

How many e-krona are needed for payments?

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Many central banks are studying the opportunities for and consequences of issuing digital currencies. The Riksbank's e-krona project is part of this work. However, the consequences for the Riksbank's work on monetary policy and financial stability depend on how great the demand for the e-krona will be. This article comprises a preliminary attempt to quantify how great this demand could be with regard to meeting the domestic transactional needs in the Swedish economy. A reasonable assumption is that demand will be relatively low and correspond to 1–2 per cent of the gross domestic product.

1 Introduction

If the Riksbank chooses to issue central bank digital currency, a so-called e-krona, as a complement to physical cash, the Riksbank will also need to obtain an idea of how large the demand for this money may be. This is because a large demand could significantly increase the size of the Riksbank's balance sheet and have implications for monetary policy and financial stability, especially in an environment with low interest rates.¹ Juks (2018) discusses the demand for e-krona from a savings and investment perspective. This article supplements his analysis by studying how much e-krona may be in demand to meet the need for transactions in the Swedish economy. We start by looking at the existing literature on demand for cash.

The e-krona studied by the Riksbank comprises central bank digital currency that is available to the general public (see Sveriges Riksbank, 2018b). There are currently very few examples of central bank digital currency, but many central banks are looking into this question.^{2 3}

There is no empirical or theoretical research into the demand for central bank digital currency and therefore no generally-accepted method to rely on. Below we will use the so-called *transaction approach*, and the analysis is based on reasonable assumptions. It is therefore important to take the analysis for what it is: a preliminary attempt to discuss some of the demand for a hypothetical means of payment. The overall conclusion is that it is reasonable to believe that demand will be relatively small from a transaction perspective, roughly on a par with the demand for cash in Sweden in recent years, which has amounted to the equivalent of 1–2 per cent of GDP.

In section 2 we survey the value of payments in the Swedish economy in 2016 and the sectors they are made between. Based on this, we then calculate in section 3 a possible demand for the e-krona in those sectors under a couple of assumptions of how various participants would act. In section 4 we sum up the various parts and discuss the whole. A short summary of the conclusions is given in section 5.

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1 See Sveriges Riksbank (2017, 2018b) as well as the Committee on Payments and Market Infrastructure and Markets Committee (2018) and Armelius et al. (2018).

2 Uruguay carried out a six-month long test on consumers and companies from November 2017.

3 Central Bank Digital Currency (CBDC) can be made accessible to a limited group of users (wholesale CBDC), for instance the financial sector, or to everyone (retail CBDC). CBDC is studied in international collaboration forums for central banks, see the Committee on Payments and Market Infrastructure and the Markets Committee (2018), and by individual central banks such as Sveriges Riksbank (2017) and Norges Bank (2018) and also by individual researchers at different central banks, see for instance Engert and Fung (2017).

1.1 We know little about the demand for cash

Money is traditionally defined on the basis of the three roles it fulfils.⁴ The first is as a *means of payment* when we buy something. The buyer uses money to transfer a value to the seller as compensation for a product or service. The second role is as a *unit of account*, that is, a standardised means of expressing prices in the economy. This allows us to simply compare prices of different products. The third role is that of *store of value* when we save money to use later.

It is in the roles as means of payment and store of value that the demand for money arises. A person wanting to buy a cup of coffee or put money in a piggy-bank needs banknotes and coins. But despite this simple truth, it is remarkable how little we actually know about what governs demand for cash in the economy. On an overall level there is consensus among central banks, academia and market participants that driving forces such as technological advances, changes in consumption patterns and demographics have contributed to reducing demand, but no one knows how much of this reduction in Sweden is due to the percentage of cash payments declining.⁵ In many countries, the demand for cash is growing, despite electronic payments becoming increasingly common around the world, see Bech et al. (2018). How consumers choose to pay is also a question of culture, and cash has traditionally held a stronger position in some countries than others.⁶ There is thus no simple qualitative correlation between the transaction need in the economy and the demand for cash.

1.2 The transaction approach

One method of calculating the demand for cash is the so-called *transaction approach*. This is based on the value of cash payments in the economy and links this to the demand for cash via an estimated velocity of cash, i.e. rate of turnover in cash. The correlation is described in equation (1) below:

$$(1) \quad M*V = p*T$$

where M is the value of cash in the economy, V is the velocity of cash and $p*T$ is the value of cash payments (p is prices and T is the number of transactions). If one knows the value of the cash payments in the economy and the velocity during a certain period of time, it is easy to calculate the demand for cash. The larger the value of cash payments is, the greater the demand will be. If the velocity increases, less cash will be needed to implement a certain amount of payments and demand will decline. This method has been used by, for instance, Humphrey, Kaloudis and Öwre (2000, 2004) and Guibourg and Segendorf (2007). The advantage with this method is that it is based on a clear causal and simple correlation. The disadvantage is that there is rarely good quality data on cash payments. In particular, there are no time series, although surveys and so-called diary studies of consumers' payment patterns can provide snapshots, see for instance Esselink and Hernández (2016), Jonker and Kosse (2013) or Henry, Huynh and Shen (2015).⁷

4 See Söderberg (2018) and Camera (2017) for an outline.

5 See for instance Segendorf and Vretman (2015) or Committee for Payments and Market Infrastructure (2012, 2014).

6 For instance, there is a considerable difference between neighbouring countries such as Germany, Austria and Switzerland on the one side and Sweden, Norway and Denmark on the other. There are also major differences within the eurozone, see Esselink and Hernández (2017).

7 In the academic literature, two main approaches have emerged for calculating the demand for cash. One is the transaction approach, and the other is the currency demand approach, which aims to measure the size of the black economy, see for instance Buehn and Schneider (2016). The basic idea is that the black economy is largely driven by tax pressure and that transactions in the black economy are preferably made in cash. This approach calculates the demand for cash as a statistical function of macroeconomic variables and tax pressure. The advantage of this method is that good quality data is available for most countries. The disadvantage is that there is no direct causal relationship between the macroeconomic variables and cash and that consumption patterns, technology, social norms and so on, change over time.

2 Payments in the Swedish economy

The first stage in the analysis is to chart the transaction need in the Swedish economy, that is, $p \cdot T$ in equation (1).

Every year, the Riksbank gathers and publishes statistics on the Swedish payments market. These statistics cover card payments, cheques, credit transfers, account transfers and direct debits. But there are unfortunately no reliable statistics on cash payments. A survey carried out by the Riksbank in spring 2018 showed that the percentage of cash payments at points of sale was 13 per cent.⁸ In terms of size, this is around the same percentage as for cash withdrawals from ATMs and in shops in relation to the total value of card payments.⁹ We will therefore use the value of cash withdrawals to estimate the value of the cash payments. In Table 1 you can see that the value of payments in the Swedish economy in 2016 amounted to just over SEK 16,000 billion. On top of this come the payments mediated within the Plusgirot system, but there is also a lack of data here. Regardless of this uncertainty, it is very probable that the total value of payments in 2016 in terms of size amounted to around four times the value of the gross national product (GDP).¹⁰ In this article, we relate the value of payments and demand for a potential e-krona to the value of GDP.

Table 1. The value of payments in the Swedish economy 2016

Payment method	SEK billion
Cards	1,008
Debit cards	773
Delayed debit cards and credit cards	230
Credit transfers	14,561
Electronic	14,381
Form	180
Direct debit	508
Cheques	4
Cash withdrawals	128
ATMs	108
In a shop*	20
Total	16,204

Source: Sveriges Riksbank

* Estimate based on interview responses in Sveriges Riksbank (2018a).

Table 2 gives an overview of the size of payment flows between different sectors of the economy in relation to GDP. It is produced on the basis of information from individual or groups of participants, such as the government budget or household incomes, which have been put together to form an overall picture. But as it is not possible to verify the overall picture, we regard them as uncertain and we have rounded off to the nearest 5 per cent to avoid giving an incorrect impression of the accuracy. The primary sources of information have been the budgets for the central government, the county councils and municipalities, data from the Swedish National Debt Office and statistics on households' disposable incomes.¹¹ Payments in the specified sectors have been estimated using other

⁸ Sveriges Riksbank (2018a).

⁹ In addition, Arvidsson, Hedman and Segendorf (2017) found that the percentages of cash payments in shops were equally large with regard to number and value.

¹⁰ In 2016, Swedish GDP amounted to around SEK 4,400 billion. Source: Statistics Sweden.

¹¹ See, for instance, the Swedish National Debt Office (2016) and Statistics Sweden's databases.

data sources or as residuals. For instance, households' disposable incomes are known, as is their consumption. The latter gives rise to payments to the private sector, municipalities and county council. Households generally do not pay their taxes to the state themselves, this is done by their employers. This is visible in the upper row of Table 2, where one can see that households pay a value corresponding to around 40 per cent of GDP to the private sector, around 10 per cent to municipalities and very little directly to the state. The total value of these payments should correspond to the value of the payments households receive from the same sectors, that is, a value of around 50 per cent of GDP. The 5 per cent that households pay to themselves is an estimate based on the value of Swish payments that are largely person-to-person payments, that a large share of cash withdrawals are used for person-to-person payments and so on.

Table 2. Size of payment flows between different sectors in Sweden expressed as a percentage of GDP

		Payees				
		Households	Private sector	Municipalities and County councils	Government	Total
Payers	Households	5	40	10	0	55
	Private sector	30	200	10	25	265
	Municipalities and County councils	10	20	0	0	30
	Government	10	10	10	30	60
	Total	55	270	30	55	410

We now have an estimate of the value of the payments that are made by various types of economic agents to one another. The next stage is to investigate how many e-krona the various agents need to make these payments.

3 Transaction demand for e-krona

The demand for e-krona for transactions can be regarded as the solution to an economic optimisation problem. A payment from one party to another assumes that the first has the money, for instance, banknotes and coins or money on account, which shall be paid to the counterpart. At the same time, holding this money is linked to an opportunity cost which in this case is the return that the money could give if invested somewhere else. Cash does not carry any interest and if held to make payments, that is, not as savings, the opportunity cost is the interest that money would generate, for instance, in a transaction account. Similarly, an e-krona would be linked to an opportunity cost in the form of loss of yield. There is thus a financial incentive to hold as few e-krona as possible. On the other hand, there is a risk that the paying party will not be able to pay if they have too little money available, something that is generally also linked to a cost. All economic agents therefore need to weigh up the costs and benefits regarding how many e-krona they need to hold to refrain as little as possible from a return but at the same time be certain they can meet their payment obligations. This is usually called liquidity management, and is a central function in large corporations, for instance. In terms of the transaction approach in Equation (1), liquidity management will determine the velocity of the e-krona V . The faster someone chooses to convert e-krona into something else, the higher the velocity.

Based on economic theory, there is no reason to believe, for instance, that companies and households would have different ways of weighing up the pros and cons. But they may have different time preferences, different costs for liquidity management and different

revenues. Large corporations have employees and administrative systems to deal with this, while the individual consumer or sole proprietorship firm does it in their spare time. The gain from active liquidity management is generally less for an individual consumer than for a large corporation, as the underlying amounts are much lower. We cannot explicitly resolve the liquidity optimisation problem for all parties in the economy, as this requires masses of information that we do not have. Instead, we will use rules of thumb for how the participants act and which seem reasonable on the basis of the pros and cons we have described above.

3.1 Assumptions of how economic agents act

The first assumption is the rule of thumb that we differentiate between households and other agents as companies, municipalities, county councils and the central government manage liquidity within the scope of their day-to-day operations, while households do not. On the other hand, it is not possible for us to distinguish between large and small companies, we will instead assume that companies, municipalities, county councils and the central government all act in the same way.

The second assumption is that the professional agents will hold liquidity to meet the payment obligations in the coming two days. We will also report the results if this period is extended to five days. By days, we mean here banking days, that is, the days when banks and payment systems are open and payments are mediated and settled.¹² We will use as a standard calculation of 250 banking days a year.

The third assumption is that households do not actively manage their liquidity. Households normally receive their income on one or two fixed dates each month and they spend the money gradually up to the next time they receive income. There is some periodicity in the other sectors too, for instance, tax payments are made on certain dates, but they have a more continuous flow of incoming and outgoing payments. To the extent that households do actively manage their liquidity, this will result in a lower demand for e-krona. These assumptions are of course gross simplifications, but they are nevertheless sufficiently realistic to comprise a base for a preliminary discussion of the transaction demand for e-krona. In brief, the assumptions state that the velocity, V , is significantly lower in the household sector than in other parts of the economy.

It is assumed that an e-krona can be used for all types of domestic payments: when paying in shops, e-commerce, household bills, invoices, wage payments and so on. In the calculations below, we assume that the e-krona has a market share of 10 per cent. This corresponds e-krona payments to a value of around 40 per cent of GDP, that is, a little more than SEK 1,700 billion based on GDP in 2017. However, this figure should not be regarded as a forecast or objective. It is a market share that can easily be used in calculations and can simply be scaled up or down, depending on what each individual reader considers to be a reasonable assessment.¹³

3.2 The household sector

The household sector has a disposable income corresponding to around half of GDP.¹⁴ Let us for the sake of simplicity assume that income and consumption are evenly divided over all of the months of the year. Households will then have incoming payments in the form of salaries, pensions, benefits and so on corresponding to just over 4 per cent of GDP per month. This inflow is balanced by an equally large outflow. Salaries are usually paid out

¹² Banks, including the Riksbank, are closed on Saturdays and Sundays and some other public holidays.

¹³ The market share that a potential e-krona might gain will depend on how it is designed and what properties the competing payment services have. There are currently no clear proposals for its design and we therefore shall not pursue an in-depth reasoning regarding market shares.

¹⁴ In 2017, households' disposable income was SEK 2,250 billion (including households non-profit organisations) and GDP amounted to around SEK 4,600 billion. Source: Statistics Sweden, income and expenditure and capital transactions (ENS2010), current prices, SEK million according to sector, transaction item and year.

on the 25th of each month and pensions are paid out one week earlier. Benefits are paid out around the same dates as salaries and pensions. Households spend around half of their incomes through card payments and cash. These payments normally concern regular consumption that we for the sake of simplicity assume is divided evenly over time. This means that the remaining half of the disposable income is used for credit transfers and direct debits, which are often used for periodic expenditure, such as accommodation. This expenditure is usually paid late in the month.

Let us illustrate the above using figures from 2016. Households' disposable incomes were then almost SEK 2,200 billion and according to Table 1, the value of bank card payments amounted to SEK 773 billion and credit card payments to SEK 230 billion. Cash withdrawals amounted to around SEK 128 billion.¹⁵ Cash and debit cards are used almost exclusively by consumers, while credit cards are used by both consumers and companies, but households account for almost all credit card debt.¹⁶ We therefore make the simplified assumption that credit cards are also largely used by households. The total value of household payments with cards and cash should therefore be just under $773 + 230 + 128 = \text{SEK } 1,131$ billion. This corresponds to around half of the disposable income. In an average month, therefore, households have income of SEK 183 billion, of which half (SEK 90 billion) is consumed regularly at a value of SEK 3 billion per day. In the final week of the month, households pay bills to a value of around SEK 90 billion.

The rate of turnover becomes 1 per month if we assume that households do not actively manage their liquidity. If the e-krona has a market share of 10 per cent of the payments market, households would then at most demand 18 billion e-krona around the 25th. Towards the end of the month the demand would decline by half (9 billion) and then gradually decline to a billion or so before increasing again at the next salary and pension pay out. In the more general case were we state demand as a percentage of GDP, demand is at its highest 0.4 per cent of GDP and then declines rapidly to 0.2 per cent at the end of the month, to gradually approach zero before turning upwards again.

3.3 Central government

The central government sector consists of parliament, the cabinet offices and the public authorities, including the county administrative boards. Their income and expenditure correspond in size to around 30 per cent each of GDP.¹⁷ This corresponds to an average payment need of SEK 5.6 billion per banking day, which gives SEK 11.2 billion for the two days we have assumed they need with regard to their liquidity management. However, the payment need will vary and be greater on certain dates and lower on others, for instance, depending on payment of salaries, sickness insurance, pensions and subsidies to the household sector (see section 3.2).¹⁸ Similarly, the value of the incoming payments will also vary. The two largest inflows are VAT, which is paid in around the 12th, corporate taxes and preliminary taxes, which are paid in around the 25th.

The state's inward and outward payments are made through the state's internal bank at the Swedish National Debt Office. How they choose to manage these payments will therefore be of central significance for the demand for e-krona. If we assume that the state makes 10 per cent of its payments (SEK 11.2 billion for two days) in e-krona, the demand will amount to just over a billion, which corresponds to 0.024 per cent of GDP.

¹⁵ Cheques are extremely rare. In Table 1, 0.02 per cent of total payments are made by cheques. The households' share of that is unknown. Therefore we will not include cheques in the calculation.

¹⁶ See Statistics Sweden, financial market statistics, section 7.7, lending in form of convenience credit card and extended credit card credit.

¹⁷ In 2017, incomes amounted to SEK 1,414 billion and expenditure to SEK 1,347 billion. GDP amounted to SEK 4,604 billion. Source: Statistics Sweden's databases.

¹⁸ The need to pay out is also greater around the 12th of each month when payments to pension funds are made, similarly around the 23rd when tax payments are made to municipalities and county councils. Source: Swedish National Debt Office (2016).

3.4 Municipalities and county councils

Municipalities and county councils do not use the state's internal bank to make payments, they use commercial banks. There is no coordination between municipalities and county councils with regard to using a particular bank, for instance. They instead act as independent units and are in this way more like companies than the state in the way they make payments. Municipalities and county councils, including regions, have incoming and outgoing payments corresponding to around one quarter of GDP each.¹⁹ This is equivalent to an average payment need of SEK 4.4 billion per banking day. The liquidity need for two days will then be SEK 8.8 billion. If we, as in the case of households, assume that the e-krona has a market share of 10 per cent, this means that municipalities and county councils would demand on average 0.9 billion e-krona (0.02 per cent of GDP). But there can be considerable variation in the demand from municipalities and county councils for e-krona because of the concentration of outgoing and incoming payments around certain dates.

3.5 Private sector

It is difficult to chart the payment flows to, from and within the private sector. But as we know the approximate total value of payments in the economy and the value of payments to and from the state, municipalities, county councils and households, we can regard the private sector as a residual; the payments not made by the other sectors must be made by the private sector. The other sectors have outgoing payments to a total value of 140 per cent of GDP (see Table 2). The total value of payments in the economy is around four times GDP and the private sector must therefore make payments to a total value corresponding to slightly more than two and a half times GDP. The private sector makes payments equivalent to two thirds of GDP to the other sectors in the form of salaries, taxes and so on. This means that the value of the payments between agents in the private sector ought to be in the magnitude of twice the size of GDP. On average this is around SEK 55 billion per banking day. If we assume that the e-krona has a market share of 10 per cent, the liquidity need for two days will be 11 billion e-krona. This corresponds to 0.24 per cent of GDP.

4 The total transaction demand

When, for instance, the private sector pays salaries to households, e-krona are transferred from one account to another. The sum of e-krona is not affected, they just change owner. When we add together the different sectors' need for e-krona, we only study the expenditure side. Otherwise there is a risk of double counting the transaction need as each payment is an expenditure for the paying party and an income for the receiving party. In section 3 we have consistently looked at the different sectors' expenditure sides. Table 3 contains a compilation of the demand for e-krona that we have assessed agents will need to meet the transaction need in the various sectors. We have based this assessment on their expenditure at liquidity management planning horizons of two and five days with a market share for the e-krona of 10 per cent. The table also takes into consideration whether households have just received their salaries (high demand) or if we are in the middle of the month just before pension payments (low demand).

¹⁹ For the financial year 2017, total income for municipalities and county councils amounted to SEK 1,083 billion and expenditure to SEK 1,099 billion. Source: Statistics Sweden, National Accounts, public sector incomes and expenditure broken down into sub-sectors.

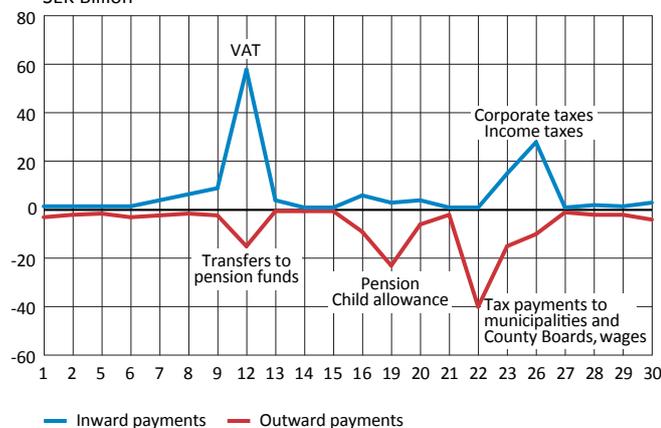
Table 3. Transaction demand for the e-krona under the assumption of a 10 per cent market share

The transaction demand for e-krona in different sectors of the economy, expressed as a per cent of GDP and in the final column as number of billion SEK based on GDP for 2017

	High demand		Low demand	
	2 days liquidity	5 days liquidity	2 days liquidity	5 days liquidity
Households	0.4	0.4	0.05	0.05
Central government	0.024	0.048	0.024	0.048
Municipalities and county councils	0.02	0.04	0.02	0.04
Private sector	0.24	0.48	0.24	0.48
Demand (% of GDP)	0.68	0.97	0.33	0.62
SEK billion (GDP 2017)	31	45	15	28

We can see in the table that if the e-krona has a market share of 10 per cent of the payments market the transaction demand should vary between SEK 15 and 31 billion, depending on what part of the month, with a two day planning horizon. This is below the current demand for cash, which is just over SEK 50 billion including cash held for saving (see Section 4.2). If we relinquish the assumption of a two-day liquidity management and instead assume a working week (five days), demand is SEK 28–45 billion, depending on the part of the month. At five days, demand thus increases by SEK 13–14 billion. If we instead relinquish the assumption of a 10-per cent market share and assume a higher market share, say 30 per cent, then Table 3 implies that demand will be 1–2 per cent of GDP for a two-day liquidity management. This means that even if the e-krona has a significant share of the payments market, the effect of transaction demand on the banks' deposits and the Riksbank's balance sheet will be manageable. However, the table does not take into account variations in demand from the central government, municipalities, county councils and the private sector. There are many indications that payments are concentrated around certain dates, which can make demand volatile. Figure 1 shows how the central government's inward and outward payments vary during an average month in 2014.

Figure 1. Central government inward and outward payments for an average month in 2014
SEK Billion



Source: Swedish National Debt Office (2016)

The calculated demand is probably an overestimation as the table does not give consideration to agents matching ingoing and outgoing payments. If e-krona are paid in

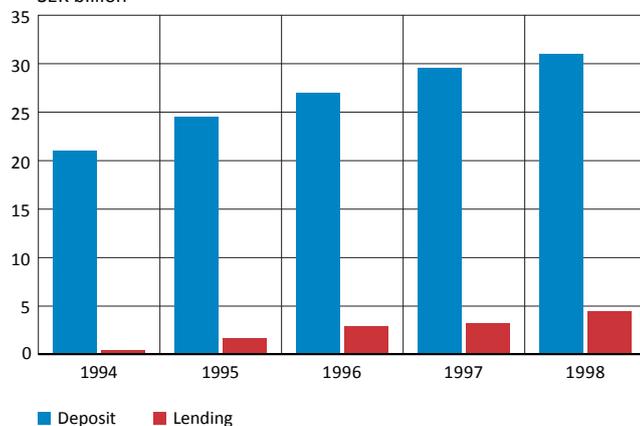
at the same time as other e-krona must be paid out, the incoming e-krona can be used to finance the outgoing payments (V increases). This effect should be fairly small in the case of a small market share, but if the e-krona were to have a large share of the payment market the effect could be significant. Section 4.1 about Postgirot discusses this further.

4.1 A comparison with Postgirot

A possible benchmark to test the reasonability of the demand calculation above is Postgirot. Postgirot was a separate payment system that was offered by a state-owned bank – Postgirot Bank.^{20, 21} The customers could move money in and out from Postgirot, i.e. to and from bank accounts outside Postgirot, and make payments between accounts in the Postgirot system. On an overall level it describes exactly what an e-krona is: a state account structure for payments to which a number of payment services have been linked. Deposits in Postgirot Bank can be regarded as demand for ‘Postgirot money’ and comprise a point of reference for calculations of the demand for e-krona.

In 1998, when Postgirot’s market share had already begun to decline, 430,000 companies and one million households had accounts there. The number of payments was 400 million and the total turnover was SEK 5,000 billion. The Swedish population was then 8.85 million, GDP was SEK 1,873 billion and the total value of payments in the economy was SEK 7,899 billion.²² Postgirot thus had in turnover terms a market share of around two thirds of the payments market and a large share of private and corporate customers. Postgirot itself claimed a market share of just over 46 per cent of the payments market. Postgirot Bank also provided corporate credit on a small scale. Figure 2 shows the average deposits in Postgirot Bank between 1994 and 1998.

Figure 2. Average deposits and lending at Postgirot Bank 1994–1998
SEK billion



Source: Posten (1998)

During 1998 the average deposits increased to SEK 31.1 billion from 29.6 billion in 1997. However, the increase could be attributed to deposits in accounts with favourable interest rates. Deposits had a high level of volatility, which indicates that the customers primarily maintained liquidity in Postgirot to be able to make payments, that is, Postgirot’s customers held on average SEK 31.1 billion in Postgirot to be able to make payments of SEK 5,000

²⁰ Postgirot Bank was a part of the Post group, see Posten (1998).

²¹ Postgirot was established in the mid-1920s after an investigation of the need for a postal cheque system (Swedish Government Official Reports, 1922). The investigation identified the advantages of account-based payments and the purpose of a postgiro system was to simplify payments, make the state’s payments more efficient and reduce the use of cash. At that time, not all households had access to bank accounts and nor were there bank branches in all parts of Sweden. Postgirot expanded gradually and over time became the dominant payment system for credit transfers and direct debit payments. Towards the end of the 1990s, Postgirot’s dominant position was gradually weakened. In 2001, Postgirot was sold to Nordea, a private commercial bank, and changed its name to Plusgirot in 2005.

²² See Committee on Payments and Market Infrastructure (2001).

billion. The average deposit thus corresponded to 0.6 per cent of the transferred value. Postgirot was probably a very efficient system, as a large share of households and companies had accounts there, which made it easier for professional agents to manage their liquidity by using incoming liquidity for outgoing payments.

The e-krona, with an assumed market share of 10 per cent, is at between 15 and 45 billion, which corresponds to around 0.9–2.6 per cent of the payment turnover. The average deposits in Postgirot in 1998 (the demand for ‘Postgirot money’) amounted to 0.6 per cent of the turnover. The comparison indicates that our calculations above are reasonable and not under dimensioned.

4.2 Household saving in cash

Households demand for e-krona will not be solely determined by their transaction needs. Some households may want to have savings in e-krona in the same way that some households today have an amount of savings in cash. In normal times, banks and other financial institutions would probably be able to offer savings products that in terms of yield are more beneficial than an e-krona, just as they currently offer savings products that give a higher return than cash. Below is a brief description of households’ savings in cash.

The Riksbank carries out an interview survey of households’ payment habits every other year.²³ In spring 2018, 12 per cent of respondents over the age of 18 said they had savings in cash. Of these, 60 per cent had less than SEK 10,000, 11 per cent had between SEK 10,000 and 100,000 and 2 per cent had more than SEK 100,000 saved in cash. A further 18 per cent did not know and 10 per cent did not want to tell the amount.

Let us assume that those who did not know or did not wish to respond on average behave in the same way as those who stated an amount. We can further assume that those who stated an interval on average were in the middle of the interval, that is, have SEK 5,000 or SEK 50,000 saved. We assume that those who have stated SEK 100,000 or more have SEK 200,000. The number of people in Sweden aged 18 or over is around 8 million.²⁴ Under the assumptions we have made above and if the sample is representative, household savings in cash would amount to around SEK 17 billion.²⁵ If households save in e-krona in the same way as they now save in cash, it will then correspond to slightly more than 0.35 per cent of GDP.

5 Closing comments

The value of the e-krona needed by economic agents to meet their domestic transaction needs is relatively small under reasonable assumptions regarding the e-krona’s market share and the agents’ liquidity management. The effects of this transaction demand on the banks’ and the Riksbank’s balance sheets are thus also relatively small, as are the effects on monetary policy and financial stability.

If an e-krona proves to have significant effects on the balance sheets, monetary policy and financial stability this will instead be due to demand arising for two other reasons. To begin with, we have so far focused exclusively on the domestic transaction need. One cannot rule out the possibility that agents from other countries might demand e-krona to make payments in situations of financial stress in their home countries. This is not something that could happen overnight, however. All agents who wish to hold e-krona will need to undergo an investigation based on the regulations for the e-krona. Although there are no regulations as yet, we can assume that they will include the customary money laundering and know-

²³ See Sveriges Riksbank (2018a).

²⁴ At the end of 2017 the number of people aged 18 years and older was 7,998,644. Source: Statistics Sweden database, population according to age and gender 1860–2017.

²⁵ This agrees with a survey made by Forex Bank in 2013 where they found that Swedish households had SEK 18 billion at home, see Forex (2013).

your-customer checks. It is also likely that foreign agents would need to use Swedish banks as agents or to become participants in the Riksbank's settlement system. There are thus certain rigidities and costs if a foreign agent wishes to have e-krona.

The second reason is a significant need for savings and investment. That there is a substantial investment need is confirmed if we compare demand deposits in monetary financial institutions with the liquidity needed to make payments. In August 2018, demand deposits amounted to SEK 2,580 billion.²⁶ The liquidity to make all payments in the economy should be around SEK 200 billion if we assume that the liquidity need amounts to around 1 per cent of the turnover value (around SEK 18,000 billion or four times GDP), which is a lower liquidity utilisation than in the old Postgirot system. Even if this figure can be discussed it is clear that around 90 per cent of demand deposits are held for other reasons than payments.

²⁶ Source: Statistics Sweden, Financial market statistics, Table 5.1. Monetary financial institutions cover more institutions than the banking sector alone, for instance, the Swedish National Debt Office.

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²⁷ The Committee on Payments and Market Infrastructure was previously known as the Committee on Payments and Settlement Systems (CPSS).

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