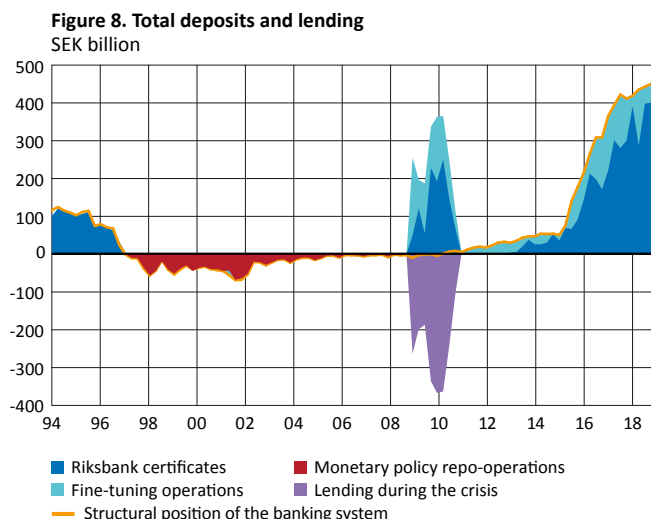
From the beginning of the 2000s, the aggregated banking system's deficit gradually decreased as a result of the Riksbank choosing, on several occasions, to let the returns from the foreign exchange reserves be reinvested in foreign currency and the dividend to the central government instead to be paid out by increasing the amount of central bank reserves. In connection with the crisis of 2008–2009, the Riksbank provided temporary liquidity support to banks by lending 'newly created' central bank reserves. The sum of the banks' accounts in RIX therefore increased, which led to the banks increasing their deposits by the equivalent sum over the same period.

Even after the crisis, once the extra liquidity had been phased out and deposits had fallen back, it can be seen that the sum of the banks' accounts in RIX has continued to increase. This is again largely due to the Riksbank choosing to pay dividends using central bank reserves. Another important cause is that the banknote and coin stock has decreased by just over SEK 50 billion since 2009, which has also contributed to an increase in the banks' surplus in relation to the Riksbank (see above).

At the start of 2015, the Riksbank began purchasing Swedish government bonds for monetary policy purposes, funded with central bank reserves in the form of deposits and Riksbank Certificates. Once this monetary policy stimulus is no longer needed, these holdings can be phased out and the sum of deposits and Riksbank Certificates will then decrease again. If nothing unexpected occurs, however, the monetary policy debt will continue to be positive even if the Swedish government bond portfolio would decrease.¹⁶

¹⁵ In conjunction with the defence of the Swedish krona, the Riksbank sold large amounts of foreign currency forward (a deal in which the transaction takes place at a future date). When the currency was eventually to be delivered, the Riksbank extended the position by 'fx swaps' (in which foreign currency was bought to be able to indemnify existing forward contracts, while a new forward sale of foreign currency was also established). When the fixed exchange rate for the krona ceased in November 1992, the krona depreciated and, in order to be able to extend the forward position with the same amount of foreign currency, more krona were needed, which led to an increase in the banking system's surplus in relation to the Riksbank in the payment system. The extension of the forward position decreased gradually up until 1997 (see Sveriges Riksbank, 1998).

¹⁶ It was already a positive monetary policy debt before government bond purchases were initiated. Since then, banknotes and coins have declined further without the assets having decreased, which leads to an increase in the monetary policy debt.



Source: Sveriges Riksbank

Foreign currency loans

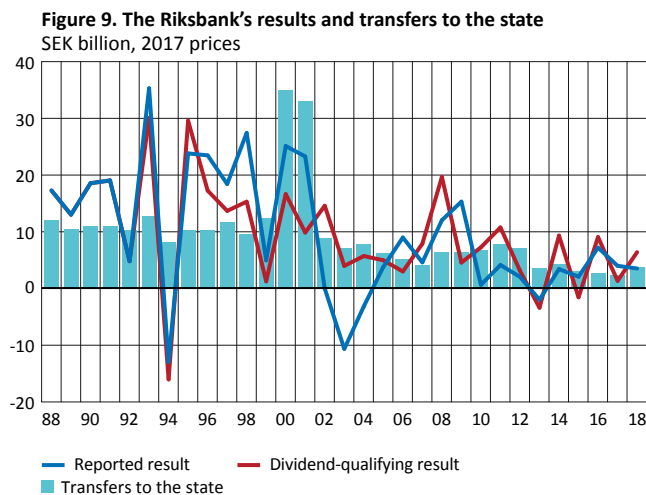
The Riksbank has funded some of the foreign exchange reserves by borrowing foreign currency from the Swedish National Debt Office when the foreign exchange reserves were expanded in 2009 and 2012 (see above). The Debt Office has borrowed euros and dollars on the financial market specifically for this purpose. These currency loans are an interest-bearing liability for the Riksbank, where the interest rate is the Debt Office's market borrowing rate.

Equity

Equity can be considered as a liability to the Swedish state as the state owns the Riksbank. When the Riksbank makes a profit, equity increases, and a loss causes it to decrease. However, any profit dividend to the central government also reduces equity. In Figure 5, we can see that since 1980, a broad definition of equity, which includes unrealised gains, has varied around approximately SEK 100 billion in 2017 prices. At the end of 1990s, equity increased, but, for 2000 and 2001, extra-large profit dividends were disbursed for a total of SEK 40 billion. In the 2018 annual accounts, the Riksbank's equity was SEK 61 billion, including the profit for the year, and unrealised gains were SEK 67 billion. As the central government does not have an explicit required return from the Riksbank, equity can be seen as interest-free capital for the Riksbank, just like banknotes and coins.

In 1988, the General Council of the Riksbank decided that the Riksbank should follow a profit dividend model in which 80 per cent of the five-year average result is transferred to the central government, see Gardholm and Gerwin (2011).¹⁷ Figure 9 shows transfers to the central government from the Riksbank since 1988, in fixed prices. The financial result on which the dividends are based deviates in some respects from the reported result in the annual report, which is also illustrated in Figure 9. The difference is that the dividend-qualifying result is calculated excluding all changes in the value of gold and currency, but including unrealised changes in the value of bonds.

¹⁷ An important motive for using a five-year average was that it was desirable to have dividends that were stable over time, in order to avoid unmotivated fluctuations in the state's budget outcomes.



The exclusion of gold and currency effects from the dividend-qualifying result is due to the fact that the krona exchange rate can vary considerably and to thereby ensure that temporary fluctuations do not create unmotivated fluctuations in the dividend to the central government. Furthermore, it is undesirable for the Riksbank to have to sell parts of the foreign exchange reserves in order to distribute profits that are due to a krona depreciation. For example, it may depend on the policy need requiring the foreign exchange reserves to consist of a certain volume of dollars and this volume is not affected by fluctuations in the exchange rate (Gardholm and Gerwin, 2011). The fact that unrealised gains and losses for bonds are included is due to the Riksbank, when the profit model was introduced, having had an income concept that included all unrealised changes in the value of bonds. When the Riksbank later introduced different accounting practices with revaluation accounts, in which only certain negative unrealised changes in value were included, the General Council also chose to change how the dividend-qualifying result was calculated so that the dividend principle would not change (Gardholm and Gerwin, 2011).

This model for profit dividends means that if the Riksbank has a dividend-qualifying result that is positive over time, nominal equity will have a net addition of 20 per cent of the dividend-qualifying profit. This implies that the Riksbank's equity can grow over time, which is a reasonable arrangement as both the economy and price levels typically increase over time.¹⁸ A disadvantage of this model is that, if the Riksbank ends up with low equity due to large losses, it will take a long time to build up equity again with the help of its own profits, as the intention is to disburse 80 per cent of these in dividend to the government. In such a situation, the Riksdag can, if necessary, deviate from the model and decide not to disburse dividends for a period of time.¹⁹

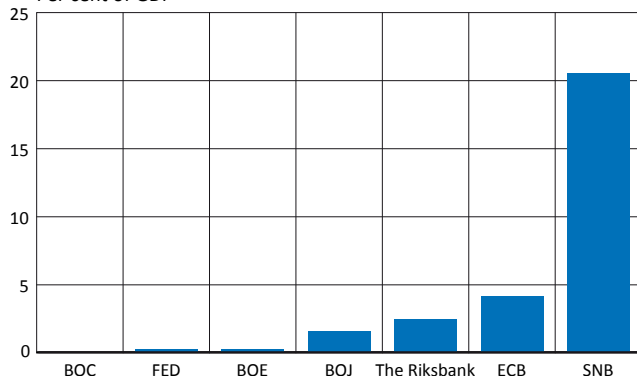
If we consider a broad definition of equity, which includes non-realised gains or losses, the Riksbank has equity of 2.5 per cent of GDP. In Figure 10, we compare with other central banks. Fed, BOE and BOC have equity that is very small, 0.2 per cent of GDP or less. ECB has almost twice as much equity as the Riksbank. SNB stands out with equity equal to just

¹⁸ If the Riksbank's return on equity were 10 per cent over the long term, equity would increase by two per cent per year after dividends, which would lead to equity being able to grow in step with an inflation rate of two per cent. A return on equity of 10 per cent is obtained, for example, if the Riksbank's entire liability side consists of equity of SEK 40 billion and banknotes and coins for SEK 60 billion, and the long-term return on assets is four per cent, on condition that the costs of the bank are zero.

¹⁹ The Riksbank also has an option to take decisions on this itself, if equity is too low given the financial risk, without involvement from party politics, by making provisions for financial risk. The right to make such provisions is based on the ECBS accounting guideline, which has been made binding for the Riksbank via Chapter 10, Article 3 of the Sveriges Riksbank Act.

over 20 per cent of GDP. The reason why we see such substantial differences between levels of central bank equity may be due to discrepancies in mandate, legislation, accounting practices, relationship to the state, policy situation and so on.²⁰

Figure 10. Comparison of equity for a number of central banks
Per cent of GDP



Sources: Annual reports for each central bank respectively (for year 2017), and the OECD

Revaluation accounts

The Riksbank applies market valuation of its assets in its reporting. To avoid unnecessarily large fluctuations in the reported profit, the Riksbank uses so-called revaluation accounts. This also follows ECBS accounting guidelines, which the Riksbank is obliged to do in accordance with the Sveriges Riksbank Act. Each asset, like a bond or a currency, has its own revaluation account. Unrealised gains and losses are booked on these accounts so that they do not affect reported results and equity. If a revaluation account is negative at the end of the year, a so called write-down is implemented, which leads to the negative amount affecting the reported result and the revaluation account is set to zero.^{21, 22} If a profit for an asset is realised, which occurs when the asset is sold, it is recorded by the revaluation account in question being decreased and the financial result for the year being increased.

If the Riksbank sold all the assets on its balance sheet, at prevailing market values, actual total equity would then be the sum of the reported equity and the revaluation accounts. A broader definition of equity can therefore include the sum of the revaluation accounts, even though this is an unlikely event. In the 2018 annual accounts, the sum of the revaluation accounts was SEK 67 billion, see Table 5. SEK 34 billion of the revaluation accounts comes from unrealised gains for the gold holdings, SEK 4 billion from unrealised price gains for bonds in foreign currency, SEK 19 billion from unrealised exchange rate gains for foreign assets and just under SEK 10 billion from unrealised gains for bonds in SEK.

Other liabilities

Other liabilities mainly consist of a counterpart item in relation to the IMF, accrued expenses and pre-paid income.

20 The Federal Reserve, for example, has a stable earning capacity from a large seigniorage, which may be one reason why equity can be kept so low. The SNB's high figure is due to the inclusion of the provision made by the SNB to maintain currency assets on an appropriate level from a monetary and exchange rate policy perspective, and to constitute a buffer for the risks posed by its large holdings of foreign assets.

21 This can be seen as the reporting of unrealised gains occurring according to some form of precautionary principle, in which the reported result is affected by unrealised losses but not by unrealised gains. Technically speaking, the write-down takes place by the acquisition value being reduced to the market value, which leads to the revaluation account going to zero and the financial transaction net result decreasing by the same amount as the write-down.

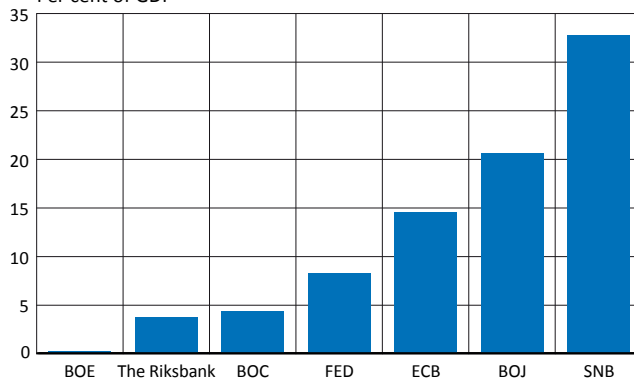
22 An original idea with revaluation accounts was that the central bank would not distribute unrealised gains. It does not work this way for the Riksbank, as the General Council's guidelines on dividends includes unrealised changes in the value of bonds in the dividend-qualifying result.

2.2.3 The size of the balance sheet

As we discussed in Section 2.1, a central bank has a fundamental size of asset holdings based on the size of its equity and banknotes and coins in circulation, and the balance sheet cannot be less than the sum of these two items. If the central bank chooses only to utilise this size of asset holdings, we can say that the size of the balance sheet over time is driven by the size of the liability side. This means that fluctuations in the demand for banknotes and coins and changes in equity, from profits, losses, capital injection or dividends, determine how the size of the balance sheet changes. If the central bank needs to have a larger balance sheet than this minimum level, interest-bearing loans of different kinds are normally required. In these cases, we can instead say that the size of the balance sheet is allowed to be driven by the asset side, for example if the central bank executive deems it necessary to buy assets on the fixed income and foreign exchange market for monetary policy purposes.

The size of the interest-free capital can be seen as a rough indicator of the degree of financial independence for a central bank. Compared with many other central banks, the Riksbank's interest-free capital as a share of GDP is relatively low, which you can see in Figure 11.²³ As we have noted above, an important reasons for this is the low demand for banknotes and coins in Sweden, which means that the conditions for earnings via seigniorage are by and large worse for the Riksbank than for many other central banks.

Figure 11. Comparisons of interest-free capital for a number of central banks
Per cent of GDP

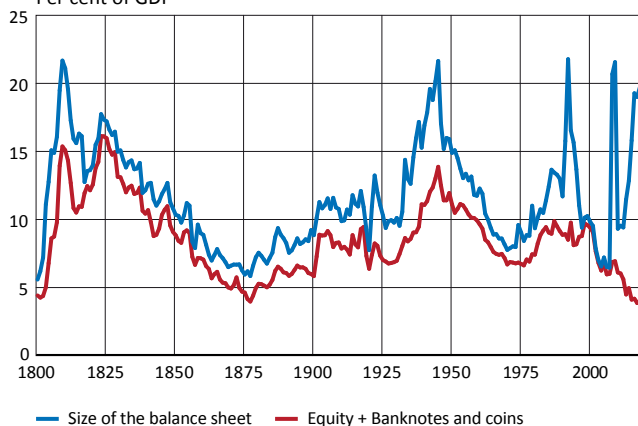


Note. Interest-free capital is here defined as the sum of equity and banknotes. Note that a few of these central banks (for example BOE) also can have a non-interest-bearing liability in the form of the deposits banks need to place with the central bank without interest, which is sometimes called a non-interest-bearing reserve requirement.
Sources: Annual reports for each central bank respectively (for year 2017), and the OECD

In Figure 12, you see the Riksbank's interest-free capital and total balance sheet respectively since 1800, expressed as a percentage of GDP. If we see the interest-free capital as a minimum level for the Riksbank's total balance sheet and compare this level with what the total balance sheet has actually been over the last 218 years, we see that the interest-free capital seems just now to be at historically low levels. At the same time, balance sheets are at historically high levels. The large discrepancy between the minimum level and the total balance sheet size shows that the Riksbank has needed to implement major policy measures over the last decade, while the interest-free capital has shrunk as a consequence of fewer banknotes and coins in circulation. As we can see in the figure, this discrepancy varies over time, which reflects that the Riksbank's need for balance sheet measures also varies over time.

²³ In the case of the Bank of England, we have excluded cash from interest-free capital since seigniorage is remitted in full directly to the Treasury.

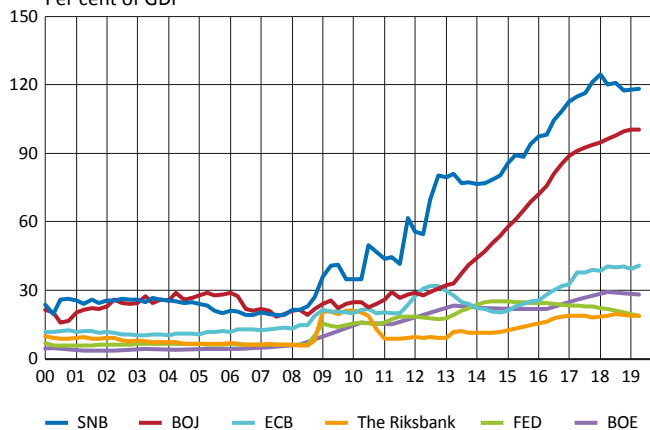
Figure 12. The Riksbank's interest-free capital and total balance sheet size
Per cent of GDP



Sources: Sveriges Riksbank and Statistics Sweden

In Figure 13 you can see that many central banks, all over the world, have expanded their balance sheets in the wake of the global financial crisis in 2008–2009. The level of the Riksbank's current balance sheet in relation to GDP is hence not remarkable in an international perspective.

Figure 13. The balance sheet sizes of a number of central banks
Per cent of GDP



Sources: Respective country's central banks and national accounts

The historically low level of the Riksbank's interest-free capital shows that the conditions for the Riksbank's earning capacity have worsened over the last decades, which we could also see in Figure 9. The question is whether lower earnings have affected the degree of financial independence for the Riksbank. We look more closely at this question in the next section, where we discuss the concept of financial independence.

3 Long-term financial independence

One way of manifesting and strengthening a central bank's independence in the execution of its tasks is for the central bank to be financially independent. One condition for such independence is for the funding of the central bank's operations not to be part of the political budget process. For the Riksbank not to be dependent on appropriations in the budget requires a durable source of income that can cover the operating costs the Riksbank incurs in executing its tasks in monetary policy and financial stability. As we saw in Figure 9, the Riksbank's earnings are enough to pay its operating costs and, in addition, to make a

profit, which shows that the Riksbank is financially independent, even if its earning capacity and profits have become lower recently. In addition, the Riksbank's earning capacity must be robust towards the financial risks linked with the Riksbank's assets and liabilities, so that its long-term earning capacity remains sufficient, even after periods in which the Riksbank has made major losses.

3.1 The Riksbank's income statement and profit

A central bank has four main sources of financial revenue:²⁴

- seigniorage from banknotes and coins (see section 2.1.1)
- return on equity
- interest rate spread from debt-financed investments
- fees, including revenue from any reserve requirement

There is no direct link between specific asset and liability items on the balance sheet. This means, for example, that no specific asset is purchased with equity. Naturally, the Riksbank's choice of portfolio composition affects the yield the Riksbank gets from its assets. The composition of the portfolio is driven partly by pure policy needs, for example that a certain amount of the portfolio is to be invested in dollars, and partly by normal financial administrative considerations, such as how long the foreign exchange reserves' average maturity should be at present. The more risk, the higher the average yield, but also the greater the variation in the Riksbank's earnings.

As we mentioned above, equity and the natural investment scope from banknotes and coins is invested in some form of asset that generates an income for the Riksbank. The contribution to the financial result thus becomes the yield from this investment, as the funding cost can be considered to be zero from the Riksbank's perspective.

An interest rate spread from debt-financed assets is the yield that the Riksbank could get, for example by investing in long-term bonds and funding this with short-term central bank reserves, such as the Swedish government securities holding built up for monetary policy purposes. The other example from the Riksbank's balance sheet concerns currency loans from the Swedish National Debt Office that fund a large part of the foreign exchange reserves. As a consequence of its tasks, the Riksbank most often has liquid assets with low credit risk (as discussed above), which means that yield is relatively low compared with the funding rate. This means that net yield tends to be low, or even negative, when assets are funded using interest-bearing debts.²⁵

The use of central bank reserves as funding provides increased leverage that entails a higher risk of losses. Consequently, a lower amount of interest-free capital cannot be replaced by a greater proportion of central bank reserves without affecting the risk and therefore the need for buffers. It cannot be ruled out that central banks, for various reasons, may also decide to keep the central bank reserves on a positive level further on, for example if the implementation of monetary policy demands that there is a lot of liquidity in the system. The Riksbank has sent a proposal for consultation about moving towards an operational framework with deposits and loans at the repo rate +/- 10 basis points (Sveriges Riksbank, 2019c). In such a system, banks with surpluses may make deposits at the Riksbank and banks with deficits can borrow money from the Riksbank (known as gross clearing), in which case the interest rate spread of 20 basis points would make a positive contribution to the Riksbank's financial result.

²⁴ We disregard the additional possibility of direct fiscal transfers from the government due to the arguments about financial independence discussed above.

²⁵ The part of the foreign exchange reserves funded using interest-bearing currency loans from the Swedish National Debt Office can be considered to contribute an expected loss, as loans and assets are relatively uniform in maturity, but the Swedish National Debt Office's currency borrowing is slightly more expensive than the government bonds in which the Riksbank, in turn, invests.

Fees and reserve requirements presently play a very small role for the Riksbank's income. Fees are formed, for example, of membership fees in the RIX payment system, and cover the system's operating costs, more or less. Formally, the Riksbank also has the possibility of applying a reserve requirement, if this is for monetary policy purposes. Under the current law, this is therefore not something that the Riksbank can use solely to increase earnings. If a reserve requirement was applied, the banks would have to hold reserves at their account with Riksbank in proportion to their customers' deposits, receiving a relatively low interest rate. This would increase the Riksbank's access to cheap funding and in the special case of zero interest on required reserves contribute to earnings analogous to the case of cash described above. However, since 1994, the level of the reserve requirement has been set at zero and, naturally, the effect on earnings has been zero since then.²⁶

The most important source of revenue for the Riksbank can therefore be considered to be the yield on interest-free capital in the form of the stock of banknotes and coins M and equity EK . The average yield on the assets is assumed to be the long-term nominal interest rate

$$(1) \quad i = r + \pi + tp,$$

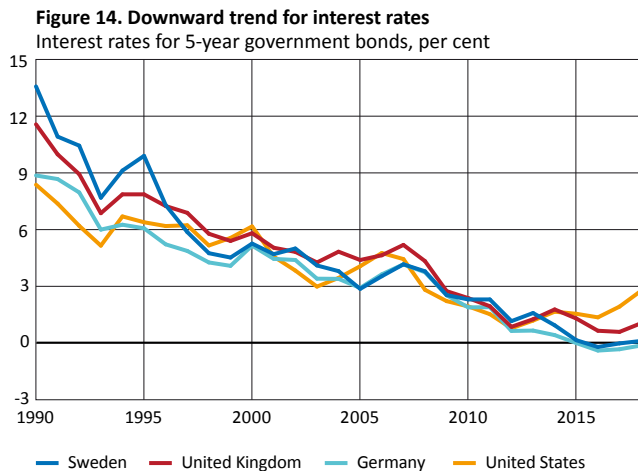
where r is the long-term real interest rate, π is average inflation and tp is a term premium. For positive earnings, a positive average yield is needed. We examine a simple example where we assume that the Riksbank only uses the natural investment scope from the interest-free capital. The average profit over the long term then becomes the difference between the revenues for the assets A and the Riksbank's operating costs DK and can be summarised in the following equation (see Appendix: Calculations for long-term earning capacity)²⁷:

$$(2) \quad PROFIT_t = (r + \pi + tp)(A_{t-1}) - DK_t = (r + \pi + tp)(M_{t-1} + EK_{t-1}) - DK_t.$$

From the simplified description above, we can identify two key reasons for the Riksbank's decreased earnings, as we discussed in section 2.2.1 and Figure 9, which also explain why these can be expected to continue to be lower than previously. First, the volume of banknotes in circulation has decreased, leading to a lower level of interest-free capital, which is visible in Figure 5. Second, interest rate levels have been trending down both in Sweden and internationally, see Figure 14 and the discussion in Laubach and Williams (2003) and Holston et al. (2017).

²⁶ At the abandonment of the reserve requirement, the banks had about SEK 14 billion tied up in interest-free assets and the level of the requirement was two per cent (Lotsberg, 1994), while the compensation rate was zero per cent.

²⁷ We disregard here detailed accounting rules and the use of revaluation accounts.



Source: Thomson Reuters

The Riksbank is still making a profit, on average, which indicates that earnings are compatible with financial independence. However, this could be considered to be a lower degree of financial independence than previously. But how can sufficient earnings and a sufficient degree of financial independence be defined? In the next part, we discuss this question and its connection with central banks' need for capital.

3.2 How large is the Riksbank's need for interest-free capital and equity?

An initial question is: does the Riksbank need any revenue or equity at all? Unlike private companies, a central bank can always pay its own way in its own currency by crediting the account in the payment system for the recipient's bank. Cannot the Riksbank just 'print money' and thereby always be financially independent?

The Riksbank can certainly pay its bills over the short term by crediting the banks' accounts in the RIX payment system. However, if the Riksbank's costs permanently exceed its revenue, the banking system's surplus towards the Riksbank in the payment system will grow infinitely.²⁸ If the losses are small, this could take a long time, but it is neither a sustainable nor a responsible approach towards safeguarding the central bank's financial independence.

With the present approach towards the Riksbank's earnings, in which banknote seigniorage and equity form an interest-free capital, the question arises of how much equity is needed for sufficient financial independence, for a given real amount of banknotes and coins. The need for equity is determined by two main factors with several components (see also Figure 15):

- 1) Earnings
 - a. Equity needs to be big enough to create, together with banknotes and coins, a sufficient 'interest-free capital' that can provide financial net revenues to cover the central bank's running operating costs.
 - b. The total interest-free capital also needs to ensure an average profit that is sufficient to allow the Riksbank to rebuild equity in case of large losses.
- 2) The risk buffer
 - a. In addition to the above, equity needs to be large enough to be able to form a buffer for the existing financial risks towards which the central bank is exposed via its assets and liabilities.

²⁸ In addition, it would probably not be compatible with the prohibition on monetary financing under Article 123 of the Treaty on the Functioning of the European Union.

- b. A buffer may also be needed to cover for uncertainties over the future size of average yield and the amount of cash, so that the central bank's earnings do not need to be affected by a lower seigniorage, for example.
- c. A further buffer may be needed to allow the central bank to temporarily extent the financial risks in conjunction with certain policy requirements (for example crisis measures or asset purchases for monetary policy purposes).

Figure 15. The need for equity
Illustration



The aim of risk buffers is to ensure that interest-free capital remains large enough to provide reasonable earnings, even if the central bank makes major losses. Reasonable earnings can be considered to cover running costs and, additionally, to provide an average profit large enough to build up the buffers again.

Hall and Reis (2015), as well as the second parliamentary inquiry (SOU, 2013:9), advocate an automatic recapitalisation of the central bank if the interest-free capital decreases due to losses. Under the assumption that such an arrangement can credibly be implemented in practice, the risk buffers can be discarded. However, if equity is calibrated so that the combined revenues from banknotes and coins and equity are just enough to fund operations, there will be an equal chance that the state will have to pay money into the central bank or that a dividend will be paid to the Treasury. Given that political majorities can change, it is unclear how much long-term financial independence such a central bank could be said to have unless the suggested automatic rule for recapitalisation is written into the constitution and thereby becomes very difficult to change.

If the amount of banknotes and coins is sufficiently high, the need for equity could be zero or even negative, as seigniorage leads to such a large surplus that no equity buffers are needed. This means that the central bank can be solvent even though equity is negative, unlike the usual situation for a normal company.

Both Buiter (2009) and Del Negro and Sims (2016) argues that what determines whether the central bank is solvent, which has to be seen as a minimum requirement for financial independence, is whether the current value of future expected surpluses exceeds the absolute value of negative equity. In other words, negative equity can be possible over the short term if future surpluses are expected to be great enough to prevent equity from becoming more and more negative. In this case, the central bank is solvent despite the negative equity.

If the central bank is not solvent, future losses will lead to constantly increasing negative equity, which would eventually lead to the private sector gaining a larger and larger claim on the consolidated government. The interest paid by the central bank on this claim would contribute towards the further accumulation of debt, which would approach infinity over the long term. One solution would be to set the interest rate at zero to avoid rising debts. However, this would prevent the central bank from using the interest rate to meet its inflation target. Del Negro and Sims (2016) argue that a situation in which central bank

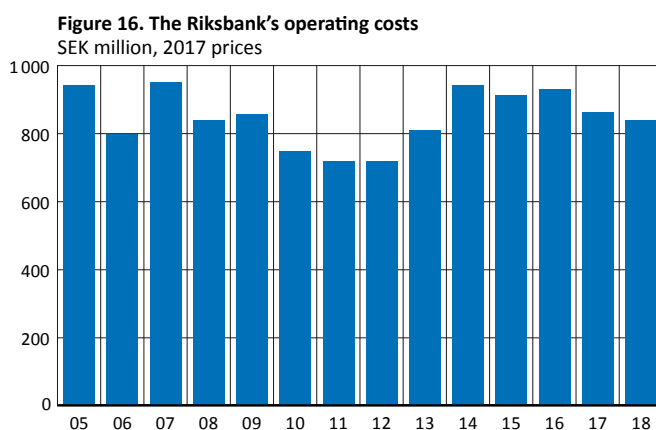
reserves approach infinity cannot be considered to be a well-defined equilibrium, as the private sector will then be accruing infinite assets against the state, and thus instead argue for a definition of solvency as above.

A real-world example of how negative equity need not be an acute problem for a central bank is provided by the Czech National Bank, which currently has negative equity but very high current and expected future seigniorage. The logic is that the central bank can retain future profits to restore equity. One condition, of course, is that the regulatory framework that governs the central bank's operations allows this. The US central bank also has very small albeit positive equity in relation to its assets, but there too the present value of the seigniorage is very high. However, both of these cases require historical correlations and assumptions for cash demand and interest rates to apply in the future too.

Archer and Moser-Boehm (2013) argue that there are negative signal effects of a central bank having negative equity, as the general public may find it difficult to estimate the value of the future seigniorage. According to this reasoning, central banks can therefore be recommended always to have positive equity, regardless of whether the solvency condition has been fulfilled.

3.3 The Riksbank's costs and some possible financing reforms

According to point 1a above, the Riksbank's average revenues must at least cover running operating costs, which currently amount to about SEK 850 million per year. A first parliamentary inquiry (SOU, 2007:51) presented two alternative financing strategies. In the first of these, seigniorage is used to cover running costs, in combination with return on calibrated equity if necessary. In the second alternative, only equity is used to create earnings to finance operations. In the second case, seigniorage would be paid directly to the state.



Sources: Sveriges Riksbank and Statistics Sweden

A second parliamentary inquiry (SOU, 2013:9) decided to recommend the Riksbank to have an interest-free capital whose real return would exactly cover operating costs in the long term, under the assumption that the real interest rate would average at least 1 per cent, which was considered to be a low assumption. In addition to this, the inquiry advocated the introduction of an automatic rule for recapitalisation and therefore argued that the risk buffers could be kept very small.²⁹

Hence a sufficient part of the nominal return on assets would be retained to preserve the size of the Riksbank's interest-free capital. With this system a decline in the volume of cash

²⁹ The equity that the inquiry advocated was included in the interest-free capital that would safeguard earnings (factor one in section 3.2). The size was certainly justified by gold price risk and interest rate risk, but only in the short term as greater losses would automatically lead to a capital injection to restore the interest-free capital.

would automatically lead to an adjustment of the appropriate amount of equity needed to ensure a sufficient income.

The Riksbank is striving to keep cost increases in its operations in line with inflation. This is also a critical assumption for the proposal above, as the real return then becomes enough to pay the constant real operating costs.

But the Riksbank's costs may rise faster than inflation, for example if demands are made for increased security in cash handling, the production of more statistics or new payment services, potentially including the work of developing and running an e-krona in the future. For example, in the event that the Riksbank's costs were instead to grow at the same rate as growth in the economy, the model would only work if the real interest rate were to exceed the growth rate in the economy. This is because equity must increase at the same growth rate to be able to give a sufficient return in the next period. Consequently, only the difference between the real interest rate and the growth rate can be used to finance the Riksbank's expenses in the current period. The assessment of the central bank's long-term cost development is therefore an important input when we try to find a sustainable model for financial independence.

Finally, we can note how the proposals of the inquiry would be affected under the assumption that the nominal amount of cash would instead grow. In this case, the Riksbank would not have to retain as much of the profit for interest-free capital to grow apace with inflation, and this difference could then be distributed to the state or used in the event that the Riksbank is faced with a need to retain profits and build up equity, as in point 1b in section 3.2. This also indicates, for long-term earnings based on interest-free capital, that seigniorage is a more advantageous source of revenue than equity for the central bank. This holds under the assumption that the amount of cash grows apace with inflation or nominal GDP (one example of such a calculation can be found in Appendix: Calculations for long-term earning capacity).

3.4 A conceptual framework for financial independence and balance sheet risks

All else being equal, it is evident that the larger the revenue and the more equity the central bank has at its disposal, the smaller the risk is that the bank will lose its financial independence. In addition, it will have a better ability to manage unexpected events. At the same time, binding up equity in the central bank may possibly entail a disadvantage for the state, as this capital has an alternative cost. The state will thus have to make a trade-off concerning how much equity it considers appropriate to bind up in the central bank.

If the central bank instead pays out part of its equity to the state, the national debt can be reduced by an equivalent amount. For example, if the market uses the proportion of the national debt to GDP as a basis for pricing the risk premium for government bonds, a lower national debt could eventually reduce interest expenditure for the entire national debt. This would apply, in particular, to a strained situation in which national debt is approaching the fiscal limit where future budget surpluses would scarcely be enough to repay the debt (see Leeper and Walker (2011)).³⁰

Larger equity also implies increased possibilities for the central bank to act by taking on risk in future unforeseen scenarios, in accordance with point 2c in section 3.2 above. The increased freedom of action entailed by a high level of equity could, however, also be seen as inappropriate by politicians unwilling to allow the central bank to expose the consolidated government budget to any risks. Quite simply, an excessively increased capital buffer could lead the central bank to undertake unnecessarily high-risk measures, which would not be efficient from a societal perspective. Major losses for the central bank mean that the state

³⁰ The governments' consolidated net debt will remain unchanged, and if market participants instead focus on this quantity to determine the risk premium the effect should be very small.

misses out on future transfers of profit and, in the worst case, needs to recapitalise the central bank. The amount of equity that the central bank is allowed to retain can be said to reflect the size of the risks that the politicians can accept that the bank takes. Plosser (2019) discusses the political risks inherent in a large balance sheet and points out that an operational framework for monetary policy that allows interest rate management in combination with a large amount of central bank reserves could lead to pressure to use the central bank's balance sheet for political purposes. See also Cavallo et al. (2018) for a discussion of political risks associated with a large balance sheet.

How, then, can a reasonable 'risk mandate' for a central bank be formulated? Buiter (2009) points out that the static balance sheet for a central bank does not say so much about its solvency, as the central bank's most important asset – the monopoly on issuing banknotes and coins – is not typically taken up on the asset side. Consequently, current book equity alone is not enough to measure the central bank's financial strength.

One alternative, which, in line with Buiter (2009), Hall and Reis (2015) and Del Negro and Sims (2015), focuses on the intertemporal aspects would be to examine the probability that the central bank will require a capital injection from the state over the next 10–20 years. Setting a limit on how high this probability can become is compatible with the definition of financial independence. This can then be translated into how much equity it is appropriate to keep, partly depending on the financial and macroeconomic risks currently affecting the prospects for the central bank's earnings, and partly depending on the need for financial buffers entailed by the execution of the central bank's tasks.³¹

The advantage of defining such a risk mandate, instead of focusing on a statutory level of equity, is that it automatically becomes dynamic and reacts to changed conditions. For example, declining seigniorage means an increased need for equity, and decreased risks will mean a decreased need for equity. In purely practical terms, it is conceivable that the Riksbank would update, at appropriate intervals, its calculations of the risk that capital injections from the state would be needed and provide suggestions, based on these calculations, of how much profit could be distributed.³²

The disadvantage of such an approach would be that this type of long-term risk assessment is difficult to perform, although this kind of reasoning could still be helpful when considering policy decisions with major consequences for the balance sheet. If the Riksbank were considering a policy measure that affects the balance sheet, it would need to update its calculations of the probability for recapitalisation and develop an impact analysis with alternative courses of action. For example, assume that the Riksbank wishes to purchase more government bonds that are financed using central bank reserves. This would lead to a heightened interest rate risk in the total asset portfolio. If equity was initially well balanced, the extension of the portfolio could entail an excessive risk of recapitalisation in the following period. Whether this is the case depends on the initial size of the Riksbank's buffer. If the 2c buffer is not enough to keep the risks within the intended mandate, the situation could be managed either by reducing the risk from one other component in the balance sheet, for example by reducing the interest rate risk by shortening the maturity of the foreign exchange reserves, or by temporarily increasing equity with retained profits. Occasionally, perhaps, it may be impossible to stay within the risk mandate, for example if the increase of the risk becomes so high that not even retaining all profits over the next few years would be enough to return the probability of recapitalisation to an acceptable level. In this case, the Riksbank could either refrain from the measure or inform the Riksdag that the risk of recapitalisation had been raised due to a necessary policy measure.

31 A similar alternative would be to make a long-term Value-at-Risk calculation, for example over a 15-year horizon, and set a limit for the maximum losses the Riksbank may make in 99 per cent of the sample space.

32 A variation of this approach would be to regulate on the basis of the amount of capital the Riksbank may retain. This would limit the risks the Riksbank would be able to take on, given that the probability of recapitalisation must be kept within a framework.

If the Riksbank has a target for interest-free capital, this level must be reassessed when conditions change. For example, the amount of equity will need to be increased if the long-term real interest rate falls. If the Riksbank is allowed to increase the interest-free capital due to these changed conditions, the question arises of how the target is to be attained. If the buffers 1b and 2b are slim, it is likely that the Riksbank, in such a scenario, will lack the possibility of retaining enough profit within a reasonable time horizon. In this case, the state will instead have to inject capital into the Riksbank. Given the definition of financial independence above, this means that the buffers 1b and 2b must be in proportion to the uncertainty of earning capacity, as otherwise the state will have to inject funds 'too often'. If the Riksbank has a target for equity instead of interest-free capital, this mechanism will become even stronger, as variations in the volume of banknotes will then also affect the need for equity.

For example, Flam (SOU, 2013:9) considered that a conservative assumption for the real interest rate was a level of at least 1%, completely in line with the established economic theory that the real interest rate should, at a minimum, exceed the growth rate of the economy. Under this assumption, SEK 85 billion in interest-free capital should just be enough to finance costs of SEK 850 million. However, over the last 10 years, the real interest rate has been negative, and it has been argued that it will continue to be very low for a long time to come, for example for demographic reasons. This period shows partly how difficult it is to estimate how key variables for the Riksbank's earnings can be expected to develop, and partly that making calculations based on long-term averages is insufficient, as the system also has to function during lasting deviations.

4 The greatest risks to financial independence

When discussing financial portfolio risks focus is often on nominal values, for example how many billion that the Riksbank risks losing at a certain horizon. When thinking about the risks to the funding ability of a central bank it is more natural, as done above, to focus on the real interest-free capital. Whether focus should be on nominal or real quantities matters. For example, eliminating part of the nominal exchange rate risk from the currency portfolio may not necessarily reduce the real risks.

Hall and Reis (2015) focus on three primary financial risks for a central bank's balance sheet, all of which come from the assets and liabilities that the central bank holds or may hold in future: exchange rate risk, interest rate risk and credit risk. To these risks, we would like to add two factors that are important to the Riksbank: the risk of declining future seigniorage and the value of the long-term real interest rate.

4.1 Exchange rate risk

At the end of 2018, the Riksbank held foreign currency worth about SEK 450 billion, primarily so as to be able to offer funding to Swedish banks during a financial crisis. Changes to the krona exchange rate affect the value of this holding and returns measured in kronor. As long as the amount of foreign currency is not affected, exchange rate risk in kronor is not normally something that affects the Riksbank's preparedness to provide liquidity support in foreign currency. On the other hand, it could form a risk for the Riksbank's earnings expressed in kronor if this involves a long-term change in the krona exchange rate. The factor that affects the Riksbank's earnings is real interest-rate free capital. The covariation of fluctuations in price levels in Sweden with changes to the nominal exchange rate is therefore important for assessing how the exchange rate risks affect the financial independence of the Riksbank.

At the end of 2018, about SEK 250 billion of the foreign exchange reserves were borrowed in foreign currency (euros and US dollars) via the Swedish National Debt Office (see section 2.2.). The Riksbank invests the foreign currency in government bonds with

relatively similar maturities and foreign currency exposure to the borrowing. This makes the risks inherent in this part of the foreign exchange reserves small from a management perspective.³³ For example, if the krona appreciates, the assets' value in kronor will certainly fall, but so too will the krona value of the Riksbank's foreign debt.

The potentially high exchange rate risk arise from the fact that part of the foreign exchange reserves is funded by liabilities in kronor, such as equity, central bank reserves, and banknotes and coins. This part was worth about SEK 200 billion at the end of 2018. If the exchange rate appreciates, the value of the currency assets counted in Swedish kronor decreases, but the value of the liability items does not change. For example, if the exchange rate permanently appreciates by 10 per cent, this immediately entails a decline in value of around SEK 20 billion from the part of the foreign exchange reserves with a foreign currency exposure.³⁴ As no guarantee exists that the nominal exchange rate will return to its earlier value, this entails a real long-term risk to the Riksbank's nominal equity. The reason that the nominal exchange rate will not necessarily return to earlier levels is related to the Riksbank's inflation targeting policy. For example, if a domestic economic shock leads to lower inflation in Sweden for a period, but does not affect the rest of the world, the level of prices in Sweden will fall more than the level of prices abroad. If we assume that the real exchange rate is stable in the long-term, the nominal exchange rate, which is the product of the real exchange rate and the ratios of price levels, thus falls. However, the real value of the foreign exchange reserves does not change in this case, and thus a non-hedged foreign exchange reserve becomes preferable, if the aim is to achieve a stable real interest-free capital. However, if the real exchange rate is not stable, or if the foreign price level often fluctuates independently of the Swedish one, the conclusion could be the opposite. Weighing up how much of the foreign exchange reserves should possibly be hedged also requires a thorough analysis of the short-term fluctuations of exchange rates and interest rates.

A further potential exchange rate risk would arise if the Riksbank should choose to intervene on the foreign exchange markets, for example with the aim of avoiding an excessively strong exchange rate. In such a situation, both the size of the balance sheet and the exchange rate exposure from foreign currency could increase heavily, as both the Czech and Swiss National Banks have experienced in recent years.

4.2 Short-term interest rate risk

At present, the Riksbank holds a large portfolio of Swedish bonds financed using monetary policy liabilities. If the Riksbank holds these bonds to maturity, their return will be known in advance but the funding cost depends on the development of the repo rate over the portfolio's lifetime. This variation in the difference between revenue and expenditure is a kind of interest-rate risk. Note that here we refer to variations in market rates and central bank policy rates around the long-term levels of the real interest rate and inflation compensation as discussed in section 3 on the long-term return on central bank assets. Whether or not these risks translates into risks for the real interest-free capital depends on the covariation of the repo rate and inflation. Sometimes the repo rate is increased more than inflation, in which case risks are reinforced – an unexpectedly high funding cost would coincide with a lower real value of equity.³⁵ But sometimes the interest rate is decreased to

33 On the other hand, some risk will remain if the foreign exchange reserves must be used. In the best case, the holding of foreign government securities can be repoed out to receive short-term liquidity that can be lent to the banks against good collateral, while the interest to be paid is invoiced to the Swedish banks. In the worst case, the foreign government bonds must be sold, and an interest rate risk arises for the Riksbank.

34 For the Riksbank, previously unrealised depreciations can build up an earmarked buffer in the form of revaluation accounts for each currency. However, this could be distributed in the event that foreign currency exposure changes, for example between different currencies, as these would then be realised, in an accounting sense. Consequently, it is not a buffer that is completely under the Riksbank's control. However, the Riksbank has the possibility of making earmarked allocations for certain types of risk, including currency risk. These allocations act as restricted equity in which all or part of the profit is earmarked as a buffer for specific types of risk. The Riksbank can adjust these allocations on the basis of the risks the Riksbank perceives.

35 What happens with the interest-free capital depends on how cash demand reacts.

increase inflation, in which case the two effects work in opposite direction. Furthermore, there is a covariance between the interest rate risk and the above discussed exchange rate risk, which highlights the need for a comprehensive analysis of the entire balance sheet.

The yield of a government bond reflects partly the market's expectations of the short-term interest rate over the maturity of the bond according to the so-called expectation hypothesis, and partly a risk premium that is usually positive but that, recently, may occasionally have been negative.³⁶ If the short-term interest rate becomes unexpectedly high, the average funding cost will become unexpectedly high, pulling down the central bank's profit. Another source of interest rate risk comes from the possibility that any risk premiums may rise, causing the market price of the bonds to fall. If bonds need to be sold in such a situation, a loss will arise.

At the end of 2018, the Riksbank had almost SEK 400 billion in Swedish government bonds with an average maturity of just under five years (see section 2.2.1). The bond holding has been funded by central bank reserves with an interest expenditure closely tied to the repo rate. If the Riksbank holds the bonds to maturity and the repo rate becomes one percentage point higher than expected, on average, over the maturity of the bonds, the funding cost will thus increase by around four billion kronor per year. If the repo rate becomes one percentage point lower than expected, the funding costs will fall by the same amount.

4.3 Credit risk

The credit risk in the government bonds owned by the Riksbank is deemed to be low (see Sveriges Riksbank, 2019a). However, it cannot be ruled out that, in a future scenario, the Riksbank would purchase higher risk assets than it has so far. For example, for quite a long time, the US central bank purchased a very large proportion of newly-issued bonds with US mortgages as collateral (known as mortgage-backed securities) in a situation where uncertainty over their value, and thereby the credit risk, was so great that many investors refrained from purchasing them.

The Riksbank may be exposed to a further type of credit risk if it supports Swedish banks with liquidity in a crisis scenario. The Riksbank normally demands very good collateral for all its transactions with the banks. However, in a stressed scenario, it may be difficult to value certain assets on the banks' balance sheets. The amount of money the banks should be allowed to borrow if they deposit a certain asset as collateral at the Riksbank then becomes a matter of judgement. If a bank that has been allowed to borrow from the Riksbank enters bankruptcy, the Riksbank risks making a credit loss if it turns out that the value of the collateral lies below that of the loan (see, for example, SOU 2013:9, pp. 126–127 and 143, as well as Ernhagen et al., 2002).

4.4 Risks associated with seigniorage and the long-term real interest rate

As we discussed above, the seigniorage from banknotes and coins arises from the fact that the investment rate is normally positive, while the cost for banknotes and coins is almost zero. One assumption that is made in many economic models and also in several of the risk calculations made for central bank balance sheets (see, for example, Hall and Reis, 2015) is that demand for cash follows the development of GDP, at least in the slightly longer term. This assumption is logical, as more cash is needed if the turnover rate for cash is constant and GDP is growing, both in real and nominal terms.

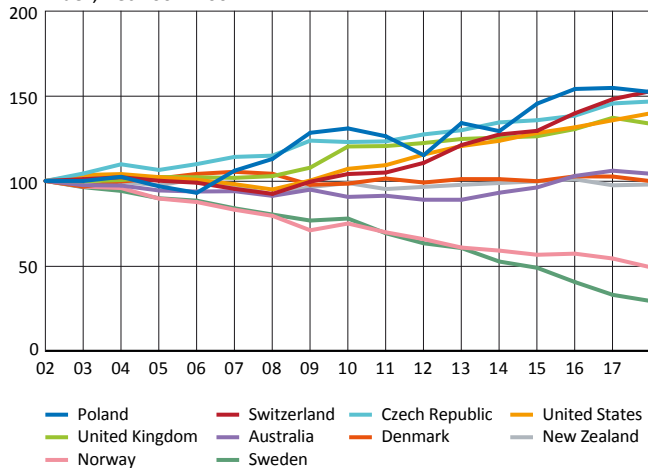
In Figure 17, we can also see that this development corresponds approximately with the data for many countries. For some countries, the real demand for cash has increased,

³⁶ See, for example, Kim and Wright (2005) for estimates of risk premiums for US government bonds.

particularly in the wake of the 2008–2009 financial crisis. This may be due partly to the lower level of interest rates, which reduces the alternative cost for holding cash, partly to the lower confidence in the banks in some countries and partly to increased demand for what are known as reserve currencies such as the US dollar, the euro and the Swiss franc.

Figure 17. Index for the cash share of GDP

Index, Dec 2001=100



Note. An unchanged index level implies that the amount of cash grows at the same rate as GDP. A rising (falling) index level implies that the cash amount grows faster (slower) than GDP.

Sources: Respective country's central bank, IMF and the World Bank

With this assumption, the amount of banknotes and coins will grow 'by itself' when GDP grows. This would mean that the Riksbank would not have to transfer the nominal part of revenue (inflation compensation) from seigniorage, but instead would be able to use the entire nominal revenue to pay running costs. A billion banknotes and coins therefore generates greater earnings for the Riksbank than a billion in equity does, as long as the amount of banknotes is growing (see Appendix: Calculations for long-term earning capacity).

At present, the amount of outstanding banknotes and coins is about SEK 60 billion. If the long-term real interest rate is at least one per cent, as was assumed by the Flam Inquiry (SOU 2013:9) and the inflation target is two per cent, the long-term nominal interest rate becomes three per cent. If the Riksbank receives a yield of about three per cent on the amount of banknotes, this becomes SEK 1.8 billion per year in seigniorage that can be used to cover the Riksbank's costs. This corresponds to about twice as much as is needed at present. With these assumptions, we see that about SEK 30 billion in banknotes and coins at current prices is needed to finance the Riksbank's costs, as long as cash demand grows apace with inflation in the period ahead.³⁷ However, as we discussed in section 3, it is reasonable for the central bank to make a moderate profit on average so that it is able to increase its equity with retained profits if necessary. Consequently, a further decrease in banknotes and coins is a risk to the Riksbank's earning capacity.

The current value of future seigniorage would be infinitely large if the real growth in the economy were permanently to exceed the real interest rate at the same time as cash demand were to grow in line with nominal GDP. If the costs only grow in line with inflation, the Riksbank's income would then grow faster than the costs. Achieving a well-defined equilibrium requires the real interest rate to be greater than the growth rate in the economy (see Buiter 2009). The current value of the seigniorage is given by

$$S = \frac{iM}{r - \Delta y}$$

³⁷ We note that interest rates are currently substantially below three per cent, and it would therefore be a major problem if the only funding came from interest income from 30 billion of cash.

where Δy is growth in the economy. For example, if we assume that the real interest rate in the long-term equilibrium is three per cent, that inflation compensation is two per cent and that growth is two per cent, the nominal interest rate will be five per cent, and banknotes and coins for SEK 60 billion gives a current value equivalent to SEK 315 billion. Following the logic in Hall and Reis (2015) and Buiter's (2009) reasoning, the Riksbank should thereby have a further asset item of SEK 315 billion. However, this assumption is sensitive for the level of the repo rate. If it is 2.5 per cent instead, the current value will be approximately twice as great. This mechanism helps explain why the risk of insolvency for the Federal Reserve system is very small, in spite of the possibility of some quarters with losses, as confirmed by the calculations in Hall and Reis (2015), Cavallo (2018), Carpenter (2015), Christensen et.al. (2015) and Rudebusch (2011). Quite simply, this is due to the current value of future seigniorage being very high in relation to the risks present on the balance sheet. Figure 7 shows that the quantity of outstanding banknotes in the United States is approximately six times greater than it is in Sweden.³⁸

However, the Riksbank's experiences from recent years indicate a weakness in these calculations. It is uncertain how robust cash demand will be, considering rapid technological changes, not least in the area of payment services. In Figure 6, we see that the assumption that the amount of banknotes follows nominal GDP does not work well for Sweden. Instead, it looks as though banknotes and coins are following a downward trend. In 1980, the amount of banknotes was six per cent of GDP, while today it has decreased to just one per cent. Development over the last five years has been particularly dramatic. Several factors have contributed to this development: improved and simplified card payments, new payment technologies such as Swish, increased online shopping, a reduced number of bank branches handling cash, and frequent banknote and coin changeovers (see. For example, Engert et al. 2019, and Erlandsson and Guibourg, 2018).

The question is how this development will continue in Sweden. There are signs that the development towards decreased cash usage is accelerating (see, for example, Sveriges Riksbank, 2018) and a continued decline of banknotes and coins is therefore an obvious risk for the future earning capacity of the Riksbank.

The value for the long-run real interest rate is a decisive factor for earnings

A reasonable value for the long-term neutral real interest rate is a much-debated question. Holston et.al. (2017) argues that the value has fallen substantially. Furthermore, Carvalho et.al. (2017) stresses that it is reasonable to expect this decline to be quite long-lasting due to demographic factors, as an ageing population tries to save for its future pensions. As the value of the real interest rate is a decisive factor for how much interest-free capital the Riksbank needs if it is to have reasonable average earnings, it is important to take account of uncertainty over the future level of the real interest rate. This is very much a relevant question when long-term government bond yields are negative, both in Sweden and abroad.

It is interesting to make a comparison with the Bank of England, which finances its operations by requiring private banks to deposit non-remunerated funds that are then invested in government bonds, which creates a source of income for the Bank of England. However, the low government bond yields of recent years have caused problems with falling revenues for the banks, and a new regulation now explicitly index links the amount of capital the private banks must deposit to the level of the government bond yield (see HM Treasury, 2018). If the government bond yield falls, the banks must thus deposit more money so that the interest incomes for the Bank of England remain unchanged. Correspondingly, index

³⁸ These calculations assume that the central bank's costs are approximately zero, as they focus, in this context, on very high risks in the asset items. In a case where the costs are not approximately zero, the discounted current value of the seigniorage minus the costs must be calculated.

linking of the Riksbank's interest-free capital could be conceived, so that, if the average interest rate level is expected to fall, the Riksbank will be given the opportunity to build up its own capital.

5 Concluding remarks

In this article, we have attempted to illuminate the manner in which a central bank's balance sheet is constructed and how it affects the Riksbank's long-term ability to fund its own operations and thereby remain financially independent of the state. Possibly the most important risks for the Riksbank's future earning capacity concern the amount of banknotes and coins in circulation going forward, as well as what will happen to real interest rates over a longer perspective. Lower demand for cash and lower real interest rates have already had a negative effect on the Riksbank's earnings, even if the Riksbank is still making a profit, on average. Considering it is uncertain how these variables will develop in the period ahead, it will be difficult to set a static target for how much equity the Riksbank needs. Either the target needs to be flexible enough to allow it to be adjusted to changes in the level of interest rates and the number of banknotes and coins in circulation, or the target will have to be set with a margin that allows room for the uncertainty surrounding these variables.

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Appendix A – Calculations for long-term earning capacity

The Riksbank's long-term earnings and profit depend on the composition of the balance sheet, long-term interest rate levels and the Riksbank's operating costs.

The Riksbank's nominal net interest income can be expressed as³⁹

$$(3) \quad N_t = (r + tp + \pi)(M_{t-1} + EK_{t-1} + PP_{t-1}) - (r + \pi)PP_{t-1}$$

where r is the long-term real interest rate, tp is the term premium that investors receive in addition to r to invest in long-term bonds. π is the average inflation compensation that investors receive, which we assume coincides with average inflation. M is nominal banknote volume, EK is nominal equity and PP is nominal monetary policy liability, which is to say the banking system's surplus in the payment system.

The Riksbank's nominal interest-free capital can be expressed as

$$(4) \quad K_t = M_t + EK_t$$

If we assume that the banknote volume grows with inflation over the long term and consider that equity grows with the net interest income minus the operating costs, we can rewrite (4) as

$$(5) \quad K_t = (1 + \pi)M_{t-1} + EK_{t-1} + N_t - DK_t$$

$$(6) \quad K_t = (1 + \pi)M_{t-1} + EK_{t-1} + (r + tp + \pi)(M_{t-1} + EK_{t-1} + PP_{t-1}) - (r + \pi)PP_{t-1} - DK_t$$

$$(7) \quad K_t = (1 + \pi)(M_{t-1} + EK_{t-1}) + (r + tp)(M_{t-1} + EK_{t-1}) + \pi * M_{t-1} + tp * PP_{t-1} - DK_t$$

The real interest-free capital then becomes

$$(8) \quad K_t = \frac{K_t}{P_t} = \frac{K_t}{(1 + \pi)P_{t-1}} = m_{t-1} + ek_{t-1} + \frac{(r + tp + \pi)}{(1 + \pi)} m_{t-1} + \frac{(r + tp)}{(1 + \pi)} ek_{t-1} + \frac{(tp)}{(1 + \pi)} * pp_{t-1} - dk_t$$

where lower-case letters represent real variables. We can then note that

$$(9) \quad m_{t-1} + ek_{t-1} = k_{t-1}$$

Which means that the change in the real interest-free capital follows from (8)

$$(10) \quad \Delta k_t = \frac{(r + tp + \pi)}{(1 + \pi)} m_{t-1} + \frac{(r + tp)}{(1 + \pi)} ek_{t-1} + \frac{(tp)}{(1 + \pi)} * pp_{t-1} - dk_t$$

The first three terms now represent the real contribution from the sources of income seigniorage, invested equity and interest rate spread from debt-financed assets, respectively. Note that, as the real banknote volume is constant,

$$(11) \quad \Delta ek_t = \Delta k_t.$$

39 Given that some of the assets are in the form of gold, a more detailed arrangement of the following calculations would have to take into account that the expected long-term return from gold may deviate from the real interest rate (normally, it could be expected to be lower). However, we have chosen to simplify the reasoning and not explicitly include this factor.

Consequently, avoiding a long-term negative trend in real interest-free capital or equity requires all three potential sources of income not to be smaller than operating costs. If we assume that real operating costs are constant in the long term, the condition for this becomes

$$(12) \quad \frac{(r+tp+\pi)}{(1+\pi)} m + \frac{(r+tp)}{(1+\pi)} ek_{t-1} + \frac{(tp)}{(1+\pi)} * pp_{t-1} \geq dk.$$

To simplify the expression further, as well as to be more compatible with the calculations and assumptions made by Flam (SOU 2013:9), we can assume that the effective interest rate spread the Riksbank can receive is zero.

$$(13) \quad \frac{(r+\pi)}{(1+\pi)} m + \frac{(r)}{(1+\pi)} ek_{t-1} \geq dk$$

Under this condition, it can be seen that banknotes and coins make a greater contribution to earnings than equity as long as inflation is positive. This also means that, if this applies, a reduced long-term level for the real banknote volume will demand a greater increase of equity to maintain an unchanged long-term earning capacity.