

# Centre for Central Banking Studies

Issuing central bank securities

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BANK OF ENGLAND







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Many central banks around the world are faced with the challenge of implementing their policy goals in the presence of surplus liquidity in domestic banking systems. Surplus liquidity can impair the central bank's ability to control its operational target and impact on its profitability, potentially affecting its ability to operate in an independent manner. Within the range of instruments available, the issuance of central bank securities is one policy option that has been used effectively by a number of central banks.

Central bank securities are marketable instruments that the central bank issues in order to reduce counterparties' holdings of excess reserves. Counterparties are usually then free to trade such securities in secondary markets. Central bank securities can be issued using different auction methods and can take a variety of forms. They can vary across maturities, from as short as overnight out to many years, and can pay either a fixed or floating rate of interest. The way in which such securities will vary, will depend on the idiosyncrasies of specific countries and systems combined with the goals of the central bank.

While a number of alternative policy tools are available to central banks — such as the taking of term deposits from counterparties, the use of repurchase transactions for other central bank assets and adjusting the reserve requirements of commercial banks — central bank securities fulfil the following three criteria: (i) operations are in principle not constrained in size; (ii) instruments are tradable; and (iii) instruments permit an equitable distribution of liquidity across the system. But, one potential drawback of central bank securities is that their issuance requires close co-ordination with other public sector issuers. In particular with central governments to ensure that the issues are not seen as competitors, thereby damaging the liquidity of all public sector securities.

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**The views expressed in this *Handbook* are those of the author, and are not necessarily those of the Bank of England.**

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# Issuing central bank securities

## Introduction

A number of central banks around the world are confronted with the challenge of implementing their policy goals in the presence of surplus liquidity in their domestic banking systems. A surplus of liquidity means that cash flows into the banking system persistently exceed demand for such balances and is reflected by holdings of reserves by commercial banks in excess of the central bank's required level. The presence of excess reserves in a financial system impacts on the central bank's ability to implement its monetary policy objectives, and central banks must undertake operations to withdraw them. One tool used successfully by many central banks is the issuance of central bank securities. Central bank securities are usually marketable instruments that the central bank sells primarily to reserve account holding commercial banks as a means of reducing excess holdings of reserves.

In addition to monetary policy purposes there are other reasons why a central bank may choose to issue its own securities. Central bank securities can be used to raise funds to meet other policy goals. The Bank of England has for a number of years issued its own securities, denominated first in euro and more recently in US dollar, using the proceeds to finance the Bank of England's own foreign currency reserves. Following the Asian crisis in the late 1990s Bank Negara Malaysia created a subsidiary, Danamodal, to assist in the recapitalisation of the Malaysian banking system which was funded by the issuance of its own securities; a model that has been used in other situations of bank rescue.

Hawkins (2004) conducted a survey of central banks, drawing upon information provided on central bank websites and through answers to a BIS survey, finding 31 central banks that at that time had their own central bank securities in issuance for a variety of purposes. In the wake of the unprecedented liquidity injections by central banks around the world as a response to the financial market crisis that began in 2007, a number of additional central banks, including, Japan, Sweden and Switzerland, began to issue central bank securities or similar instruments to aid the implementation of monetary policy.

The relatively small number of central banks that issue their own securities reflects the specific situations faced by many. For example, if a central bank faces a liquidity shortage, then there may be little reason for it to consider issuing its own securities for monetary policy purposes. In addition a number

of central banks, such as India, are forbidden by statute from issuing their own securities.<sup>(1)</sup>

The primary purpose of this handbook is to outline how central bank securities can be used in the implementation of monetary policy in the face of a surplus of liquidity. Section 1 outlines the mechanisms through which a central bank implements monetary policy. Section 2 discusses how central bank securities fit into monetary operations. Section 3 discusses the characteristics of central bank securities. Section 4 looks at a number of alternatives to central bank securities, while Section 5 outlines the advantages and the disadvantages of central bank securities in comparison to these alternatives. Section 6 discusses some of the potential ways a central bank can co-ordinate the issuance of its own securities with the central government to limit the negative impact on liquidity for both issuers. Finally Section 7 looks briefly at alternative methods of auction that central banks employ to issue their own securities.

## 1 Central bank operations

### Choice of operations

To understand the reasons why a central bank would consider issuing its own securities as part of its monetary policy operations, it is important to understand how a central bank implements monetary policy through market operations and how a surplus of liquidity can arise.

Bindseil (2004) noted that monetary policy implementation consists of three elements: the selection of an operational target, the establishment of a framework to help control that target and finally the use of instruments of monetary policy to achieve the operational target.

While the ultimate goal of a central bank's monetary policy is usually to achieve price stability and thereby encourage economic growth, these targets tend to be outside a central bank's direct control and often there is a lag between central bank actions and their impact on the ultimate goal. Therefore central banks often use an operational target, an economic variable it can directly control. In recent years there has been a consensus among many central banks that short-term interbank interest rates are the optimal operational target.<sup>(2)</sup>

(1) Such restrictions stem from the fear of central bank securities impacting on the market for government securities and the potential losses that could stem from the central bank issuing its own securities.

(2) See Gray and Talbot (2006a).

For some central banks, however, such as those in small open economies, where there is a rapid pass-through from movements in the exchange rate into domestic inflation, or those in economies where the central bank's credibility is weak, the use of an exchange rate target may be a preferred strategy. Assuming free movement of capital, a central bank that chooses a fixed exchange rate must sacrifice autonomous monetary policy and hence import the operational target of the country whose exchange rate it is fixed against. This has seen a move away from the past consensus where central banks would choose operational targets based on the central bank's balance sheet such as monetary aggregates or reserve levels.

In terms of instruments, recent years have seen central banks move towards indirect market instruments, often some combination of open market operations, reserve requirements and standing facilities.<sup>(1)</sup> Direct administrative controls, such as retail interest rate restrictions have fallen out of favour as they are perceived as incompatible with market-based systems and may generate unwanted market distortions. It is within this range of indirect monetary policy instruments that a central bank will issue its own securities as a monetary policy instrument.

The choice of operational target does not necessarily determine the framework that the central bank may use. For example, one way to achieve an exchange rate target may be to use monetary policy instruments to maintain domestic interest rates in line with interest rates in the country of the target currency. Even if the central bank targets neither short-term interest rates nor exchange rates, it may still use many of the same instruments to avoid unnecessary uncertainty and price volatility in interbank markets caused by day-to-day swings in liquidity across its balance sheet.

### Central bank balance sheet

Although, as noted above, in recent years the consensus has seen short-term interest rates or exchange rates, as opposed to balance sheet quantities, become the operational target of choice, the central bank's balance sheet remains the most important place to begin to understand both the implementation of monetary policy and the liquidity position of the system as a whole. Although local idiosyncrasies and varying accounting standards mean that the mode of presentation and categories used can vary significantly from central bank to central bank, nearly all central bank balance sheets can be generalised to the form presented in **Table A**.

The main liabilities of the central bank — notes, required bank reserves and free bank reserves — are known as the 'monetary base'. The monetary base, and in particular bank reserves, both free and required, are crucial to the functioning of an economy as they form the ultimate means of settlement for transactions. Commercial banks will settle transactions with

**Table A** Stylised central bank balance sheet

Assets	Liabilities
Foreign assets (net)	Notes (and sometime coin)
Lending to government (net)	Required bank reserves
Lending to banks (net)	Free bank reserves <sup>(a)</sup>
Other items (net)	Capital

(a) Free bank reserves are defined as reserves held by commercial banks at the central bank that are held in excess of those required to satisfy contractual reserves. They may be held voluntarily as insurance against unforeseen payment shocks or involuntarily.

each other across the books of the central bank. In normal times confidence in this narrow transactional role of the central bank feeds broader intermediation between the commercial banks and the wider economy encouraging commercial banks to play their traditional role of maturity transformation to assist growth in retail and commercial deposits.

Central banks typically implement monetary policy by exploiting their monopoly control over the creation of the monetary base to influence the level of short-term interest rates or the exchange rate. Many do this by adjusting the terms on which they are willing to supply or absorb liquidity from the markets in order to provide the optimal quantity of liquidity that will permit commercial banks to fulfil reserve requirements and be able to make interbank payments. If the central bank provides too much or too little liquidity and there are penalties for reserve deficiencies and excesses then it is likely that the market price of this liquidity will deviate away from the desired target.

### Definition of surplus liquidity

Returning to the central bank's balance sheet, if growth in the size of the central bank's balance sheet is driven by growth in the liabilities, then there exists a shortage of liquidity. In such situations, the growth in demand for notes and/or the level of required bank reserves increases as the quantity or nominal size of transactions in the economy increases. Holdings of free reserves will be small and purely voluntary, driven by commercial banks' wish to insure against payment shocks and the possibility of penalties for contractual reserve deficiencies. The central bank will then increase the asset side of its balance sheet, by increasing its lending to banks to meet this demand.

In contrast, if growth in the size of the central bank's balance sheet is driven by growth in its assets then there exists a surplus of liquidity. In such situations growth in the assets of the central bank are met by a subsequent increase in commercial banks' involuntary holdings of free bank reserves, unless the central bank is able to absorb this surplus liquidity through market operations which will appear on the liabilities side of its balance sheet.

(1) For a greater discussion of monetary policy instruments see Gray and Talbot (2006b).



A shortage of liquidity was the default position of most developed economy central banks prior to the financial market crisis that began in 2007,<sup>(1)</sup> while a surplus of liquidity was the common position in many developing countries.

A surplus of liquidity could occur as a result of sustained growth in any of the assets of a central bank; however, the two most common sources are growth in foreign assets or in lending to government.<sup>(2)</sup> Foreign currency assets in developing countries often increase as in the process of development, the economy attracts large capital inflows. The effect of these inflows on liquidity is often magnified by central bank intervention in the foreign exchange market to counter appreciation of the domestic exchange rate. Lending to government increases in countries where governments run unsustainable fiscal policies and look to the central bank to meet the shortfall in expenditure that cannot be met through taxation or cost effectively through debt markets. To avoid the latter situation, many central bank laws, including the Maastricht Treaty covering the European Union, prohibit such 'monetary financing' to safeguard central bank independence.

### Differences between a surplus of liquidity and a shortage of liquidity

Whether there is a surplus or a shortage of liquidity has implications for the central bank and has the potential to influence the following: (i) the transmission mechanism of monetary policy; (ii) the conduct of central bank intervention in the money market; and (iii) the central bank's income.

When there is a shortage of liquidity, commercial banks are forced to borrow from the central bank, potentially at penalty rates in standing facilities, otherwise reserve requirements will not be met and interbank payments may not be made. As a result, when the central bank is lending money to commercial banks it is able to choose the terms on which it deals, such as the assets it takes to match its liabilities. This allows the central bank to attempt to limit the level of risk it is willing to be exposed to. Finally when there is a liquidity shortage, operations should earn central banks money. In such a situation the central bank will be lending money to the market and will hold an asset earning a positive interest rate (usually at or close to the central bank's policy rate). Against this asset it will hold as liabilities, notes and reserves. Notes do not pay interest, while reserves can either be unremunerated or remunerated (usually at a rate no greater than the central bank's policy rate). Overall it is likely that interest earned on the central bank's assets will be greater than the interest owed on its liabilities.

When there is a surplus of liquidity, then depending on the overall size of the surplus, commercial banks may not be forced to transact with the central bank without impacting the ability to meet reserve requirements and for interbank payments to be made. The central bank therefore may be in a

weaker position to dictate the terms on which it transacts with the market. When there is a liquidity surplus, operations can cost the central bank money. In such a situation the central bank will be absorbing money from the market and will have a liability paying a positive interest rate. Against this it will hold assets, such as loans to government or foreign currency denominated assets, which likely pay a lower rate of interest. Dalton and Dziobek (2005) detail a number of examples of central bank losses, including the cases of Brazil, Chile, Czech Republic, Hungary and Korea who all made losses as a result of the interest rate differentials between liabilities used for domestic sterilisation and assets held for foreign exchange purposes.

The upshot of the above is that when there is a shortage of liquidity the central bank will always lend enough to the market to obtain balance, when there is a surplus of liquidity it is harder for the central bank to drain enough to obtain balance. As a result, in many cases of surplus liquidity the central bank has less control over the first step of the monetary transmission mechanism. That is not to say that central banks that operate with a surplus of liquidity are not able to implement monetary policy effectively and there are many examples of central banks around the world which are able to do so: for many the issuance of central bank securities is a key policy tool.

## 2 Using central bank securities in monetary policy implementation

### Operations under a shortage of liquidity

When faced with shortage of liquidity the central bank decides the terms on which it will supply the market with liquidity. It must choose the balance between active (open market operations) and passive (standing facilities) operations, between repurchase and outright operations and the maturities over which it wishes to make the liquidity available. The central bank's interaction with the market needs to be frequent as day-to-day changes in the elements on its balance sheet will impact on the quantity of liquidity available to commercial banks to fulfil reserve requirements and make payments. If the central bank does not adjust the quantity of liquidity available it can lead to unwanted volatility in market prices.

*In extremis*, the central bank could choose to roll over all of its liquidity provision each day by only lending at overnight maturities. However, this would be burdensome and expose the central bank to operational risk. Instead, the majority of

(1) In response to the crisis many central banks in developed economies significantly increased the size of lending to commercial banks. This led to commercial banks holding significant free reserves. Borio and Disyatat (2009) provide a concise summary of actions taken by major central banks during the crisis, while Keister and McAndrews (2009) discuss the impact of increased reserves.

(2) For a comprehensive discussion of the sources of surplus liquidity see Gray (2006a).

central banks exploit the fact that although the size of the liquidity shortage varies with movements in the components of their balance sheet, a certain degree of the shortage is permanent. Therefore the central bank can ease the operational burden by offering longer-term repurchase and permanent operations and only adjust a small quantity of the available liquidity on a day-to-day basis. In addition the central bank can exploit other market instruments such as reserve requirements that permit averaging to ease the need to operate on a daily basis and instead operate on a less frequent basis, such as weekly.

### Operations under a surplus of liquidity

When faced with a surplus of liquidity the choices available to a central bank are slightly more complex and, as noted above, the fact that commercial banks are not compelled to transact with the central bank may mean the central bank has to choose instruments desired more by the market than by itself. A central bank can decide whether to accept the surplus of liquidity or to move to a shortage of liquidity. If the central bank accepts the surplus of liquidity it can choose to use a range of maturity instruments to absorb enough liquidity to bring the market back to balance, that is, to the point where free bank reserves are willingly held and market prices are in line with policy. In that case even the shortest-term operations are on balance liquidity absorbing. If the central bank chooses to move to a shortage of liquidity it will absorb, usually through longer-maturity operations a quantity of liquidity greater than the size of the liquidity surplus leaving a shortage of liquidity that the central bank can meet through short-maturity liquidity providing operations. In that case, the short-term operations will on balance be liquidity providing. The primary determinants of which option the central bank will choose are the size and the stability of the overall surplus of liquidity and the varying cost of the operations available.

As discussed above, there are advantages to a central bank in moving to a shortage of liquidity and operating to supply liquidity to the market. However, before considering such a move, the flow as well as the stock position of the surplus needs to be considered. If the underlying cause of the surplus, be it capital flows or monetary financing of government, is still ongoing, then any move to create a shortage of liquidity will likely be short-lived as the asset side of the central bank's balance sheet will continue to expand. It may also be the case, for example when sterilising capital inflows, that the central bank does not wish to address the source of the surplus as it may lead to unwanted macroeconomic outcomes, such as an appreciation of the domestic currency.

Even if the source of the surplus has been addressed and the size of the surplus is stable it may be that the costs involved in creating a shortage of liquidity are greater than merely choosing to absorb the existing surplus. A common characteristic of many economies facing a surplus of liquidity

is an upward-sloping yield curve. The significant excess of liquidity in the banking system is likely to be a key determinant of short-term interest rates being low. In the long run the yield curve is likely to be influenced by expectations<sup>(1)</sup> and liquidity preferences<sup>(2)</sup> implying that long-term rates are often higher than short-term rates. In this instance the central bank will find it more costly to create a shortage of liquidity, even though the central bank will earn money through the supply operations it will then conduct. As a result the central bank may instead choose merely to absorb the surplus, concentrating the majority of its operations at shorter maturities.

### Using central bank securities

Central bank securities can be used in both scenarios as an instrument to absorb unwanted holdings of free reserves. The central bank through its operations will sell counterparties its central bank securities in return for reserves balances. The sale of central bank securities adjusts the composition of the central bank's balance sheet reducing the quantity of free reserves which are replaced as a liability by the securities in issue. Whether or not the central bank is merely absorbing the surplus or creating a shortage of liquidity will determine whether or not the size of the central bank's balance sheet is changed. In the case of absorbing the surplus, the size of the balance sheet will remain unchanged and only the composition of the liabilities will be affected. If the central bank is creating a shortage of liquidity then the balance sheet will increase by the size of the freshly created shortage with the assets increased by the now required market lending.

The majority of central banks around the world that use central bank securities as an instrument of monetary policy in a surplus of liquidity environment maintain the quantity of securities in issue below the total size of the surplus and use other instruments such as reserve requirements, short-term open market operations and standing facilities to absorb the remainder of the surplus adjusting for day-to-day movements in other balance sheet components. The case of the Bank of Korea, who issue central bank securities as a means of absorbing a surplus caused by capital inflows, is considered in Box 1.

## 3 Characteristics of central bank securities

As with nearly every component of monetary policy operations around the world, the characteristics of central bank securities can vary significantly depending on the local

(1) Bodie, Kane and Marcus (2002) define the expectations hypothesis 'as forward rates being equal to market consensus of the future short-term interest rates; and liquidity premiums are zero'. 'An upward sloping yield curve would be clear evidence that investors anticipate increases in interest rates.'

(2) Bodie, Kane and Marcus (2002) when defining the liquidity preference theory note that there are both short-term investors and long-term investors active in the market that need compensation to hold bonds different from their investment horizons. 'Advocates of the liquidity preference theory of the term structure believe that short-term investors dominate the market so that, generally speaking, the forward rate exceeds the expected short rate.'

## Box 1

### Example of the use of central bank securities

There are a number of central banks around the world that use central bank securities as an instrument to implement their monetary policy in the face of a surplus of liquidity. This box analyses the case of Korea.

In response to a significant inflow of foreign capital at a time of strong economic growth, the Bank of Korea has attempted to implement monetary policy despite a surplus liquidity. Since 1961 the Bank of Korea has issued its own securities known as 'Monetary Stabilisation Bonds' (MSBs) and has since 1998 used these securities as the primary means of absorbing the excess of liquidity in the market.

MSBs are issued at a range of maturities from fourteen days out to two years, with two years being the most common maturity (Chart A). The maximum amount of MSBs to be issued is set by the Monetary Policy Committee every three months. When the Bank of Korea wishes to adjust the quantity of liquidity available to commercial banks at shorter maturities it uses repurchase transactions and standing facilities. Since March 2008 the Bank of Korea has used weekly one-week maturity repurchase transactions as its main form of open market operation.

The Korean authorities have invested significant resources into promoting active secondary market trading of MSBs and holdings of such instruments have stretched beyond commercial banks that hold reserve accounts at the

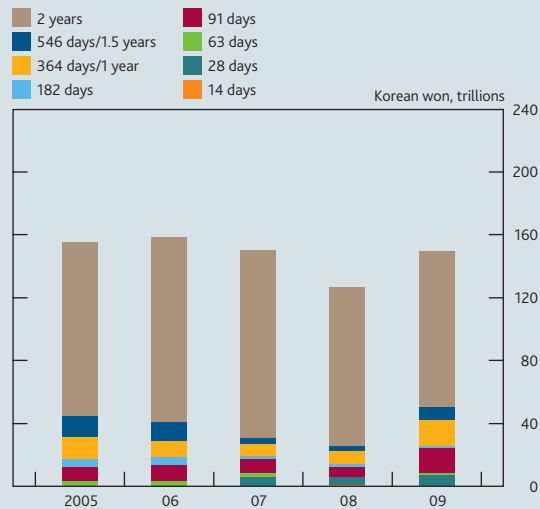
idiosyncrasies and the goals of issuing such securities. We can characterise the main fields of central bank securities as the following:

#### Maturity

The shortest possible maturity that a central bank could consider issuing central bank securities is overnight. At such short maturities many central banks choose instead to offer deposit facilities for operational simplicity. The advantages of central bank securities, discussed below, are limited at short maturities — ie no possible opportunity for the commercial banks to trade the securities and limited costs to the counterparties for tying up their money. But, for consistency, and to distinguish open market operations from deposit standing facilities, central banks may consider issuing securities with overnight maturities.

For securities with a maturity longer than overnight, the central bank faces a trade off. It wants to choose a maturity that reduces the operational costs of issuance and gives enough time for the advantages of the central bank securities

Chart A MSBs outstanding



Bank of Korea. Changes to tax regulations in 2009 made it easier for foreign investors to hold MSBs, though such measures as the exemption of withholding taxes were revoked in 2011. Despite some crossover in investor base and the fact that it acts as fiscal agent for the Korean government, the Bank of Korea is successfully able to differentiate its securities from central government ones. The fact that the quantity it chooses to issue is clearly signalled in advance helps as does the fact the range of maturities for both MSBs and Korean government bonds do not overlap. MSBs, as noted, are issued with a maximum maturity of two years, while Korean government bonds range in maturity from three years up to 20 years.

to be utilised. But, it must choose a maturity short enough so that the potential misalignment of the quantity of securities in issue compared to the changing size of the surplus as a result of other balance sheet factors does not lead to unwanted interest rate volatility. In addition to the size of the changes, the central bank's ability to forecast such changes may also be important. When issuing securities the central bank tries to absorb an amount equal to its best estimate of the size of the surplus over the period of issuance, therefore the central bank's ability to forecast balance sheet changes<sup>(1)</sup> and the horizon over which it feels its forecasts are most accurate will play a role in determining the maturity at which the central bank will issue its securities. However, the longer the maturity of the securities issued the more likely that the central bank will need to employ other market instruments such as reserve requirements that permit averaging to ensure that day-to-day movements in other elements on its balance sheet do not lead to unnecessary volatility in market conditions. Beyond

(1) For more discussion on how central banks forecast changes in their balance sheets see Gray (2006b).

overnight, the shortest central bank securities in issue tend to have maturities of around seven days. For example, the Bank of Mongolia in 2010 issued Bank of Mongolia securities on a weekly basis with maturities of seven days.

For longer-term central bank securities there is theoretically no upper limit to the maturity that the central bank can choose to issue at; Cifuentes *et al* (2002) noted that the Bank of Chile had issued securities with a maturity of 20 years. The choice of maturity will likely be influenced by discussion with market participants and other public sector issuers as to which maturities they would favour. In addition, as discussed below, the issue of central bank securities can have positive externalities for market development, particularly in situations of limited government debt, by potentially encouraging the development of market infrastructure and creating a default risk free rate over which other securities can be priced. Therefore the central bank may choose to issue at a range of maturities to allow the creation of a rudimentary yield curve.

If the central bank is issuing longer-term securities to artificially create a shortage, it will likely want to avoid dealing both ways in the market at the same maturities so as not to create unnecessary confusion. In benign market conditions the central bank will often choose to issue at longer maturities allowing it to lend at shorter maturities. However, in times of market stress when commercial banks desire longer-term central bank funds the choice may be reversed.

### Interest

Central bank securities can be issued to pay either a floating or fixed rate of interest. The choice between fixed and floating rates is often of secondary importance to ensuring that the chosen rate is consistent with the wider goals of the operational framework and does not lead to distortions in commercial bank behaviour.

For many central banks that have a short-term interest rate as their operational target, operational frameworks use symmetrically priced standing facilities, remunerated reserves with averaging or a combination of the two as the primary means of implementing their policy rate in short-term interbank markets. In such systems, as noted previously, the central bank is aiming to ensure that short-term market operations leave the optimal level of reserves available to the market participants. The rate at which the central bank makes this optimal quantity of reserves available, be that through liquidity supplying operations when there is a shortage of liquidity or the issuance of central bank securities or other liquidity absorbing operations when there is a surplus of liquidity is not central to the achievement of the operational target. If interbank markets are liquid and banks act in line with the incentive structure created either by the pricing of the standing facilities or the terms of reserve remuneration, then market rates should converge on the target independent of the

rate that the reserves were made available. To ensure that commercial banks face no opportunity costs from holding reserves and that the central bank does not make significant profit or loss from its market lending, central banks generally choose to supply or absorb reserves at an interest rate close to their chosen policy rate. In this case a central bank issuing short-term securities to adjust the quantity of reserves available to commercial banks will be best served by choosing to pay either a fixed rate of interest at or very close to policy rate or a floating rate linked to the targeted market interest rate. Both rates would be consistent with limiting the opportunity costs for commercial banks holding reserves and limit the profit and loss of the central bank.

If the central bank is issuing securities with longer maturities then often such maturities will be greater than the time to the next interest rate decision. In this case the central bank will want to choose an interest rate, floating or fixed, that does not lead to over or underbidding by counterparties. To understand why, consider the situation where the central bank is widely expected to reduce its policy rate at the next meeting. If the central bank planned to issue a security that pays a fixed rate either at or close to its current policy rate with a maturity beyond the next policy meeting, then in such a situation the central bank will likely be inundated with offers for these securities. The reason being that the equivalent maturity market rate will be lower than the rate that the security pays, as in relatively efficient markets expectations of future rate changes will be priced in and there should be no systematic arbitrage opportunities. In such a scenario, market participants will realise there is a costless profit opportunity from borrowing the funds at the lower market rate, and buying the central bank security at the higher policy rate. The opposite would be true if the central bank was expected to raise rates at its next policy meeting. In this case the central bank securities would be paying a lower rate than market interest rates of an equivalent maturity and therefore the central bank would likely see very little interest in its securities. To avoid such distortions the central bank should consider issuing securities that pay either a fixed rate determined by the market through a competitive auction or a floating rate either linked to a chosen market rate or indexed to the average policy rate over the period.

### Denomination

The central bank faces a choice of issuing securities in its own domestic currency or issuing in a foreign currency. Since the goal of issuance for monetary policy purposes is to limit the availability of the domestic currency being held by counterparties as free reserves, most central bank securities are issued in domestic currencies. If the central bank is selling securities issued in foreign currency, it will need to perform further operations using the foreign exchange (FX) market to influence the availability of the domestic currency. Such operations are unlikely to be costless and will likely have an

impact on the exchange rate of the domestic currency. If the securities are being issued as a means of sterilising foreign currency intervention then the central bank is unlikely to want to have further influence on the exchange rate.

### Legal structure

One of the challenges faced by central banks around the world is to convince their counterparties to take part in operations to absorb the surplus of liquidity rather than continuing to hold free bank reserves at the central bank. In addition to the characteristics discussed above there are other features that the central bank can incorporate into their securities that will encourage counterparties to purchase them.

One reason why a counterparty may choose to continue to hold free reserves as opposed to taking part in the central bank's draining operations is that they fear tying up their money. If the counterparty requires the money during the life of the transaction they would need to access unsecured interbank markets. Depending on the credit standing of the counterparty or wider market condition this could be difficult or expensive. One of the advantages of issuing central bank securities in contrast to other operations available to the central bank is that they provide the purchaser with a security which they can subsequently use in other operations, potentially reducing the costs of accessing funds. The central bank has the ability to make its securities eligible as collateral in its own operations, be it standing facilities or, in the case where the central bank has issued longer-term securities to create a shortage of liquidity, in regular open market operations. In addition to uses in central bank operations the central bank could encourage private sector providers of payment and settlement systems to consider accepting and including the central bank securities for use in such systems. For example, if central bank securities are included in the broadest category of government securities in securities settlement systems, it can increase their potential usage in other secured transactions.

The central bank should also ensure through the design of the securities that there are no legal restrictions on the ability of counterparties to transfer ownership of the securities between themselves and should do everything within their powers to provide a backdrop that encourages the trading of such securities.

Commercial banks around the world are subject to capital and liquidity regulations. One reason a commercial bank may choose to continue to hold free reserves at the central bank is that it provides the commercial bank with a highly liquid asset that will likely have a zero risk weighting when calculating capital requirements. If the central bank is unable to design securities that provide similar characteristics then it may be the case that the commercial banks are unwilling to purchase such securities as they would have a negative impact on the

costs of meeting regulatory requirements. Therefore it is in the central bank's interests to ensure through co-ordination with the relevant regulatory authorities that the securities it issues are subject to the same favourable regulatory treatment as reserves are. Whether or not central bank securities are likely to be treated favourably for liquidity purposes will likely be tied to how quickly a holder of a central bank security can realise the value of the security in exchange for money and is directly linked to the factors discussed above.

## 4 Alternatives to central bank securities

### Deposits

Probably the simplest operation available to central banks in the presence of a surplus of liquidity is to require commercial banks to place deposits at the central bank. Such deposits can be for the maturity of the central bank's choosing, trading off the operational burden of taking the deposits with the willingness of commercial banks to tie up funds at the central bank. The taking of deposits should not affect the overall size or the asset side of the central bank's balance sheet. On the liabilities side of the balance sheet, the level of free reserves will be reduced, replaced by a liability — which assuming the maturity makes them less liquid, is not part of the monetary base — representing the deposits made by the commercial banks. If the maturity of the deposits is overnight, then operationally there is no difference from a deposit standing facility.

If the maturity of the deposit facility is greater than overnight then it is likely that commercial banks will want some form of compensation for leaving funds on deposit at the central bank. The monetary policy framework can be set up to encourage the commercial banks to take up the offer of deposits, ie by remunerating deposits and leaving free reserves unremunerated if deposits are not taken up.

As with the issuance of central bank securities, the central bank faces a choice as to whether to pay a fixed or floating rate on the deposit.

The main downside to deposits is that they lack the flexibility that either the sale of central bank securities or the repurchase of central bank assets permits. Once the commercial bank has placed the funds on deposit at the central bank, short of cancelling the deposit, which will impact on the overall liquidity position, there are no other ways for the commercial bank to access the funds. In addition, the inability to cancel deposits may lead them to be treated less favourably in terms of liquidity regulations. How favourably deposits are treated within liquidity regulations will likely be inversely related to their maturity. Short-term deposits, however, may be a useful tool if local laws prevent the central bank from issuing their own securities.

Between September 2008 and March 2009 the Reserve Bank of Australia (RBA) offered a term deposit facility as a means of absorbing, at short-maturities, reserves provided to financial institutions through longer-term repos. The term deposits had maturities between seven and fourteen days and paid a rate at a margin lower than the RBA's target rate, determined by competitive auction.

### Repurchase of central bank held assets

As opposed to either selling its own securities or taking deposits a further option available to a central bank is to use repurchase agreements to utilise assets held on the central bank's balance sheet. Such operations are often structured as the exact mirror image of repurchase agreements used to provide liquidity to the market in situations of a shortage of liquidity. Instead of the central bank purchasing the asset and increasing the balance on the commercial bank's reserve account at the start of the transaction, before unwinding at a set later date, the opposite takes place and the commercial bank purchases the asset from the central bank by reducing the balance on its reserve account, before the transaction is later unwound and the asset returns to the central bank.

Such transactions have no impact on the overall size of the central bank's balance sheet but do change the composition, crucially on the liabilities side of the balance sheet the size of commercial banks' free reserves is reduced and replaced by market lending liability equal to the amount owed in the repurchase agreement. Crucially this new liability is not part of the monetary base and the surplus of liquidity in the system is reduced and possibly eliminated by such transactions.

The ability to use such repurchase operations is limited to the quantity of assets held on the central bank's balance sheet: once the central bank has exhausted its holdings of repurchasable assets it must look into other policy tools. For central banks where the source of the surplus has been quantitative easing type policies, then there will likely be a significant quantity of high-quality assets available for repurchase.<sup>(1)</sup> At the other extreme, for central banks that have been forced to monetise government debts as a result of unsustainable fiscal policies, the quantity of suitable assets may be small, as, if such assets were readily marketable, the central bank would be unlikely to be holding them in the first place.

A further downside to the use of repurchase operations is that such transactions, unlike the sale of central bank securities or the taking of deposits, expose the central bank to a degree of counterparty credit risk on any scheduled coupon payments on the securities. If the central bank has sold its own securities or taken a deposit then the central bank holds the funds for the duration of the transaction and at maturity the funds are returned to the counterparty with the agreed interest; at no point is the central bank bearing counterparty credit risk. But,

in repurchase transactions, for the duration of the transactions, although the legal ownership of the assets has been transferred to the repurchase buyer in the trade — in this case the commercial bank — by market convention any coupon payments paid on the securities are passed back to the repurchase seller — in this case the central bank. This means that for the period between the coupon payment being made and the time that the counterparty pays these funds over, the central bank is exposed to some counterparty credit risk.

Many central banks around the world, including Korea, Thailand, Indonesia, Mexico and Argentina use short-term repurchase agreements of domestic currency assets as a means of fine-tuning the quantity of reserves available to commercial banks by offsetting movements in other components of their balance sheet, however, all the central banks mentioned above also use other monetary policy instruments to offset the majority of their surpluses of liquidity at longer maturities.

A further form of transaction available to central banks looking to absorb liquidity that utilises the sale and repurchase structure is FX swaps. In an FX swap the central bank uses foreign currency as the underlying collateral in the repurchase transaction. Such instruments are common among countries that operate fixed exchange rate regimes and naturally have significant quantities of foreign currency on their balance sheets. For example, the Monetary Authority of Singapore uses FX swaps as one instrument to regulate the availability of domestic liquidity.

### Increased reserve requirements

A further alternative available to a central bank, particularly if the surplus of liquidity is relatively small and stable, is to introduce (or increase existing) contractual reserve requirements. Such a move could be done on a scale which eliminates the surplus of liquidity and creates a shortage of liquidity which the central bank can then meet through standard liquidity providing operations.

At first glance such a response may appear to be simple and cheap, especially if reserves are unremunerated, however, in the long run such actions will have a negative effect on market development. Unremunerated reserves are a tax on financial intermediation; that is to say that as commercial banks increase their financial intermediation, ie make loans and take deposits, they increase the size of their liabilities subject to reserve requirements and are thus forced to leave greater amounts unremunerated at the central bank. Such a state of affairs would likely discourage commercial banks from

(1) In countries such as Japan, the United Kingdom and the United States, asset purchases in relation to the monetary policy response to the crisis have seen a significant increase in reserves held by commercial banks at these central banks. One policy tool floated by the US authorities as a means of eventually reducing the quantity of reserves is to use repurchase agreements.

increasing lending and encourage them to engage in actions that increases business through channels not subject to reserve requirements or engage in statistical manipulation to reduce such requirements.

If the central bank were to pay remuneration on the required reserves then the effects would be broadly similar to those seen when the central bank asks commercial banks to deposit funds; but may be less precise if commercial banks were subject to some set level of reserve requirement. This would especially be the case if the distribution of the surplus was skewed, with some commercial banks holding a greater proportion of the excess free reserves than others.

Increased reserve requirements are also an imprecise tool to absorb surplus liquidity as the amount drained will vary with changes in commercial banks' balance sheets, and not, unless the level of reserves was changed, with changes in the central bank's balance sheet.

The impact on the central bank's balance sheet will depend on how large the increase in reserve requirements is relative to the overall surplus of liquidity. If the central bank were to merely increase reserve requirements up to a size short of the total surplus of liquidity then the overall size of its balance sheet and the asset side would remain unchanged, the only difference would be that on the liabilities side, free reserves would be reduced, replaced by required reserves. If the increase in the level of reserve requirements was greater than the size of the surplus of liquidity then the central bank would have artificially created a shortage of liquidity: in this case the size of the central bank's balance sheet will be increased. On the liabilities side free bank reserves will be reduced, replaced and exceeded by the higher required reserves. As the liabilities side will have increased by a greater amount than the initial size of the assets side the central bank will need to increase the asset side of the balance sheet by conducting supply operations to provide the required liquidity to the market.

Though under such operations the size of the monetary base is either unchanged or increased, if reserves are remunerated at policy rate it will create a situation where commercial banks may be willing to hold the increased level of reserves and the market interest rate will remain in line with policy.

The Bank of Mexico uses a form of reserve requirement to reduce the amount of excess liquidity in the system by requiring commercial banks in Mexico to place 'mandatory long-term deposits' (MLDs) at the central bank. Usually these MLDs do not have a defined maturity and banks are not able to withdraw them, however, the banks do receive remuneration on such balances. The Bank of Mexico sets the total amount of MLDs for the system according to the amount of liquidity needed to be withdrawn; the amount each bank

will have to deposit is calculated based on certain liabilities at a particular date.

### Remuneration of reserves

An alternative to increasing reserve requirements would be for the central bank to abolish formal reserve requirements and instead remunerate all reserves held by commercial banks at policy rate. Such a move would create a 'floor' system of monetary policy as discussed by Bernhardsen and Kloster (2010) and Keister *et al* (2008), which can be very effective in keeping market rates in line with policy rates. Such 'floor' systems disconnect the quantity of money in the system from the implementation of monetary policy; changes in the quantity of free reserves do not impact on market interest rates. In such a system the central bank provides or accepts a large quantity of liquidity in the market, and although there are no formal reserve requirements, all reserves are remunerated at policy rate. In terms of the central bank's balance sheet, with a surplus of liquidity the implementation of such a framework would have little impact but to categorise free reserves as required reserves.

Potential drawbacks of 'floor' type systems include the potential negative impact on interbank activity. While the Reserve Bank of New Zealand who operate under such a system were able to encourage interbank activity by setting upper limits on the amount that individual banks are able to place on deposit at the central bank, such a policy in the face of surplus liquidity may not lead to all of the surplus being absorbed.

## 5 Advantages and disadvantages of central bank securities

### Tradability and distribution of the surplus

Of the options discussed thus far central bank securities are the only instruments that fulfil the following three criteria: (i) operations are not constrained in size; (ii) instruments are tradable; and (iii) instruments permit an equitable distribution of liquidity across the system in situations where interbank markets are not developed. Deposits fulfil the first and third criteria, but are not tradable meaning that once a commercial bank ties up their funds in a deposit then if they need the funds they must borrow unsecured in short-term money markets. Depending on the depth of the market or the commercial bank's credit standing this could prove to be expensive. The repurchase of assets held on the central bank's balance sheet fulfils criterion two, in that the commercial bank can use the security it has received in further transactions, and criterion three, but the ability to perform such operations is constrained by the initial holdings of suitable assets on the central bank's balance sheet. Finally if the size of such reserve requirements is imposed by the central bank at an arbitrary level they are unlikely to permit the equitable distribution across the system,

that is, different banks are likely to be holding different quantities of free reserves so the implementation of increased reserve requirements is likely to mean some banks being left with surplus free reserves, while others may face a shortage of reserves. The ability to distribute these funds is then dependent on the depth of the unsecured interbank markets and the credit standing of the commercial bank needing to borrow.

Central bank securities fulfil all three criteria. Ignoring the potential cost of issuing such securities, which will be looked at below, the only potential restriction on the quantity of central bank securities that can be issued is the market's appetite. Since the quantity issued will likely be determined by such appetite — the size of the surplus — this constraint is unlikely to be binding. The tradability of securities means that counterparties who purchase the central bank's securities should be able to easily access funds by selling the security, either outright or through a repurchase agreement. Finally, as the central bank securities are likely to be sold in a transparent and fair manner that permits all holders of reserves to be able to at least purchase the securities in the secondary market — methods of auction will be discussed below — and if such markets are relatively liquid, it should lead to the counterparties holding the greatest quantities of free reserves being able to hold the greatest quantity of central bank securities.

### Market development<sup>(1)</sup>

The issuance of central bank securities for monetary policy and/or liquidity management can have other benefits in addition to assisting with the implementation of monetary policy. The potential creation of active secondary market trading in such securities can have the benefit of helping to develop wider financial markets, particularly in countries where there may not be an active government bond market.<sup>(2)</sup> If the central bank were to issue securities at a variety of maturities then the pricing of such securities can be used to form a rudimentary default risk-free yield curve which market participants can use as a benchmark from which to price other assets. The existence of such a default risk-free curve should then encourage the development of other fixed-income securities, including a corporate bond market.

In addition to assisting in the pricing of fixed-income securities, the development of active secondary markets for central bank securities may also encourage the development of wider financial markets. They can encourage the growth of both physical and legal market infrastructure.

Physical infrastructure relates to trading platforms and payment and settlement systems. The ability to trade in a well defined and transparent market place with the confidence that payment and settlement will occur in a timely and reliable manner, will encourage market participants to trade and foster

greater market liquidity. Once such infrastructure is in place for the trading of central bank securities such structures can be adapted to other financial instruments.

Legal infrastructure relates to market conventions, trade disclosure and supervision. Again market participants are likely to be more willing to participate in financial markets if they are confident that they are protected by effective laws and it is a long-held belief that markets thrive on information; the more that can be provided, the better for market activity.

### Drawbacks

Probably the greatest drawback from the issuance of central bank securities is the potential impact that the presence of an additional public sector issuer, in addition to existing issuers such as the central government, may have on the liquidity for all public sector securities. The methods for overcoming such potential problems are discussed below.

Furthermore, while the properties of central bank securities may be seen as superior to other solutions proposed, the cost of the issuance as well as the potential cost of building the necessary infrastructure may mean that the cost is greater than other potential solutions, such as the taking of deposits or increasing reserve requirements that will likely need far less infrastructure to support. This greater cost could even lead to central bank losses. Such losses will erode the central bank's capital level and eventually could lead to the central bank being forced to seek recapitalisation from its government. The need for recapitalisation could compromise the central bank's ability to operate in an independent manner. Milton and Sinclair (2010) discuss the level of capital that a central bank requires to bear sustained losses and continue to operate in an independent manner and conclude that such a level varies from country to country and depends on local idiosyncrasies including the central bank's relationship with the ministry of finance.

A further potential downside of central bank securities is that their desirable properties may exacerbate the issue they were designed to address. Some central banks that have sold central bank securities as a means of sterilising the impact of inward capital flows have found such flows have increased. By creating a liquid asset in their domestic currency, capital inflows have increased further as foreign investors seek to purchase the newly created securities.

(1) For a more in depth discussion relating to market development see Gray and Talbot (2006a).

(2) This may be the case in countries where the government has benefited from commodity exports and runs a balanced budget and has no or limited amounts of existing debt in issuance.



## 6 Differentiating central bank securities from government securities

As discussed above, one drawback with the issuance of central bank securities is that such actions may have a negative impact on the central government's ability to issue its own securities. There could be difficulty differentiating between the products and could lead to limited liquidity in the market for both issues. Such issues are not insurmountable but are likely to require close co-ordination between government and the central bank and clear communication with the purchasers of such securities.

If a central bank is issuing its own securities for monetary policy and/or liquidity management purposes then its aims are likely to be very different to those of a government issuing its own securities for revenue generation purposes. Fundamentally, the purpose of issuing central bank securities is to transform the liabilities side of its balance sheet, unless the central bank is significantly overissuing to create a shortage of liquidity then the amount of securities it is issuing should not impact on the funds available for the purchase of government securities. In addition, unlike the government, the central bank is not aiming to maximise its revenue through the sale of its securities. The price at which the central bank sells its securities will be determined by its policy goals; in contrast the goals of a government when issuing securities are likely to be purely related to maximising revenue.

Despite these major differences, it is still possible that there may be some difficulty in market participants distinguishing between the products, especially if the central bank also acts as issuer for the government and there is significant harmonisation in the features of both types of securities.<sup>(1)</sup> In such a situation a high degree of co-ordination would be beneficial to all parties involved. The most fundamental element to any co-ordination is communication so that the central bank, government and market are all clear as to which securities are being issued and for what purposes.

If a central bank is issuing short-term securities to absorb the surplus on an ongoing basis then it will need to adjust the quantity of securities in issue on a regular basis so as to account for changes in the overall liquidity position. Therefore the central bank may benefit from limiting the maturity of its securities in issue to the very shortest maturities, giving it greater scope to adjust the quantity in issue. On the other hand, a government, issuing securities to fund expenditure, would be less likely to need to adjust the quantity of securities in issuance on such a regular basis. Therefore given the potential costs of having to regularly roll over its issuance the government would benefit from issuing at longer maturities. Therefore, one potential solution could be for the central bank to commit to only issue its securities with short maturities

while the government would commit to only issuing longer-maturity securities, hence market participants would be able to distinguish between the products on the basis of maturity. As noted in Box 1, in Korea, the Bank of Korea issues its central bank securities with a maximum maturity of two years, while Korean government bonds are issued with a maturity of over three years.

If a central bank is issuing longer-term securities either to create a shortage of liquidity or to moderate the amount of liquidity required to be absorbed in short-term operations, then it is unlikely that market participants will be able to distinguish purely on the basis of maturity. It is quite feasible that the central bank could commit to a specific maturity bucket and thus reduce some of the uncertainty. However, in these situations as other short-term operations exist (either supplying or absorbing liquidity) there is less need for the central bank to adjust regularly the amount of these securities in issue and it therefore can potentially pre-commit to the timing and the size of its auctions. Such clear and precise announcements mean that market participants have a clear knowledge as to the size and regularity of central bank operations which they can separate from the government's issuance.

No matter the type of the issuance, short term or long term, having regular timings for auctions can reduce some of the market participants' uncertainty, ie if both the central bank and government are issuing once each week, the central bank could commit to holding its auctions on the same day each week while the government could stick to a different day.

Even if communication is effective in distinguishing between the products, there is the possibility that having two public sector bodies issuing securities leads to reduced liquidity in the markets for both issues. McCauley (2003) proposed a solution where the government would be the sole issuer of securities and it would issue a quantity equal to its own financing needs plus the size of the planned central bank issuance. The government would then deposit the proceeds of the sale of extra securities at the central bank, with the central bank paying an interest rate aligned with the issuance yield.<sup>(2)</sup>

In terms of the central bank balance sheet such an operation could be effective in reducing or eliminating the surplus of liquidity as long as commercial banks are willing to purchase the government securities. To fund their purchase of government securities the commercial banks would reduce their holding of free reserves, such funds would then reappear among the central bank's liabilities as a deposit by government.

(1) A high degree of harmonisation in features could be being held in the same registry, using the same yield calculation and share eligibility for central bank operations and regulatory treatment.  
 (2) Such a yield would avoid any issues of the central bank or government profiting at the expense of the other.

As long as the government is committed to leaving such funds on deposit at the central bank — removing them from the definition of the monetary base — then both the surplus of liquidity and the total size of the monetary base are reduced.

The most significant drawback to such a scheme is the political implications of both the increase in government debt issuance — ie potentially negative signals regarding fiscal competence — and the possibility that governments could increase spending by reducing the deposit at the central bank without seeking the agreement of the legislature to authorise such an increase.

## 7 Methods of auction

Whatever form the central bank settles on for its securities it needs a mechanism for disseminating such securities to its counterparties. Central banks face a choice between absorbing funds through standing facilities — operations conducted at the behest of the counterparty — or through open market operations — operations conducted at the behest of the central bank. A number of arguments can be made in favour of heavily weighting issuance towards open market operations. Issuing securities through standing facilities is a more opaque method and leaves the central bank less in control of the timing of issuance, and thus the size of the surplus. When issuing securities through open market operations the central bank will initiate the process by announcing the size and timing of the operations, when issuing through standing facilities the timing and size of the operations are decided by individual counterparties. In addition, the bilateral nature of standing facility transactions leads to the possibility that market participants may perceive that other participants may be able to receive preferential treatment and hence become less willing to hold or trade such securities. Instead if the central bank issues its securities through a fair and open tender process, such as an open market operation, then counterparties will have more confidence in the process; as a result, they may be more willing to participate in the auctions. Greater counterparty trust in the securities should benefit secondary market trading, which as discussed previously should have positive benefits for wider market development. In addition, as discussed above, clear communication about the timing and size of central bank issuance can reduce some of the problems related to co-ordinating it with central government issuance.

If the central bank chooses to issue its securities in open market operations through competitive auctions then the next choice that it faces is how to conduct such auctions. The literature on auction design is a vast one, the discussion below attempts only to highlight the main elements the central bank needs to consider.<sup>(1)</sup>

### Fixed or variable price tenders

One of the fundamental options facing a central bank when considering auctioning its own securities is whether to conduct auctions where all participants bid the same price for the securities (or in this case the same rate of interest) or whether to permit different priced bids. In the case of a variable-price auction, where the auction is oversubscribed the central bank is able to discriminate between bidders based purely on price — usually for central bank revenue purposes preferring the lowest rate up to the point where the allocation is filled at the 'stop-out' rate. In the case of a fixed-price auction, to ensure transparency and fairness, the central bank may not want to be seen to discriminate between bidders and thus must allot securities on a pro-rata basis. A significant drawback of fixed-price auctions is that they can be prone to overbidding if counterparties fear that the auction may be oversubscribed. In such a situation the counterparty will bid for a greater quantity than it actually wants expecting to receive the amount it wishes once allocations are reduced by the pro-rata process. Both methods of auction are consistent for issuing securities that pay both a fixed or floating rate of interest.

Bindseil (2004) listed two main advantages of variable-price tenders: (i) they are a more efficient method for the central bank to obtain market information as bidders should reveal their true expectations of market conditions; and (ii) they reduce the possible efficiency impairment from auctions being overbid or underbid. He also noted four advantages of fixed-price tenders: (i) they send a strong signal on the central bank's policy stance; (ii) the chance that under variable rate tenders the variation in the gap between policy rate and the stop-out rate could be misunderstood by market participants is removed; (iii) more consistent when acting as price-setter; and (iv) do not disadvantage less sophisticated bidders.

However, a further choice for central banks that conduct variable-rate auctions is whether to conduct auctions as either a 'pay-your-bid' auction, where all successful bidders receive the rate they bid or as a uniform-price auction, where all successful bidders receive the 'stop-out' rate in the auction. One reason why an auctioneer may choose to use a uniform-price auction is that it removes the potential for the winner's curse, where a bidder in an auction later finds they have overpaid. This removes one of the main drawbacks highlighted by Bindseil, that variable-rate auctions disadvantage less sophisticated bidders as in the end all successful bidders end up receiving the same rate. A simple example of these various auction methods is shown in Box 2.

### Open auction or with counterparties

A further choice facing the central bank is how widely it should permit access to its auctions. Once again the decision will likely be influenced by the maturity of the securities issued.

(1) See Klemperer (2002) for an overview of auction design literature.

## Box 2

### Auction methods

To understand how the different auction methods work, consider the following case in which the central bank wants to issue \$10 billion worth of its own securities and it has a policy rate of 4.5%.

Example 1 — Central bank conducting a fixed-rate auction at its policy rate for one-week bills towards the start of its reserve maintenance period, receives the following bids:

Counterparty	Amount (\$ billions)	Rate (per cent)
A	5.0	4.50
B	2.0	4.50
C	2.0	4.50
D	1.0	4.50
E	0	–
F	0	–

In this auction the rate at which counterparties bid is set at the policy rate and the only choice facing potential participants is whether to bid or not and if so for how much. In this example the central bank has received bids totalling the same amount as the amount on offer and the central bank has no need to discriminate between bidders and therefore can allocate as follows:

Counterparty	Amount (\$ billions)	Rate (per cent)
A	5.0	4.50
B	2.0	4.50
C	2.0	4.50
D	1.0	4.50
E	\$0	–
F	\$0	–

Example 2 — Central bank conducting a fixed-rate auction at its policy rate for one-week bills towards the start of its reserve maintenance period, receives the following bids:

Counterparty	Amount (\$ billions)	Rate (per cent)
A	6.0	4.50
B	4.0	4.50
C	4.0	4.50
D	3.0	4.50
E	2.0	4.50
F	1.0	4.50

The central bank has now received total bids in excess of its policy, in this example bids total \$20 billion. The central bank does not wish to discriminate in its allocation, as it is an open market operation with fair and transparent access for all counterparties, therefore the central bank needs to allocate funds in a consistent manner. In this case the easiest way is to pro-rata the bids based on the amount they initially bid for. The easiest way to calculate allocations is to merely divide the

quantity bid for by the cover ratio (the ratio of total bids to the amount available), in this case 2.0. Such a calculation leads to the following allocations:

Counterparty	Amount (\$ billions)	Rate (per cent)
A	3.0	4.50
B	2.0	4.50
C	2.0	4.50
D	1.5	4.50
E	1.0	4.50
F	0.5	4.50

Example 3 — Central bank conducting a 'pay-your-bid' variable-rate auction at its policy rate for three-month bills in the middle of its reserve maintenance period, receives the following bids:

Counterparty	Amount (\$ billions)	Rate (per cent)
A	2.0	4.25
B	2.0	4.33
C	6.0	4.42
D	4.0	4.42
E	2.0	4.42
F	3.0	4.50

In this situation counterparties are permitted to choose both the amount they wish to bid for and the rate that they wish to bid at. In such a scenario a counterparty's choice of which rate to bid at will be determined by their expectations of rates over the period and in the above example there is a range of expectations among the counterparties. When the central bank comes to allocate funds in this instance it will look to fill the bids from the lowest bid rate upwards (in this case the central bank is profit maximising and discouraging speculative bidding). It will fully allocate each bid up to the point at which it reaches the total amount it wishes to allocate. If there are, as in this situation, multiple bids at the same rate, when the allocation is filled then the central bank, using the same principles as in example 2, will pro-rata the allocation. Such a process would lead to the following allocation of funds:

Counterparty	Amount (\$ billions)	Rate (per cent)
A	2.0	4.25
B	2.0	4.33
C	3.0	4.42
D	2.0	4.42
E	1.0	4.42
F	0	–

If the central bank was conducting a uniform-price variable-rate auction then the allocation amounts would remain the same, however, all accepted bids would receive an interest rate of 4.42%, the marginal or 'stop-out' rate.

Fundamentally, the aim of issuing central bank securities as part of monetary policy operations is to reduce the quantity of free reserves held by counterparties, usually commercial banks, at the central bank. The shorter the maturity of securities, the less time for the securities to be traded by participants, then it may be sensible to concentrate access to the securities to reserve account holding counterparties. If the central bank is issuing longer-term securities, a significantly large quantity of securities or securities not for monetary policy it may consider issuing securities that non-counterparties are able to purchase, potentially listing such securities on local exchanges.

A further argument for the central bank to consider is whether or not to limit primary issuance of securities to a limited number of 'primary dealers'. The use of primary dealers is common in the auction of various types of securities around the world. A 'primary dealer' is expected to be responsible for ensuring a whole issuance of securities is fully sold and will often play a role acting as market maker to ensure that secondary market trading remains liquid by continually quoting both bid and offer prices for such securities. In return for fulfilling these roles the 'primary dealer' will often receive a set of privileges in the market.<sup>(1)</sup>

The advantages of primary dealers are that they ensure that auctions are fulfilled and play a crucial role in maintaining market discipline, however, a central bank should continue to monitor the use of primary dealers as they may through potential collusion achieve the opposite effect and make markets less competitive.

## Conclusions

Although in recent years central bank balance sheet quantities, such as the monetary base, have been replaced by market prices, such as short-term interbank rates or exchange rates, as the chosen operational target of many central banks around the world, the central bank's balance sheet is still an important starting point to understand the liquidity position of the banking system and hence the choice of instruments available to the central bank. When the expansion of a central bank's

balance sheet is driven by growth in its assets, commercial banks will be left holding involuntary excess reserves without central bank intervention. The presence of these can severely impact on the central bank's ability to implement its policy goals.

Central bank securities are an important instrument available to central banks responding to an excess of commercial bank reserves. Their advantage over other policy options stems from the fact that they permit an equitable distribution of reserves across the system that can be adjusted through commercial bank trading and they are not constricted in the potential size of their usage. In addition, central bank securities can have a positive impact on broader market development, particularly in economies where there are limited government securities in issue. The main drawback is the potential negative impact on the liquidity in the markets for other public sector issued securities. Such problems are not insurmountable as ultimately the securities have different purposes: central bank securities are issued for monetary purposes and for the most part are merely converting one form of central bank liability for another, but resolving potential problems relies on close co-ordination between issuers and clear communication to market participants.

Central banks that issue central bank securities tend to do so at regular frequencies at a range of maturities. The advantages of such a policy include better liquidity management and market development purposes. Many central banks mix central bank securities with other market instruments such as either short-term deposits or required reserves with averaging to maximise the benefits from central bank securities and to minimise the operational burden of issuance.

Central banks should aim to issue such securities through a fair and transparent auction process. The choice between fixed or variable-price auctions will often be situation specific. Uniform price variable-rate auctions, where all successful bidders pay the same price no matter what their individual bid, however, do reduce overbidding, remove the potential winner's curse and still provide the auctioneer with information on participants' true preferences.

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(1) For an in depth discussion of the role of primary dealers see McConnachie (1996).

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