



SPEECH

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Should the Riksbank issue e-krona?¹

Should the Riksbank issue electronic means of payment in the same way as we now issue cash? This is a natural question for a central bank, as technological advances create new opportunities, as the printing press once upon a time made it possible to print banknotes. Banknotes were a complement to the minted coins, and are so today too. Similarly, an electronic means of payment, say an e-krona, could be a complement to physical cash. This is the question I intend to discuss today. The question is particularly relevant for us in Sweden, as cash is being used to a declining extent and is sometimes difficult to get hold of.

The fact that cash is no longer as easily accessible as before means that the general public finds it more difficult to get hold of money issued by the Riksbank and instead often has to use money in bank accounts with the commercial banks. This is a development steered by market forces and not by the authorities. Market forces has worked well for a long time, but developments move fast for some consumers and companies. Before I explain why the Riksbank might need to issue e-krona, I would like to talk about what money is, the role it plays and what kinds of money are available today.

Innovation, trade and welfare

Innovation is something that powers development in the financial sector and has contributed to the high standard of living we now enjoy. As I am personally interested in both finance and innovation, it is particularly pleasing to be here today. Innovation

¹ I would like to thank Björn Segendorff, Gina Bayoumi, Marianne Sterner and Elizabeth Nilsson for their help with this speech. I would also like to thank my colleagues on the Executive Board of the Riksbank for valuable discussions. Stances and any remaining lack of clarity is entirely my own responsibility.

stands for new ways of thinking and the will to find solutions to new or old problems. A common problem, and one of the first that humans probably faced, is that one has something but would rather have something else.

From this problem the insight emerged that we can exchange goods and services with one another. The barter system is, in my view, the most important innovation of all time. The reason I think this is that trade is a necessary condition for welfare. There is hardly anyone who grows all their own food. Nor do we mine iron ore and grow rubber trees to be able to build our own car. Trade allows us to specialise in making goods and services that other people want and which therefore have a value. The carpenter does woodwork, the dentist fixes teeth, the author writes books and so on.

In the beginning, we traded with one another simply by swapping goods and services. However, the barter system is not practical, as it means you have to find someone who has what you want and who also wants what you have. The time and energy that has to be expended on finding a counterpart could be used more productively. In economist speak, we say that there are substantial transaction costs. The lower the transaction costs, the cheaper and easier it is to trade with others. And the more specialisation, and thus total output, increases in the economy, the higher economic welfare will become.

Money plays an important role in reducing transaction costs and this is why money is the second most important innovation in the history of the world. Money means that we can improve the traditional barter system. Instead of having to find someone who wants exactly what you have and vice versa, you sell your goods for money that can later be used to buy other goods. Money is quite simply a hard currency that everyone wants. Transactions are made easier and faster and this cuts transaction costs.

Money fulfils three functions

Money, both cash and electronic money, fulfils three functions. Firstly, it is a means of payment, which means that a monetary value is transferred to the recipient when money is handed over. Secondly, it forms a unit of account, in Sweden this unit is krona and öre and in the United Kingdom it is pounds and pence, and so on. With a common unit of account, we all measure the value of goods in the same way, which makes it easier to compare the price or value of different goods. Thirdly, money is a store of value, which means that we can save by holding cash or money in bank accounts and thereby redistribute consumption from one day to another date in the future.

Money is something we take for granted, but for money to work in practice, we first have to deal with a very complicated problem. This problem concerns trust, and trust in turn depends on many different things. However, the basic idea is that we must be able to trust that the money will retain its value over time - that we can still use it to pay with tomorrow. Otherwise we will not want to accept cash, for instance, as payment and we will try to get rid of that we have as quickly as possible. This is exactly what happens with hyperinflation. Money is exchanged as quickly as possible for bread, sanitary items, gold or something else that can in turn be exchanged for other goods or saved. Money is then unable to fulfil its three functions and we are, in a way, back in the barter economy.

Money assumes trust

Until fairly recently, the trust problem was resolved in two ways. The oldest method is by minting coins in precious metals. The coins then have a value in themselves. In Sweden, the value of metal appears to have been on average 85% of the coin's nominal value until around the 17th century. Trust in coins was also increased when the king, not only in Sweden, but in most countries, promised to accept his own coins as payment for tax collection and so on. In this way, the holder of a coin knew that the money could be used in the future at a particular value and that in a worst case scenario, if the king broke his promise, the coins had a metal value.

If we look at the 17th century, an important financial innovation took place here in Stockholm: the first modern banknote was produced. The banknote was made of paper and thus had not metal value. On the other hand, the issuing bank, in this case Stockholms Banco, guaranteed that the holder would always be able to redeem the paper for precious metals. The trust was thus shifted from the precious metals in the coin to the party storing the precious metals.

Banknotes assume that there is a broad trust in the issuing bank. The same applies of course to the money we have in our bank accounts. As you may know, after a while Stockholms Banco began issuing more banknotes than they had cover for in precious metals. After a while, distrust of Stockholms Banco began to spread and people wanted to redeem their banknotes for precious metals. We now had Sweden's first bank run, which one might say was Sweden's first financial crisis. Stockholms Banco was taken over by the Riksdag (Swedish parliament) and later became the Riksbank. It must be said that the banknotes were very popular and highly-valued as long as people trusted in their worth. Compared with coins, they weighed very little and could easily be carried around. They were also considered to be worth more than the corresponding amount in coins.

It was not until 1904 that the Riksbank was given a monopoly on issuing banknotes. Prior to this some commercial banks issued their own banknotes. The banknote monopoly meant two things. Firstly, it resolved the trust problem. Unlike commercial banks, a central bank like the Riksbank cannot normally go bankrupt. The holder of a banknote issued by the Riksbank can always be certain that it has a worth corresponding to its nominal value. Secondly, the banknote monopoly established a unique payment standard that is set by the state; in Sweden the legal tender is banknotes and coins issued by the Riksbank. The use of having a uniform standard for payments, and having this standard accepted by all, saves time and energy for individuals to expend on other things.

There is, of course, a reason why I am standing here talking about historical events. But, before I get to this reason, I would like to say a few words about the money we use today.

Central bank money and commercial bank money

Today, we have three kinds of money. The first kind is the one I have talked about the most today, banknotes and coins. These are a form of central bank money, that is, money issued by the central bank. As I mentioned earlier, the special thing about central bank money is that it has no nominal credit risk, as it stands for a claim on the central bank, which cannot go bankrupt. Cash is also the form of central bank money that can be held by the general public. The second sort of money is also central bank

money, but in electronic form. This is the money that is held in accounts with the Riksbank and it can only be held by those who are allowed to have accounts in the Riksbank, which currently means credit institutions, securities companies, clearing organisations and the Swedish National Debt Office. It is electronic central bank money that the banks use when they are making large payments to one another. This is done through a payment system called RIX. Most of the electronic payments made in Sweden, whether they are made by direct debit, credit transfer or card, pass through RIX at some point.

The third kind of money is commercial bank money. This is the holdings in accounts with the commercial banks. Such money is by definition a claim on these banks. However, banks may be forced to wind down, sometimes even going bankrupt, which happened to Stockholms Banco and as we saw in the most recent international financial crisis. This means that this money, the commercial bank money, does entail a risk - even if the risk is slight. If the bank fails, you may not be able to redeem your entire claim on the bank from its bankruptcy estate. However, these days there is a state deposit guarantee that protects depositors up to a certain limit, SEK 950,000 per person and bank.² Those with capital above this limit do not generally enjoy this protection and so commercial bank money entails some credit risk for them.

Commercial bank money is a claim on the bank and therefore a part of the financing of the bank. They are therefore transient, that is, the bank's customers can often move the money at short notice, either to another bank or withdraw it in the form of cash. The bank's assets, such as household mortgages, are not in general as transient. It is this that may create financial stability problems in the banking sector if the general public wants to withdraw their money and the bank cannot quickly sell assets to raise the needed liquidity.³ The capital requirements and liquidity requirements the state makes of the banks are aimed at making them safe by requiring they hold buffers so they can cope with loan losses and an outflow of liquidity. The capital requirements also set a limit as to how much commercial bank money the banks can create.

Commercial bank money the most common

The money that is used the most in society is commercial bank money. The banks' so-called deposits repayable on demand, that is, deposits with a high level of liquidity that can be used for payments, amounts to around SEK 2,200 billion, which is around half of Sweden's GDP, compared with around SEK 130 billion in central bank money, where cash comprises just over SEK 60 billion.^{4 5}

² The insurance covers private individuals and other legal entities with the exception of financial institutions and public authorities.

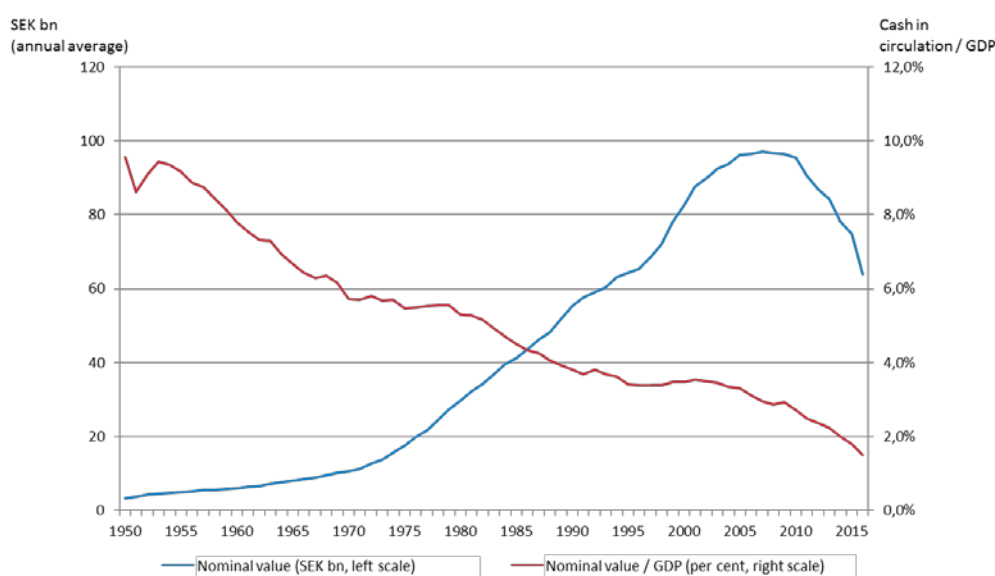
³ This was what happened to Stockholms Banco around 350 years ago. Their customers wanted to exchange their commercial bank money for precious metals. Some of Stockholms Banco's assets were, because of the over-issuing of banknotes, in the form of personal loans that could not be quickly cashed in or where the borrower lacked liquid assets. Even if we cannot go to the banks now and demand precious metals, the underlying problem remains the same.

⁴ In addition to cash, there is electronic central bank money. This includes the banks' deposits in the Riksbank overnight through the Riksbank's deposit facility and fine-tuning transactions in RIX, shown in the chart as MP debt (debt related to monetary policy transactions, see the Riksbank's Annual Report 2015). During the day, the banks have pledged assets and received liquidity in RIX. The average value of the collateral provided was SEK 112 billion during the second four months (see RIX four-month report 2, 2016). These are reported as funds in accounts in the chart.

⁵ If we look at the value of the payments between households, companies and authorities, it amounts to a total of SEK 14,000-15,000 billion a year, of which perhaps SEK 200 billion is in cash. In shops, almost one in seven payments is made in cash. More than half of the adult population has the Swedish payment app.

In Sweden, we have long had a trend towards a decline in the use of cash. The trend is seen clearly if you relate the value of cash in circulation to GDP. This is the red line in the chart (Figure 1) and it shows clearly how cash in relation to GDP has declined substantially since 1950, when it comprised almost 10% of GDP, compared with around 1.5 per cent today. The blue line is the nominal demand for cash outside of the banking sector, that is, the cash held by companies, households and authorities. Demand from the general public has fallen from SEK 97 billion in 2007 to around SEK 61 billion today. This is a marked decline in just a few years. Similarly, the withdrawals from ATMs give some indication. In 2010, Swedes withdrew around SEK 225 billion and in 2015 they withdrew only SEK 153 billion, which is also a clear decline.

Figure 1. Cash in circulation measured as an annual average, excluding the banking sector's holdings.



Sources: The Riksbank and Statistics Sweden.

There are also some statistics on the use of cash. We at the Riksbank make a survey every second year, in which households are questioned about their payment habits, which payment services they have access to, their attitudes and so on. The first such survey was made in 2010 and then almost 40 per cent said that they had made their most recent payment in cash. In September this year, the corresponding figure was only 15 per cent. This is a very marked change. Seen together, all indications point to a decline in the use of cash, and therefore a decline in demand for cash in society.

Nevertheless, the interviews show that it is rarely a problem if one wants to make a payment in cash. A large majority stated that they never or very rarely have problems paying in cash, which is pleasing. If you want to see the survey responses, you can find them on our website: <http://www.riksbank.se/en/Statistics/Payment-statistics/>

A further clear sign of the decline in the significance of cash, and one that cannot be ignored, is that a number of bank branches are currently cashless. It is thus not possible to do any business with cash over the counter, although they may have ATMs or CDMs. However, there are now more ATMs than there were a few years ago. What some consumers, smaller companies and local clubs often see as a problem, is not so much getting hold of cash, but being able to deposit it in a bank account.

Should the market determine the general public's access to central bank money?

In today's society it is almost impossible to manage if you cannot make payments. Everyone therefore needs to have access to basic payment services, including cash. In situations where the market is not able to supply basic payment services, it is the task of the state to ensure that everyone has access to such services.⁶ The possibility to withdraw and deposit cash in a bank account is one such basic payment service, but as cash is declining fast and it becomes increasingly difficult both to gain access to this physical central bank money and to use it, some groups will find it difficult to make their payments. This development is determined by market participants, the banks and other companies, but also by households, and not by the authorities. So far, the developments have not entailed any problems, but now things are moving fast and many consumers and small companies and local clubs are suffering.⁷

A decline in the use of cash also has a direct impact on the Riksbank. For one thing it reduces our significance for the payment system when cash is used less often, and for another thing it reduces our income from issuing cash. However, let me say that cash lacks importance with regard to the Riksbank's possibility to conduct monetary policy; the short-term rate is set through the conditions for the banks' deposits with the Riksbank and we affect the longer interest rates through our market operations. Cash is thus not a monetary policy tool. So although the direct impact on the Riksbank raises a number of important questions, I consider it more important to survey what the significance is for society as a whole if cash disappears.

The central question is thus whether the Swedish payment system will continue to be safe and efficient even without cash. Will all those who wish to make payments be able to do so smoothly and safely and at a reasonable cost? Even those who do not want to, may not or cannot have access to the banks' services should be able to manage their payments.

One cannot get away from the fact that cash has properties that electronic payment services lack. Will this mean that we lose a means of payment that cannot be directly replaced with something else? Cash can be handed over regardless of access to electricity or the internet. Cash payments are anonymous. A payment can be made in cash without involving the banks. Even if cash is not used on a daily basis, it comprises a backup option in certain crisis situations. And, as I explained earlier, cash is central bank money and does not involve any credit risk for the holder. I consider some central properties of cash to have a substantial value and expect they will be in demand in the future, too.

Now we are approaching the burning question. Should the state accept a development where the general public's access to central bank money is determined by the market and steadily declines over time? You know that I do not consider this an acceptable situation. But what can the Riksbank do?

⁶ The Swedish Post and Telecom Authority and the county administrative boards have the joint task of securing access to basic payment services in the areas and out in the countryside, where the market is not meeting these needs.

⁷ The Riksbank has pointed this out earlier and proposed that tougher requirements be made of the banks with regard to supplying basic payment services, see the Riksbank's consultation response on Access to payment accounts with basic functions, Interim report 2 from the 2015 Payment Services Inquiry (Fi 2015:02).
http://www.riksbank.se/Documents/Remisser/2016/remiss_FID_160318.pdf

Should the Riksbank issue e-krona?

Let me refer back to my historical summary and talk about innovation. When the first banknote was produced, it was based on a new technology, in this case the printing press, that had become sufficiently widespread and refined. There was scope to manufacture standardised banknotes of sufficiently good quality. Modern banknotes are of course also a high-tech product with all their security features, but as increasing number of electronic payment forms are developed, physical cash appears increasingly outdated.

Today we can say the same thing about modern communication technology as about the printing presses in the 17th century. Access to the internet is widespread, and computers, smartphones and tablets are household items. Thus, the conditions are ripe for launching more electronic payment forms.^{8 9} My point is simple, if the market can make use of the new technology to launch new and popular payment services, why shouldn't the Riksbank be able to do the same?

I would claim that there is currently a need among the general public and companies to have access to central bank money and that this need will still be there in the future. Perhaps not everyone has this need and perhaps not all of the time, but as the need exists, I think the Riksbank should be able to meet it. I consider that the Riksbank should carefully consider meeting the general public's need for central bank money by supplying this in some electronic form. Let me call them e-krona, which you can put in an e-wallet.

Let me also be clear about the reason. If the Riksbank chooses to issue e-krona, it would not be to replace cash, but so that the e-krona can act as a complement to cash. The Riksbank will continue issuing banknotes and coins as long as there is demand for them in society. It is our statutory duty and we will of course live up to it.

Let me also, for the sake of clarity, repeat that the Riksbank has not decided to issue e-krona yet, but to investigate the possibilities. The low use of cash in Sweden means that this is more of a burning issues for us than for most other central banks. Although it may appear simple at first glance to issue e-krona, this is something entirely new for a central bank and there is no precedent to follow.¹⁰ There is a long list of fundamental questions that need to be answered. Let me give you a few examples.

E-krona in an account?

The first question is whether e-krona should be booked in accounts or whether the e-krona should be some form of digitally transferable unit that does not need an underlying account structure, roughly like cash. If we want an account structure, would the account be with the Riksbank? If not, where would it be?

⁸ The World Economic Forum has an index, the Network Readiness Index (NRI), which ranks countries' conditions for making use of modern communication and network technologies. Sweden has been among the top three countries in the world for the past ten years.

⁹ The banks have done so with *Swish*. There is a competing service in *SEQR*. *iZettle*, another Swedish company, has a service that converts your smartphone into a card terminal. There are several other innovative payment services on the market and under development.

¹⁰ There is a growing interest in this issue in the central bank world. For instance, the Bank of England has begun to study this question, as has the Bank of Canada, see <http://www.bankofengland.co.uk/publications/Pages/speeches/2016/886.aspx> and <http://www.bankofcanada.ca/2016/06/fintech-financial-ecosystem-evolution-revolution/>

In the first case, with accounts in the Riksbank, the e-krona would be fairly similar to the central bank money that we currently have in our payment system. These e-krona would not be lost if, for instance, the consumer lost his or her telephone, if that is where they are stored. The amount of central bank money can also change rapidly and at the pace determined by the demand from the general public. It is possible, although it does not need to be the case, that this would make it more difficult for the Riksbank to carry out the fine-tuning operations that we use to steer the short-term rate, that is, the starting point for interest-rate setting in Sweden. If we instead have a digital unit that can be transferred decentralised between two people, other complications will arise. Could such a solution be compatible with the regulations on counteracting money laundering and terrorist financing? How would we prevent digital units of value being copied, that is, counterfeited?

Convey e-krona directly to the general public or through the banks?

Another important question is whether the Riksbank should issue e-krona directly to the general public or go via the banks, as we do now with banknotes and coins. If we were to use the tried and tested model, the banks would buy e-krona from the Riksbank and then give their customers access to them. If we were instead to turn directly to the general public, it would mean in practice that households and companies could open accounts, or something similar to accounts, in the Riksbank. It would in this case be something entirely new for the Riksbank, which would need to take a stance on how this could affect the banks' operations and how the Riksbank could best manage all of the new customer relations that arise.

Should e-krona generate interest?

Other examples of strategic questions are whether the Riksbank should issue unlimited amounts of e-krona if there was a high demand on the market, and whether e-krona should generate interest. These two questions concern both monetary policy and the financial stability of the banking sector. From a monetary policy perspective, an unlimited issue could be expected to increase the Riksbank's possibilities to steer the money supply, that is, issuing could in some situation function as a monetary policy tool.

Some economists advocate that the central bank should replace cash with a digital currency that can be given a negative interest rate, for instance by reducing the balances on e-krona accounts or not redeeming e-krona at their full value. These advocates say that this would make it easier for the central bank to implement an efficient monetary policy with a negative interest rate.¹¹ This reasoning is based on the central bank being prevented from setting a negative interest rate to the extent considered necessary to stimulate economic activity. Personally, I am not convinced that this problem would arise in Sweden and I would once again like to say that the Riksbank has a statutory requirement to issue banknotes and coins. I see e-krona primarily as a complement to cash.

¹¹ The idea is as follows. If the central bank introduces a negative interest rate, economic agents will choose to hold cash, which does not have an interest rate, instead of deposits with the banks. This means that the central bank's policy loses impact at the level where the agents begin to prefer cash. This is often referred to in academic research as the "zero lower bound" problem.

The issuing of e-krona together with a positive interest rate on e-krona could affect financial stability in the banking sector. Today, the banking sector functions as a system of communicating vessels. If a consumer or a company withdraws money from a bank, this money comes into another bank, either as a deposit or as payment for a product or service. If the Riksbank launches an e-krona with a positive interest rate, it can in some situations be very attractive for both the general public and companies to convert their account balances in the banks to e-krona with the Riksbank. The banking system could then be drained of the funding for its lending, and become unstable, which could damage the supply of credit in the economy.

In addition to the questions I have just mentioned, there are a number of other questions, such as technological solutions, consumer integrity and how a solution can be adapted to suite different groups in society. As you hear, I have only been able to take up a lot of questions here. I don't have all the answers. And I don't think anyone else has at present. The only thing we can be fairly certain of is that whatever direction the Riksbank chooses to take - whether or not to issue e-krona - it can have a major impact on the payment market, the banks' business models, the way interest rate setting functions, financial stability, and so on.

The Riksbank will investigate e-krona

Now I have given my view on the situation for Sweden as one of the countries where the use of cash is declining the most and the fastest and where the general public are finding it increasingly difficult to get access to central bank money. The Riksbank is one of the central banks that will need to take an active stance on whether or not to issue a digital currency first. We cannot wait any longer, and I shall now tell you what we intend to do in the coming years.

We will need to work within three different areas at once. Firstly, we need to identify what technologies can be used. This includes investigating both decentralised and centralised alternatives. It is important not to exclude alternatives in advance and thus limit the room for manoeuvre. Perhaps what we need is a combination of centralisation and decentralisation? We also need to study what technical competence we have, and what we need. We need to investigate in what way payments in e-krona can be initiated: with smartphones, plastic cards or in other ways.

The second area is what I call policy issues, where we study the potential effects on the Riksbank, the payment market, monetary policy, financial stability and so on. Here, we ask ourselves what properties an e-krona should have to best meet the needs we see in the economy. I discussed examples of these questions earlier.

The third area concerns legal issues. Examples here are what opportunities and what flexibility the Riksbank's current mandate allows us, how different laws affect the requirements we should make of an e-krona system and so on.

Even if we intend to work within these different areas in parallel, there will be interdependencies that we must take into account. One obvious example is that the properties we want an e-krona to have will affect what technology we can use.

The e-krona project will also need to be run in different phases. As a possible e-krona can affect the financial sector and the economy in so many different ways, there are many and complex questions that must be answered, and the answers are often interdependent. It is therefore wise to begin by creating a full list of all of the possible questions and surveying the most important deliberations and interdependencies.

Only after this, in a second phase, will it be possible to begin answering the questions and in this way gradually identifying which answers give the best target-fulfilment as a whole. If we do this work properly, at the end of the second phase we will have a set of answers that provide a good picture of how we want the e-krona system to look. Here of course the Riksbank can decide either to conclude the project or to proceed further. If the Riksbank decides that the e-krona system would promote the safety and efficiency of the payment system, the next step will be to construct such a system.

I believe that the Riksbank has never before launched such a complicated project in such an unknown area. The complexity of course gives rise to risks and uncertainties throughout the project, something we will need to compensate for by being flexible.

I understand those who may think that the whole idea of an e-krona sounds too much. But the fact is that Sweden has implemented a similar reform before, that is, digitalised financial assets. I am referring to our holdings of shares and other securities. Up until the 1980s, holding shares meant that one had pieces of paper, share certificates. But with the aid of technology and support of the law, shares are now held in accounts.

However, the difference between the historical changeover from share certificate to account and the Riksbank's plans for an e-krona is that the Riksbank is not intending to abolish banknotes and coins, but is considering supplementing them with another service to the general public. We are also doing this for the people who do not have, do not want to have, or cannot have access to the current version of the payment system, so that they can also manage their payments safely and efficiently.

Learning, problem-solving and new ways of thinking are what innovation is all about. This is what keeps us humans moving forward and I know that there is a lot of knowledge, power of initiative and innovating thinking gathered here today. I myself and the Riksbank will be open to your knowledge in this field. Thank you for inviting me here today.