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This workshop on the “Development of Information Technology and Central Banking” bears witness to, firstly, the prominence to which IT has risen also in central banking, and, secondly, to the growing importance of central bank co-operation. These issues have been close to my heart for the last ten years. I am therefore deeply grateful to the Bank of Japan for inviting me to the first EMEAP workshop devoted to these issues.

My talk comes early in the workshop. I see my task as setting the scene, rather than going into some of the intricacies of IT in a central banking context – about which you know much more than me. To set the scene, I shall use a broad brush to apply some bold strokes.

This morning, I would like to share with you some personal thoughts about the impact of IT on the future of central banking. The plan of my presentation is simple. I look at central banks as service providers in the market for specialised financial services. I examine what the impact of information technology on the demand for these services is. The conclusion is that in the future central bank services as offered today may no longer be in demand. I argue that the survival of central banks hinges on adapting to changing demand and providing excellent services in a cost-effective manner.

the market place

When analysing IT and central banking, we tend to focus on the supply side. We take the services our central banks provide for granted. They are the outcome of the political or internal decision-making process. The question is how to harness technology changes in order to provide quality services to the public. The task of IT departments is to help carry out the central bank’s job as efficiently as possible.

Before we go into greater depth, I would like to pause for a moment and take a different perspective. I suggest we look at the other side of the coin, the demand side. How will the changes in IT change the demand for central bank services? Or, to be more provocative, as Charles Goodhart has put it: can central banks survive the IT revolution?

Such a question may strike us as utterly outlandish. But consider for a moment that central banking in a way has been a peculiarity of the 20th century. In 1900 there were only 18 countries with central banks. Today that number is 172. How many central banks will be needed in the future? Will central banks exist at all?

products

Let’s get a glimpse at the future by looking at how the demand for central bank services is affected by the IT revolution. Central banks offer a wide range of services. The type of

¹ Keynote speech given at the EMEAP High Level Workshop on IT and Central Banking in Tokyo on 2-3 October 2000, at the Bank of Japan. I would like to thank Gunter Baer, Claudio Borio and Gabriele Galati for their critical review of the text.

service and way of providing it are very different from country to country. But the core services of central banks everywhere are monetary and financial stability.

monetary stability: monetary stability mostly means stable prices, or a specific inflation rate. In some countries it means a stable exchange rate. To achieve inflation or exchange rate targets, the central bank must have instruments. The main instrument is the ability to control short term interest rates on banks' deposits at the central bank.

financial stability: I do not need to say much about financial stability. Too recent is the experience in the region with financial instability, and its costly consequences. Financial stability has two main elements: markets, and institutions.

markets: The stability of markets is related to a number of factor like number of market participants, information flows, liquidity, size of the total market. Many of these are the outcome of market forces and are not directly or indirectly under the control of central banks. However, central banks play an important role in the infrastructure on which markets and institutions rely: namely payments and settlements systems. They are the lifeblood of the financial industry. In case of financial crises, they are also the mechanism through which individual illiquidity is propagated through the financial system. Exposures can be very large, even if they are of only very short duration. Therefore a failure of an institution can easily lead to a drying up of liquidity with significant knock-on effects.

institutions: Institutional stability does not mean that banks cannot fail. It means the absence of sudden chain reactions of the type you have seen in some of your countries in the recent past, during which a large part of the banking system becomes insolvent. The main instruments of the central bank, or the supervisory agency, are prudential regulation and supervision.

e everywhere

Three main technology trends seem to be of particular relevance to the demand for central bank services: the emergence of e-money (including credit / debit cards), the possibility to establish secure private payment systems, and the developments that I call in an oversimplifying way e-banking. I use this term as a shortcut for changes in the banking sector that result from the confluence of technological innovation, increased competition, and deregulation.

e-money

The development of alternative means of payment is likely to reduce the demand for currency in circulation, cash. I say likely because while this trend can be discerned on the horizon, little evidence is so far available for it.

The main effect of the emergence of alternative means of payment is that the revenues of central banks will decline. The reason is that so-called seigniorage income is the main revenue source of central banks. To put it more graphically, think of cash in circulation as an interest-free loan from the cash-holder to the central bank. The central bank invests the proceeds from this loan in short term securities. The difference between the interest rate on short term money and the zero interest rate on cash is the source of central bank income. Regarding large denomination notes, some have compared them to an efficient black market

technology that is made available against the extension of a medium-term interest-free loan from those using the technology.

e-payments

High speed networks and ever cheaper computing power make it increasingly easier to deploy real time settlements systems, whether by central banks or the private sector. Incentives to do this are provided by the global nature of settlements which now account for the majority of settlement amounts in many countries; and by the desire of payments system participants to reduce their central bank balances because they are costly.

The main effect of this trend is that the demand for central bank reserves declines. With the market for settlement balances shrinking to insignificant amounts, it may become harder for the central bank to exert effective control over short term interest rates.

reserves / broad money

The declining demand for central bank reserves is clearly visible in the data. Some of the more dramatic declines of reserve money, like in Germany, may be the result of reduced minimum reserves. However, reduced minimum reserves are themselves a reaction to increased competition, in payments services as well as between banks and non-bank providers of financial services, to which I will turn next. It may be worth noting that in some countries, e.g. Canada or the United Kingdom, settlement balances are zero at the end of the day.

e-banking

Technological innovation, combined with deregulation in the wake of increasing competition has led to a large increase in the range of institutions that provide financial services. An early example were money market mutual funds, non-banks who provided interest-bearing checking accounts bundles together with limited payments services more than 20 years ago in the United States. The trend has accelerated since. I need only mention General Electric, the sprouting of internet banks like and financial portals, e-brokers and so on. In a nutshell this trend has been summarised, perhaps a bit arrogantly, by Bill Gates, who said brick and mortar banks were dinosaurs on their way to extinction. The future belonged to click banks which would be internet based. This is certainly an extreme point of view. But there can be no doubt that the variety of financial service providers has increased tremendously in the recent past.

The main result has been that the borders between banks, which are tightly regulated and supervised, and non-banks, which are less so, has become blurred. This raises difficult questions, and quite fundamental ones centring on the basic rationale for regulation and supervision. I cannot go into this here. In any case, a regulatory approach that is centred on institutions, banks, risks losing its relevance. A rethinking of the basic objectives of regulation and supervision is required.

central banks in 2020

What do these trends mean for central banks? Looking at past performance, one cannot but note that central banks have successfully adapted to many changes.

- In the field of monetary stability, they have switched from control of broad money to inflation targeting through controlling short term interest rates.
- In the field of prudential regulation and supervision, they have switched from administrative controls to enlisting market forces through capital adequacy rules, disclosure standards and risk management guidelines.
- In the field of payments systems, they have moved from providing these systems themselves towards setting objectives and standards that reduce settlement lags through RTGS, DvP and PvP.

Thus there is all reason to believe that central banks will adapt successfully to future challenges. To put these challenges into sharper focus, and to fully appreciate some of the possible threats that technological developments may pose to the demand for the services that central banks provide, it is useful to push these developments to their logical endpoint. This is not to say that this endpoint will ever be reached. It is simply an analytical tool to help us grasp better the nature of the challenges central banks face. So, for the sake of clarity, let's advance the clock and see what would happen if the three trends identified above – e-money, e-payments, e-banking – continued unabated. How would central banking in 2020 look like? (I am sure that in this part of the world I need not elaborate why I am using 2020 as a shorthand.)

e-money: electronic means of payments have driven out all forms of currency. All payments are electronic. The main consequence is that central banks make no more profits, and are dependent on budget transfers from the government for their continued operations. Central banks will have transformed from a welcome profit centre for the government to a burdensome cost centre.

e-payments: private real time settlements systems, linking directly global banks have taken over from central bank provided payments services that are limited to national borders. There is consequently no more demand for central bank payment systems, nor for central bank reserves. The payment infrastructure can be bought or rented from global networks and application service providers like SWIFT and Microsoft.

e-banking: financial services are supplied by a wide range of organisations, ranging from ChaseDeutscheMitsubishi over Sears and Mitsukoshi to a host of virtual supermarkets. The prudential regulation of “banks” as we know them has become ineffective, and therefore irrelevant.

the bad news

The above scenario is an extreme one. Perhaps developments will never go that far. But for the sake of argument, let us look at central banking in a world without central bank money, without banks, and without public payments systems. What does central banking in such a world mean?

autonomy: The main source of central bank revenues is the interest income on its financial assets, usually short term loans to banks, combined with interest-free liabilities, currency and central bank reserves. In a world without currency and reserve money, central banks lose their main revenue source. Costs remain. The central bank is no longer a profit centre for the government, it becomes a cost centre. The result is likely to be a closer oversight over central bank use of public resources and a loss of de facto autonomy

monetary policy: With the disappearance of central bank money, the possibility to control the monetary base and through it short-term interest rates is gone. Concerns over excessive money creation may be replaced by concerns about the integrity of computer systems used for settlement purposes. In a world without fiat money,

determination of the unit of account becomes a matter of public choice. This could be a commodity standard. In this case monetary policy would no longer be needed.

regulation and supervision: Banks will disappear and be superseded by a wider range of institutions that offer financial services among other services. Furthermore, many of these services will be offered by global organisations, to a global public. It is not obvious that much of this financial activity would be regulated and supervised by the authorities, or how this could be done effectively. This too would be a matter of public choice. With the disappearance of clearly identifiable banks, there is no obvious reason why regulation and supervision tasks should be given to central banks. Governments may well opt to give this task to specialised agencies, continuing the trend of recent years (UK, Sweden, Australia etc). They may even agree to set up a global super-regulator.

the good news

Following the impact of information technology trends far into the future, it seems that at some point the main services offered by central banks today may no longer be in demand. However, there are three reasons to believe that the demand for central bank services is not likely to whither any time soon.

people like cash: Currency has three properties which substitutes like e-money find hard to match: it ensures complete anonymity; it requires only a minimum of trust in the counterpart or the “technological infrastructure”; and it has been around for a long time and people have got used to it. The slow adoption of new retail payment technologies in otherwise sophisticated economies suggests that the end of cash is not any time soon.

central banks were first: If individuals should be able to settle directly between themselves, without using central bank balances, then computers must be able to communicate in real time to permit instantaneous verification of the creditworthiness of counterparts. This needs reliable, global high speed networks and secure computer to computer communication, which is costly. In the meantime, central bank balances provide an efficient settlement medium with key advantages: it is risk free; in case of distress, central banks offer emergency liquidity through lender of last resort services; and again, central bank balances have been around for a long time. If the pricing of central bank settlement services remains competitive with private alternatives, and the services provided excellent as well as global, there is perhaps not such a strong case for developing alternatives.

Know-how and international co-operation: Regulation and supervision on a national and institutional basis is becoming ineffective. But regulation and supervision continue to be in demand for consumer protection and financial stability reasons. The creation of the Financial Stability Forum and its subgroups, which try to come to grips with some of the points discussed above, are a clear expression of government concerns. Governments are in search of effective approaches for the future. Central banks can be argued to have a comparative advantage in this area: they are close to markets; have considerable experience; and have a well-functioning international network of co-operation that can be built on. If they increase their co-operative efforts among central banks of different countries and between central banks and other supervisory agencies, then central banks can remain key in this area (reference BIS).

can central banks survive?

Taking some of the current trends in information technology to their logical conclusion, the future of central banking does not look bright. Central banks may not be needed at all in a world with global financial markets, without currency, and real time settlement within the private sector. When we look at the speed of these trends over the last 30 years central banks may be tempted to seek comfort from the glacial pace with which these developments have advanced. However, central banks are probably well advised to be more vigilant in these time of "internet speed". What can be taken from the analysis is that a "cyber-world" without central banks is thinkable, and could well materialise. But the simplistic overview shows also that the demise of central banking is in no way inevitable. Central banks have been around for a long time, and have become trusted by the public. They have a first-mover advantage. If they keep their ears to the ground, keep an open mind, and adapt flexibly, they can continue to contribute the smooth and efficient functioning of economies. Above all they must convince the public that their services are excellent and more efficient than possible alternatives, and specialise in those services where they continue to have a comparative advantage. To this end, they must harness the opportunities that the use of IT offers.