

Szilárd Erhart, Gergely Kicsák, Zsolt Kuti, Zoltán Molnár and Zoltán Monostori: Doing it differently or The impact of the financial crisis on central bank balance sheets in emerging economies*

This study investigates changes in central bank balance sheets and the non-conventional central bank measures triggered by the crisis. The trend of rapid expansion in central bank balance sheets and the resulting higher need for sterilisation is not solely a Hungarian phenomenon, it represents a challenge for many central banks around the world. Responding to a variety of exchange rate and financial crises since the end of the 1990s, the central banks of emerging economies have gradually increased their foreign exchange reserves. Due to the large weight of foreign exchange reserves in the balance sheets, total assets of the central banks in emerging countries also increased considerably. Later, after the 2008 financial crisis, advanced economies saw sudden increases in their central banks' balance sheet totals following non-conventional operations and asset purchase programmes. The expansion of central bank balance sheets and the increase in the surplus liquidity of the financial intermediary system has caused changes to central bank liabilities and their structures. Following an assessment of the global situation, we present eight case studies analyzing, central bank balance sheets of emerging economies.

INTRODUCTION

The reasons for the expansion in central bank balance sheets differ widely. In emerging economies, balance sheet totals have been increasing since as early as the late 1990s, due to the rise in their assets and, within this, their foreign exchange reserves. This made it necessary to reconsider the liability side of central bank balance sheets and sterilisation. The financial crisis of 2008 and the ensuing non-conventional measures, asset purchase programmes and central bank loans have led to a similar situation in the advanced economies.

Sterilisation, in other words the absorption of the increased liquidity from the financial intermediary system due to asset-side trends, became a more important task than before. Central bank securities and deposit operations played a key role in sterilisation. In emerging economies, the increase in currency holdings contributed significantly to offsetting the liquidity surplus.

In this Bulletin article, following the introduction, we present the overall structure of central bank balance sheets

and summarise the key findings concerning the expansion of central bank balance sheets in the economic literature. We then discuss the transformation of central bank assets and the related actions to adjust liabilities, with special focus on the sterilisation instruments. Finally, we outline brief case studies of eight emerging economies.

THE STRUCTURE OF CENTRAL BANK BALANCE SHEETS

The responsibilities of a central bank stipulated by law (currency issuance, monetary policy operations, account management and payments, foreign exchange reserve management, etc.) all impact the central bank's balance sheet (Table 1). Central banks have no direct influence over several of these factors, which are therefore called *autonomous factors* in the literature on central bank balance sheet and liquidity management.

The most important autonomous factors are net receivables vis-à-vis the rest of the world (E2), which – in small, open economies – are influenced primarily by the amount of foreign exchange reserves,¹ the receivables from the

* The views expressed in this article are those of the author(s) and do not necessarily reflect the official view of the Magyar Nemzeti Bank.

Table 1
Simplified central bank balance sheet structure

Assets	Liabilities	
E1. Receivables from banks	F1. Liabilities to banks a. deposits b. securities	} Autonomous factors
E2. Net receivables vis-à-vis the rest of the world	F2. Settlement accounts of banks	
E3. Receivables from the government	F3. Currency in circulation	
E4. Other domestic receivables	F4. Deposits by the government	
	F5. Net other items	

government (E3), and the liabilities to the government (F4) and, finally, the currency in circulation (F3) and other items (E4 and F5) in the central bank balance sheet.

The growth of central bank balance sheet totals in recent years is attributable largely to the measures by central banks on the asset side (items E2, E3 and E4) (cf. below for details).

LITERATURE REVIEW

Starting from the 1990s, economic research began to focus on the independence of central banks, including operational independence, and on the impacts of fiscal policy measures on the central bank (management of government debt, foreign exchange reserves, etc.) (Hawkins, 2003). Furthermore, the experience from different exchange rate and financial crises in the late 1990s (Asian crisis, Russian crisis, Argentine crisis) motivated many central banks to boost their foreign exchange reserves, which resulted in significant changes to their balance sheets (Antal and Gereben, 2011). Aizenman and Glick (2008) analysed the efficiency of sterilisation in Asian and South American countries.

Following the 2008 financial crisis, the subject has come to the fore due to the changes in the balance sheets of central banks and financial enterprises. Filardo and Yetman (2011) undertook a detailed analysis of the balance sheets of Asian central banks, discussing the reasons and consequences of the expansion of their balance sheets. Mehrotra (2012) also chose Asian central banks to analyse the monetary policy impacts of using central bank bonds.

Krekó et al. (2012) published a comprehensive study of non-conventional operations, another new branch in the

literature, which is related to our analysis. Non-conventional operations are primarily impacting the balance sheets of central banks in advanced economies.

Our study adds a number of observations to what is already available in the literature. We provide a detailed overview of the global reasons for the changes in central bank balance sheets. In addition, we focus our analysis on the sterilisation practices of certain countries in the Central and Eastern European region, which have received less attention in earlier analyses. Our case studies provide up-to-date information on the practices in countries already discussed in the literature.

CENTRAL BANK ASSETS

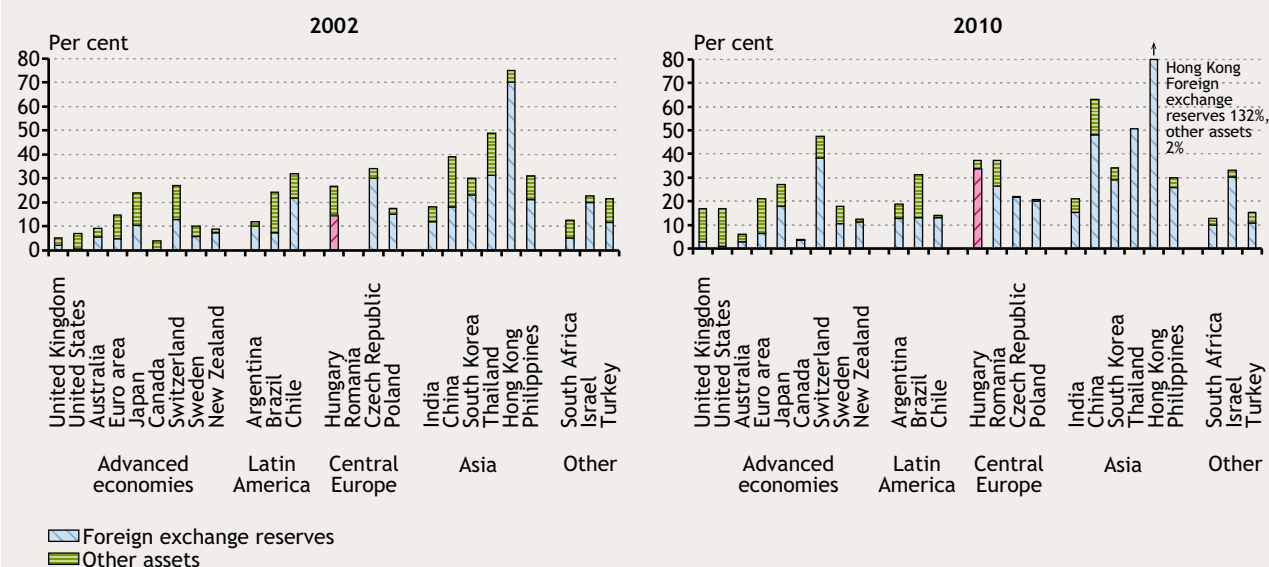
Central bank balance sheets expanded considerably in both emerging economies and (for somewhat different reasons) advanced economies. Foreign exchange reserves continue to be the key, dominant item on the asset side of central bank balance sheets; however, the actions taken by central banks in response to the crisis have triggered an increase in receivables from domestic sectors, especially in the advanced economies.

In 2002, the average ratio of central bank assets to GDP was 12 per cent (disregarding Switzerland and Japan),² with this ratio rising to 19 per cent after the 2008 financial crisis. In certain countries (United States, euro area, United Kingdom), the proportion of other assets (e.g. government securities) increased spectacularly, primarily as a result of non-conventional central bank operations, while the increase in foreign exchange reserves played a role in only a few of the advanced economies.

¹ A central bank is able to influence the amount of foreign exchange reserves, but does not have full control over changes in foreign exchange reserves in the event of an intervention. As a result, net receivables vis-à-vis the rest of the world are typically reported as autonomous items.

² Intervention in Switzerland and quantitative easing in Japan throughout the 2000s has bloated their balance sheets; their special situations and the extreme shifts in their figures would have had an above-average impact in shifting the sample (*outlier effect*).

Chart 1
Foreign exchange reserves and other assets as a percentage of the GDP



Note: The figures for balance sheet totals for the United Kingdom, United States and China in the chart on the left are from 2001. The figures for the United Kingdom, United States, Australia, the euro area, Japan, Canada, India, Korea, Thailand, Hong Kong and the Philippines in the chart on the right are from 2011.

Source: IMF-IFS, OECD MEI, Hawkins (2003), Filardo and Yetman (2011), central banks.

Emerging economies responded to the challenges of the financial crisis primarily by increasing their foreign exchange reserves, which rose to 86 per cent of their central bank balance sheet total. The process of boosting reserves had started earlier. Several countries started to increase foreign exchange reserves significantly in the wake of the exchange rate crises of the late 1990s resulting in serious real economy costs. The trend of reserve accumulation was further reinforced by increased economic openness. As a result, the ratio of central bank assets to GDP in emerging economies was already much higher (29 per cent) in 2002 than in advanced economies. Although many central banks have made their exchange rate arrangements more flexible over the past decade by switching from a fixed or quasi-fixed system to a wider currency band or a floating exchange rate, many countries still continued to buy foreign currency to retain competitiveness and prevent appreciation of the domestic currency, which also resulted in higher foreign exchange reserves. Hence, the emerging economies held, on average, central bank assets worth 34 per cent of GDP in 2010, 5 percentage points more than in 2002. Of all the emerging economies, it was the Asian central banks

that boosted their balance sheets to the greatest extent. In raw material exporter countries, a trade surplus also contributed to an increase in reserves.

CENTRAL BANK LIABILITIES

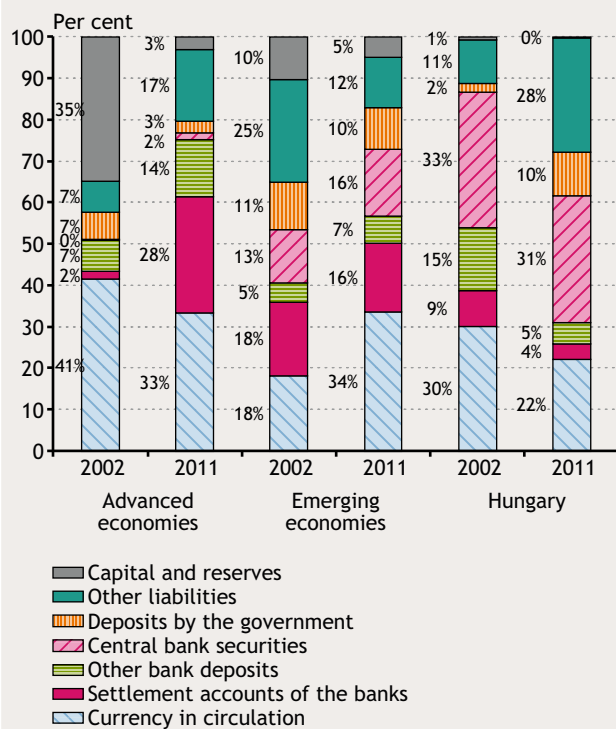
Transformation of assets triggered changes of liabilities as well. In respect of liabilities, we see substantial differences between the trends observed in different groups of countries,³ which can be attributed mostly to the differences in the objectives of the central banks and to the development of their financial intermediary systems.

In 2002, central bank liabilities were dominated by currency (41 per cent) and capital and capital reserves (35 per cent). The weight of capital items within the central bank balance sheet had fallen considerably by the early 2010s, presumably due to central bank losses and the constrained fiscal room for manoeuvre and also to the expansion of the central bank balance sheets. The increasing popularity of cashless payment instruments also caused a decrease in the currency ratio. At the same time, the importance of

³ There is a lack of comprehensive time series and cross-section figures relating to central bank liabilities; therefore, we used the following four sources of data to investigate the subject:

- BIS figures - (2002, sample per continent and country; Hawkins, 2003);
- IMF IFS Central Bank Survey and Non standardised survey (2002-, 2011);
- Filardo and Yetman (2011) (2001 and 2010 figures);
- Data collected by the authors (for 2011).

Chart 2
Weights of individual liability items within central bank balance sheets



Note: We used 2010 figures for Asian central banks and Switzerland; otherwise 2011 figures. Brazil, Mexico and Peru are missing from the 2011 sample of emerging economies, which may distort slightly upward the ratio of central bank securities within the group of emerging economies.

Source: IMF-IFS, Hawkins (2003), Filardo and Yetman (2011), central banks (2011).

settlement accounts increased significantly throughout the advanced economies, from 2 to 28 per cent. This may be due to underlying changes in the terms of central bank settlement accounts,⁴ which commercial banks, responding to the contraction in interbank market liquidity, exploited and increased their own liquidity reserves. In addition, the weight of other bank deposits and other liabilities increased considerably in the euro area, which caused the structural change observed in the advanced economies (Chart 2).

On the liability side of emerging countries' central bank balance sheets, currency and settlement account balances, which incorporated the mandatory reserves, represented near equal weights in the early 2000s; capital and reserves were somewhat lower, as were central bank securities and government deposits. From that position, it was the ratio of currency that increased the fastest until the early 2010s (from 18 to 34 per cent) for numerous reasons (rapid

economic growth, a cash-intensive period of financial development, black-market economy). The weight of central bank securities also increased, albeit to a smaller degree. The ratio of government deposits and settlement account deposits did not change substantially, while the weight of capital items fell, due to reasons similar to those in the advanced economies (central bank losses and limited fiscal room for manoeuvre, also, in part, the expansion of central bank balance sheets).

KEY ISSUES RELATED TO STERILISATION VIA CENTRAL BANK SECURITIES

The changes to the liability structure outlined above were mainly attributable to the fact that sterilisation, the absorption of increased liquidity from the financial intermediary system, became a more important task than before. Central banks sought to transform the set of instruments available to them in such a manner as to ensure that they could respond to the greater need for sterilisation in increasingly sophisticated ways, increasing the ratio of market-conform solutions. As a result, central bank securities played a key role in sterilisation in the emerging economies; we have therefore taken a separate look at these securities.

The maturity of central bank securities was typically around 0.5 years in the emerging economies. For sterilisation purposes, the Czech, South African, Polish and Hungarian central banks used securities with maturities of 1 or 2 weeks, well below the average. The central banks of Chile, Mexico, Thailand and Korea were able to issue securities with the longest maturities.

The value of central bank securities as a percentage of GDP was the highest in Hong Kong, which held the highest foreign exchange reserves. But growth was the most dynamic in Thailand, Israel and Hungary, as the value of securities as a percentage of GDP grew by more than threefold in the period 2000-2010.

Mehrotra (2012) indicates that the Asian central banks primarily used central bank securities to sterilise the surplus liquidity generated by the rise in foreign exchange reserves. This study ran empirical analyses and revealed that central banks faced with higher inflation and stronger capital inflows tended to choose longer maturities for their sterilisation instruments. A further disadvantage of

⁴ Several countries introduced interest rates tied to central bank interest rates and limits on account balances were removed.

Table 2
Value of central bank securities as a percentage of GDP and their average maturity

	Total outstanding (as a percentage of GDP)			Maturity distribution (at the end of 2010)			
	2000	2005	2010	Below 1 year	Between 1 to 3 years	Above 3 years	Average remaining maturity (years)
Asia							
China	0	12.2	10.3	70.3	29.7	0	
Hong Kong SAR	8.2	9.2	37.5	91.9	4.5	3.6	0.5
South Korea	11	17.9	13.9	63.5	36.5	0	0.8
Thailand		8.4	23.6	68	26	6	1
Latin America							
Argentina	0	4.6	4.7	88.1	11.9	0	0.5
Brazil	7.3	0.3					
Chile	29.9	15	8.6	25.9	36.6	37.6	3.4
Mexico	0	2.7	2.7	61	36	3	1.1
Peru	0.7	3.4	0.8	100	0	0	0.3
Other							
Czech Republic	18.3	23.5	19.1	100	0	0	0.01
Hungary	3.5	0.2	11.3	100	0	0	0.02
Israel	5.7	14.5	18.4	100	0	0	0.5
Republic of South Africa		0.3	1	100	0	0	0.5
Poland			4.4				0.01

Source: Filardo et al. (2012), the central bank of Poland.

sterilisation instruments with shorter maturities is that they may contribute to taking short-term positions. The study finds that, given the increase in inflation risks in Hungary, the central bank should consider extending the sterilisation maturities. In response to the 2008 crisis, several central banks cut the average maturities of their securities, although they began to lengthen maturities again as the consolidation process started. The case study of the central bank of Chile in this paper reveals that the maturities of central bank securities became shorter only temporarily during the crisis.

Overall, the need for sterilisation increased as a result of the rise in foreign exchange reserves and was managed by many central banks by the intensified issuance of securities. Sterilisation by issuing central bank securities is easier if the budget deficit and government debt is low, because that allows a central bank to act practically as the sole sovereign issuer on the market and enjoy greater room for manoeuvre (Korea, Chile). Higher domestic savings and demand for securities can make the process even easier, so that the market may even have two issuers appearing, and in this way, it should not be a problem to manage higher government debt and sterilisation (Israel).

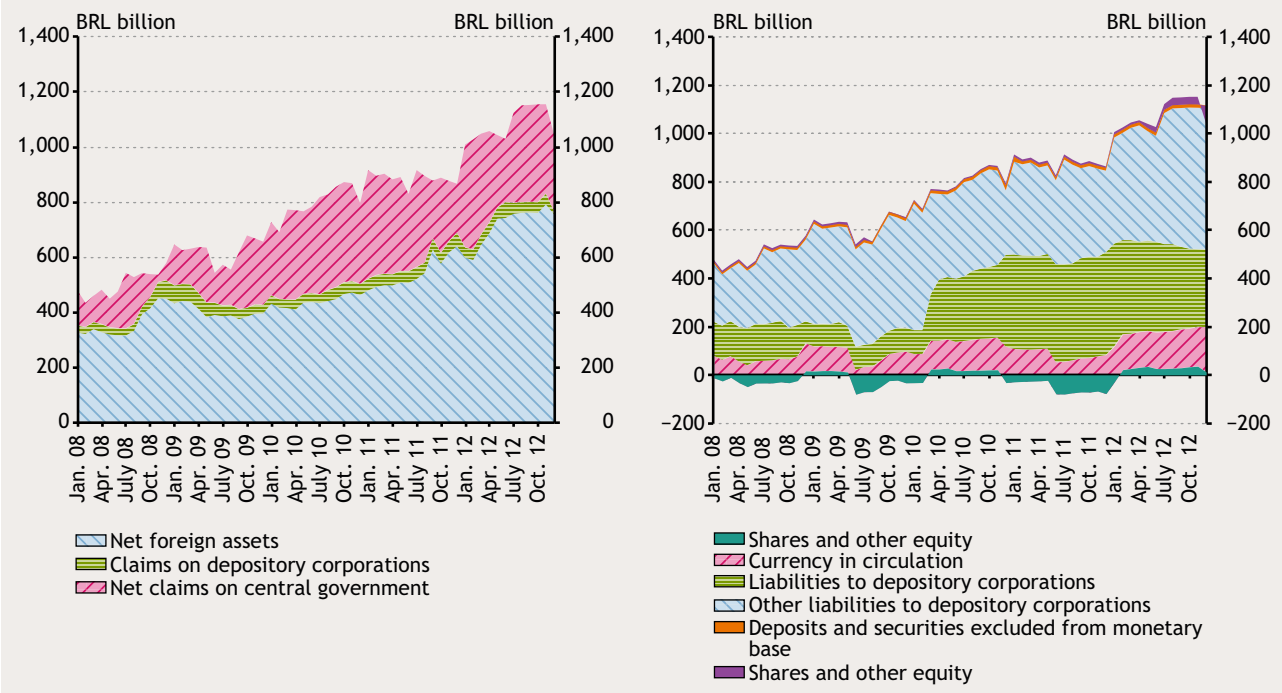
CASE STUDIES

In addition to briefly outlining the general trends, we have prepared case studies of emerging economies to present the trends in the individual countries and the resulting changes to the sterilisation instruments of central banks. We selected countries for our analysis with the aim of compiling a sample of countries similar to Hungary in terms of macroeconomic and other relevant criteria (vulnerability, central bank operations, exchange rate system, etc.). Looking at macroeconomic criteria, we find that Hungary is a vulnerable country primarily because of the high government debt, the limited growth outlook, the high proportion of short-term funds and the ratio of foreign exchange reserves to short-term funds, i.e. the low value of the so-called Guidotti indicator.

Brazil

The balance sheet of the central bank of Brazil (Banco Central do Brasil, BCB) grew from 19.1 to 23.4 per cent of GDP from 2008 to the end of 2012, which represents nominal growth of two and a half times. Most of this growth was attributable to foreign exchange reserves; consequently, the

Chart 3
Assets and the liabilities of the Brazilian central bank



central bank's reserves cover short-term external debt by a factor of 4.5, which is a reserve indicator that investors focus on. The Guidotti indicator is at 450 per cent. The changes in foreign exchange reserves are dependent on the open market operations of the Brazilian central bank, in relation to its floating exchange rate policy. Growth in the period was attributable primarily to purchases of foreign currency through interventions in the domestic foreign exchange market, and secondly to returns on reserve investments and also to other factors such as the increase in the price of securities in which the reserves were invested.

Over the short term, the BCB uses six-month repo transactions to absorb the liquidity of the banking system, but the main role in the sterilisation process is played by the system of mandatory reserves. The BCB stipulates different reserve rules for different types of deposits. The reserve requirements became more loose when the crisis broke out, but have been slowly but gradually increased since 2009. In making these small incremental raises, the BCB is balancing between the need to achieve the inflation target and stimulating growth.

Immediately after the onset of the crisis, the BCB set up a credit line to boost growth and lending, with the aim of ensuring the foreign exchange liquidity of domestic

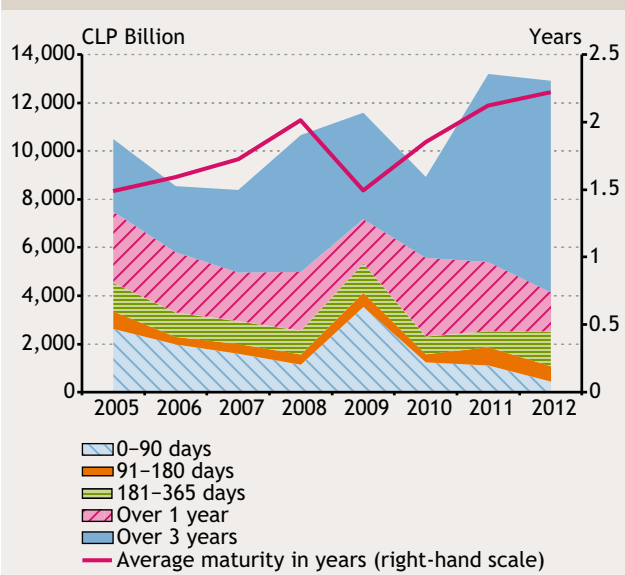
companies and primarily the export sector. These tools are no longer among the monetary policy instruments applied by the Brazilian central bank.

Chile

The balance sheet of the central bank of Chile (Banco Central de Chile, BCC) has been growing considerably for a long time now. The period of growth before the crisis can be divided into three sections: first, the financing for rescuing the banking system in the first half of the 1980s; second, the increase in foreign exchange reserves first in the 1990s;⁵ and third, the intensive interventions between April and September 2008, immediately before the crisis. The latter was a response by the central bank to the extreme growth in short-term external debt. The country's international reserves resumed their strong growth in 2011, rising by 42 per cent nominally (to 14 per cent of GDP). The increase of reserves in 2011 also improved the Guidotti ratio considerably. This is in part due to the fact that 90 per cent of the main source of the reserves, namely sterilisation bonds, are held by domestic agents, and in part due to the fact that while the country's external debt also increased, this mostly took the form of long-term debt, as a result of which Chile's overall vulnerability decreased. Another major item on the asset side of the central bank balance

⁵ In the narrow-band exchange rate system maintained until 1999, the central bank used interventions to constrain appreciation, but the foreign exchange revenues of the government (the copper exports of a state-owned company) also contributed to the increase in surplus liquidity.

Chart 4
Maturities of the securities issued by the Chilean central bank



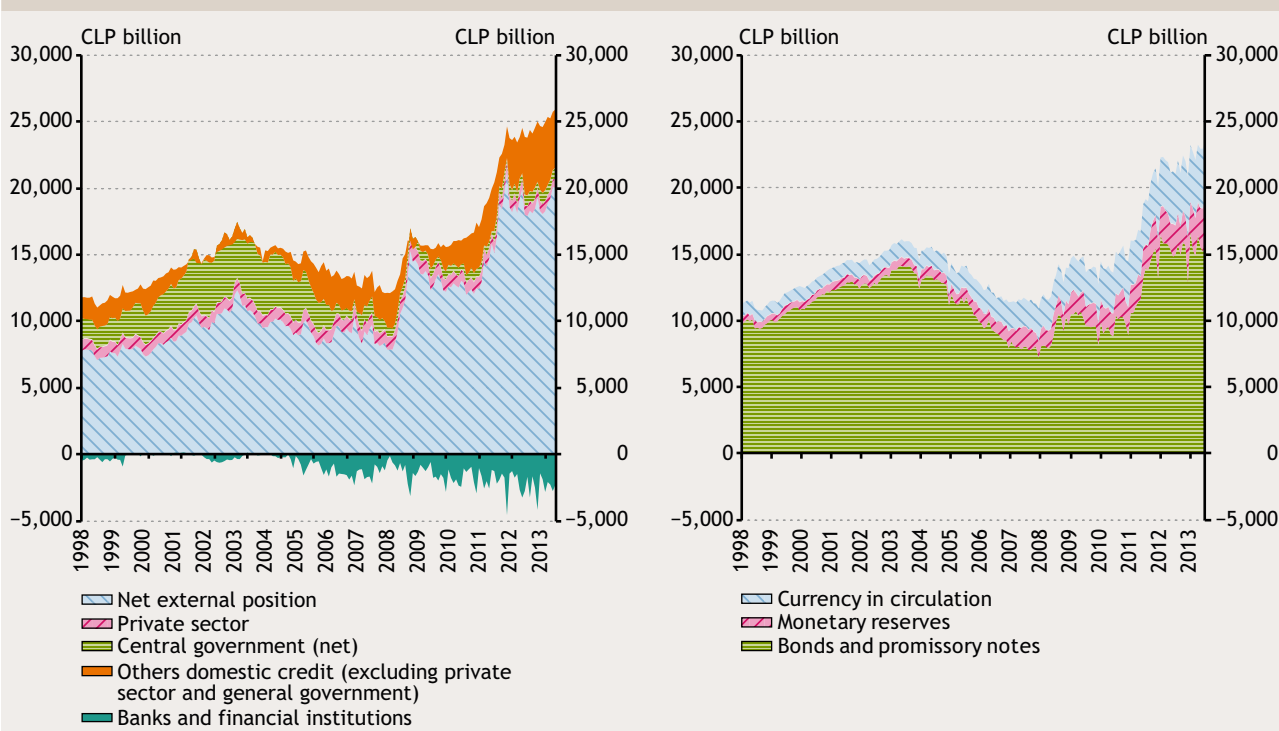
sheet is a loan portfolio approximating 15 per cent of the balance sheet.

Growth on the asset side was predominantly financed by the increase in sterilisation instruments (to 11 per cent of GDP), a result of repeated interventions. Also on the

liability side, currency continued to grow, as did equity, which turned sharply negative in 2009 and 2010. This was mostly due to the appreciation of the peso by 20 per cent, which caused a considerable revaluation in the central bank's liabilities denominated in USD. Later, in 2011, the central bank's equity started to increase (although it was still negative). All of this demonstrates that financing the foreign exchange reserves from pesos is causing considerable losses to the Chilean central bank.

The Chilean central bank has one of the most diverse offerings of bonds. The most important reason for issuing the bonds is the fact that the government does not issue peso securities, as its budget achieved a surplus of 1 or 2 per cent of GDP on average in every year throughout the 1990s (as a result, total government debt is still only 11 per cent of GDP). In the absence of government securities, the central bank was left with the task of developing the market of sovereign peso bonds and building the yield curve. Central bank bonds also stand at 11 per cent of GDP, their maturities are up to 20 years, and, along with fixed-interest papers, inflation-indexed bonds also play a rather important role. The ratio of papers with shorter maturities increased temporarily during the financial crisis, and then in 2010 the ratio of securities of over three years increased considerably, and the average maturity of the central bank's securities became longer once again. Another

Chart 5
Assets and the liabilities of the Chilean central bank



characteristic of these securities is that there used to be many, fragmented series, and moreover, their payment terms also deviated from international standards (they were annuity-type papers). Recently, however, the central bank has issued longer series of conventional bonds. Besides banks, other investors can also make purchases on the primary market and the issues also serve short-term liquidity management purposes. The central bank also has yield-curve building objectives, in which it takes into account monetary policy considerations as well.

In order to implement monetary policy, the central bank uses open-market operations to approximate interbank interest rates to the base rate. As another monetary policy instrument, the BCC introduced an instrument called FLAP (Facilidad de Liquidez a Plazo, term liquidity facility) in July 2009, when the base rate was 0.5 per cent; it used FLAP to provide liquidity to the banks for 90-180 days at the prevailing base rate, underpinning its communications in which it declared its intention to keep the base rate low over the long term.

The BCC did not use any lending stimulus, because credit activities were uninterrupted and growing at an appropriate rate.

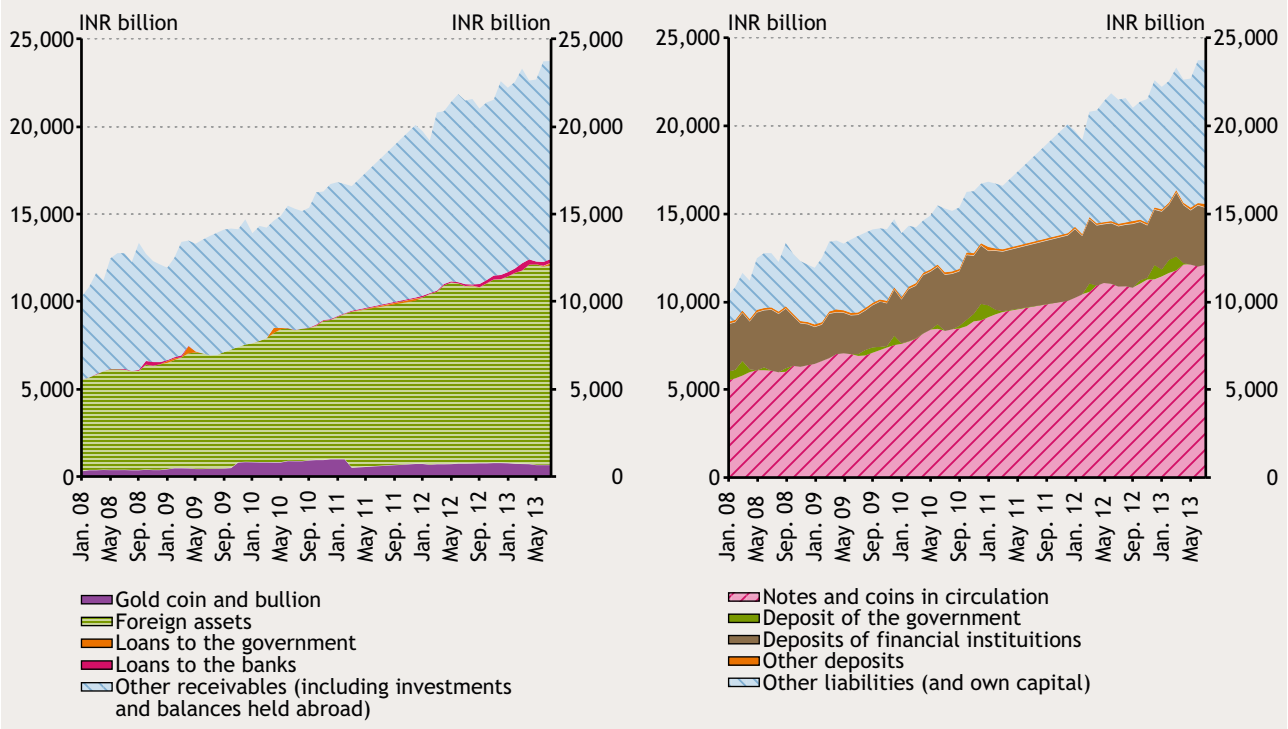
India

The total assets of the Indian central bank (Reserve Bank of India, RBI) have doubled since early 2008, although this growth is relatively small when expressed as a percentage of GDP, at nearly 1.5 percentage points (from 21.6 per cent to 23.2 per cent). Expansion of the balance sheet was primarily due to the increases in gold and foreign exchange reserves, which in turn was mainly connected to high inflows of foreign capital. At their new higher level, the reserves cover short-term external debt several times over and the Guidotti indicator was above 350 per cent in mid-2013.

The central bank manages liquidity with short- and medium-term repo transactions and by stipulating a minimum reserve ratio for banks. However, the growth in foreign reserves was offset on the liability side mostly by currency in circulation, which was a large contributor to the persistence of inflationary pressures.

Instruments specifically aimed at boosting growth include the Export Credit Refinance Facility, which is intended to stimulate lending to the export sector. The Indian central bank raised the refinancing facility in 2012 from 15 per cent

Chart 6
Assets and the liabilities of the Indian central bank



of export loans to 50 per cent of the loans disbursed. In case of the decreasing inflationary pressures, the central bank will stimulate growth with monetary easing, which it plans to achieve by cutting the base rate and the minimum reserve requirements.

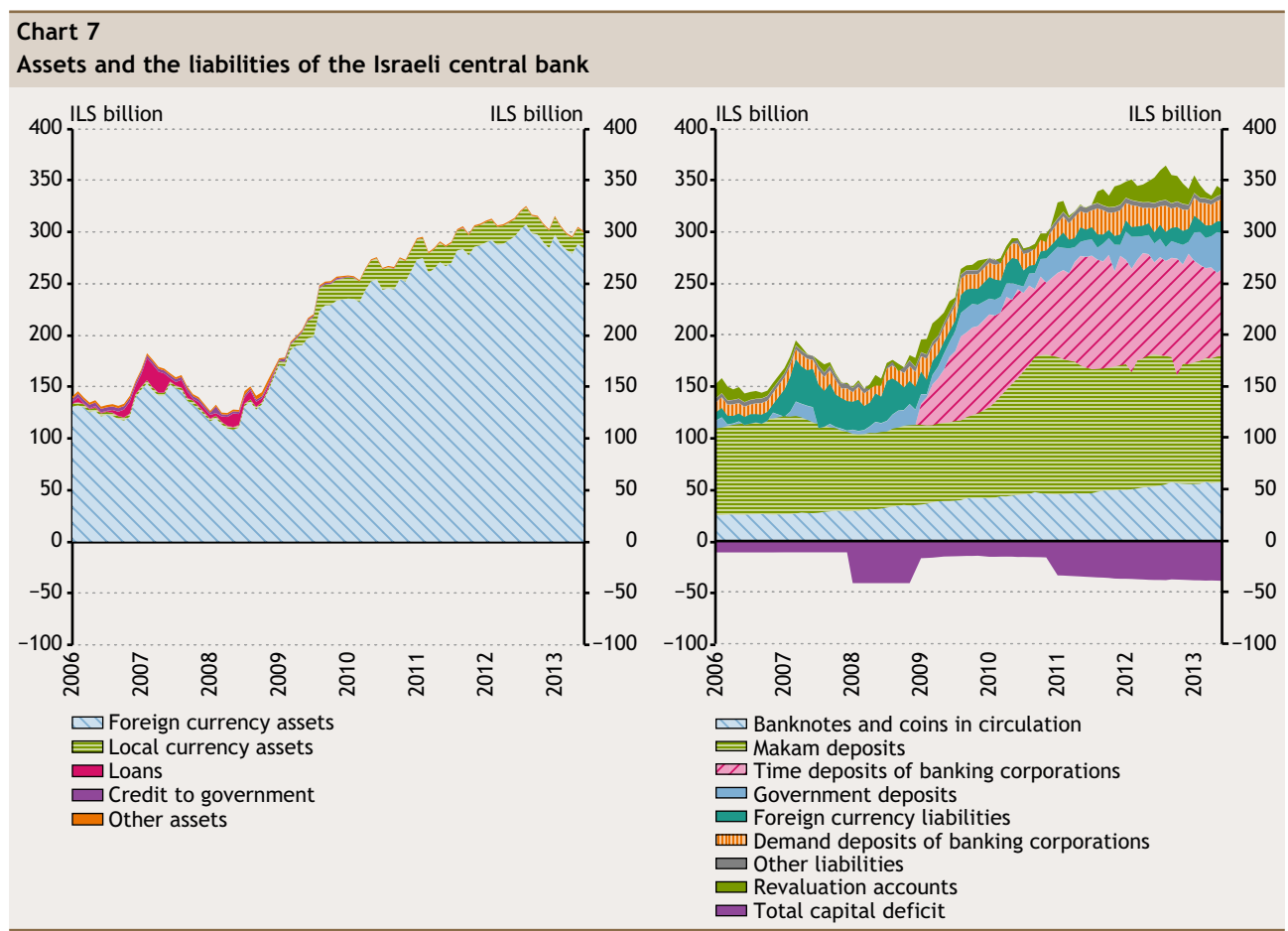
Israel

The balance sheet of the central bank of Israel (Bank of Israel, Bol) grew substantially, expanding by nearly two and a half times in the period 2008 to mid-2012. In the past year, however, the central bank balance sheet decreased slightly, amounting to 32 per cent of GDP in mid-2013. This increase is attributable mostly to the central bank's interventions: for the first time after 1997, the Bol entered the spot currency market in March 2008 and it continued to buy foreign exchange more or less continuously until 2011. At that point in time, the dynamic growth in GDP and the related increase in short-term debt demanded an increase in the reserves and, furthermore, the appreciation pressure generated by the high inflows of capital also had to be offset with interventions on the currency market. Besides the reserves, the only major item on the asset side of the central bank balance sheet is domestic securities.

Bol gives the banks one-day and one-week loans, but demand for these is low as there is surplus liquidity across the system.

The banking system can place deposits with the central bank for one day, one week or any other term depending on the situation on money markets. The other group of sterilisation instruments is makams, which are discounted bills with maturities ranging from 3 months to 1 year; these also contribute to the development of the securities market. They are subject to secondary trading on the stock market and changes in their prices are of key importance in terms of the market's inflation expectations. Following interest rate rises starting in 2010, makams attracted considerable speculative interest, and therefore the central bank has recently sought to reduce their importance. Tax was levied on non-residents' yields on makams.

In an international comparison, the sterilisation instruments of the banking system have a total which is rather high compared to the size of the economy: bank deposits and makams together account for 26 per cent of GDP. The state of Israel and the central bank may compete for sources of funding, because government debt and the sterilisation



bond total are both high, but the longer maturities of government debt make segmentation easier.

Instruments also include one-week repos of both directions, but these have not been used since 2009. The central bank employs active liquidity management, conducting all of its lending and liquidity absorption operations with variable-priced, pre-announced quantities, which means that the concept of availability does not apply to any of the instruments.

Sight deposits originating from the minimum reserve requirement are also shown under liabilities. Current accounts are liable to a 6 per cent rate and other short-term funds to 3 per cent. In order to further offset inflows of hot capital, the central bank imposed a further 10 per cent reserve ratio on foreign exchange denominated derivatives in January 2011, as this instrument reduces the yields of non-residents realised in shekels. No interest is paid in any of these cases. Besides bank deposits and makams, the third major liability item is currency in circulation.

In early 2009, the Israeli central bank reduced the base rate to 0.5 per cent and therefore, to provide further monetary stimulus, it started buying government securities on the secondary market. The aim of these purchases was to bring down the longer segments of the yield curve and thus improve lending and business conditions. The central bank applied three criteria in conducting this programme:

- It had to limit itself to purchases on the secondary market to avoid an accusation of monetary financing.
- The central bank sterilised the resulting surplus liquidity, although this had only marginal importance in view of the interest rate being close to zero.
- The purchases did not jeopardise the fundamental goals of monetary policy (inflation).

The total amount purchased ended up at ILS 18 billion, equal to approximately 7 per cent of the central bank balance sheet at the time. It is estimated that the scheme cut long-term yields by 30–40 basis points. When the yield on 20-year bonds fell to 6.1 per cent by the end of the summer of 2009, the central bank stopped the purchases. Given the constant capital inflow pressure, the purchases of government securities and the interventions on the currency market played an important role in reducing the appreciation pressure exerted on the exchange rate. A rate hike cycle started in September 2009 and as interest rates have not

returned to near zero since then there has been no further consideration of asset purchases.

The only instruments the central bank of Israel also uses today are liquidity management facilities, as justified by the constantly increasing path of lending by the banking system.

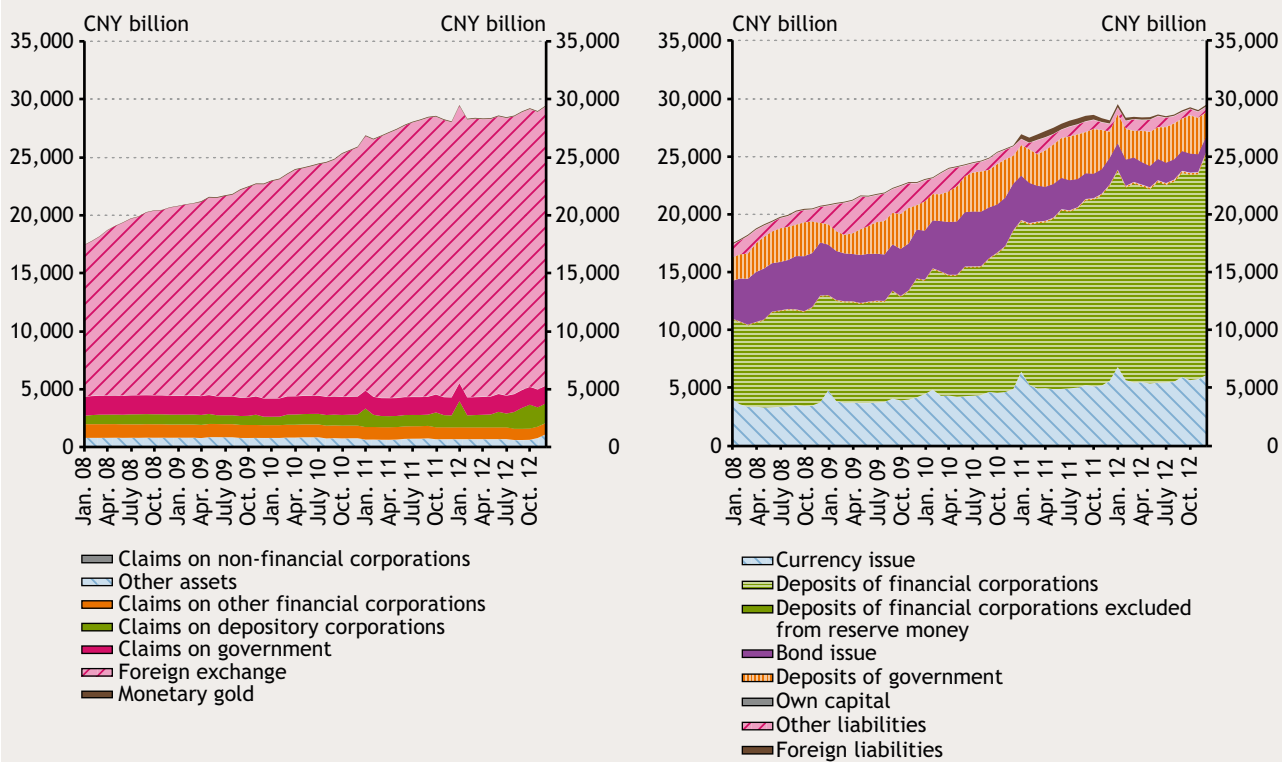
China

The balance sheet of the Chinese central bank (People's Bank of China, PBC) grew from CNY 17,000 billion in January 2008 to CNY 28,000 billion by the end of 2011, which however represented a decline of 5 percentage points expressed as a ratio to GDP. The growth in the assets of the central bank is almost entirely due to the increase in foreign exchange reserves, accumulating from the foreign exchange purchases of the central bank in the course of its managed floating of CNY. Its immense foreign exchange reserves are equal to eight times its external debt and its Guidotti ratio is therefore above 800 per cent. The intervention of the central bank on the currency market is aimed at preventing any substantial appreciation of CNY, as the central bank works on underpinning exports and therefore growth.

On the liability side, required reserves and currency grew the most. Notably, however, there has been a continued decrease in bonds issued since 2008. The central bank started to issue three-month, six-month and one-year central bank bonds in 2003. Since December 2004, it has also been selling longer-term, three-year central bank bonds. It sells the shorter securities to credit institutions reporting fast growth in credit and exhibiting substantial surplus liquidity. Central bank bonds decreased as planned, both nominally and as a ratio of GDP, from 15 per cent in 2006–2008 to 6 per cent in 2010–2011. In addition to the bonds, the Chinese central bank introduced other instruments as well (minimum reserve regime, FX swap, OMO). It is apparent that the PBC sterilises the surplus liquidity generated by the growth in foreign exchange reserves by using the minimum reserve rate. Also, it sets reference credit and deposit interest rates to influence banks' interest rates and it issues central bank bonds with short maturities.

Each year, the PBC relies on the economic stimulus objectives of the state leadership to determine its planned loan issuing and uses the reference credit interest rate to motivate the banks to achieve the loan quantity target. The sectors supported by lending activities are micro and small businesses, key national projects and agriculture (especially rural areas and small producers).

Chart 8
Assets and the liabilities of the Chinese central bank



South Korea

The balance sheet of the central bank of South Korea (Bank of Korea, BoK) increased nominally by almost one and a half times in the period 2008–2012, mostly due to the substantial increase in foreign exchange reserves, which is the dominant item on the asset side. At the end of 2012, the country's international reserves were equal to 29 per cent of GDP, which was several orders of magnitude higher than short-term debt.

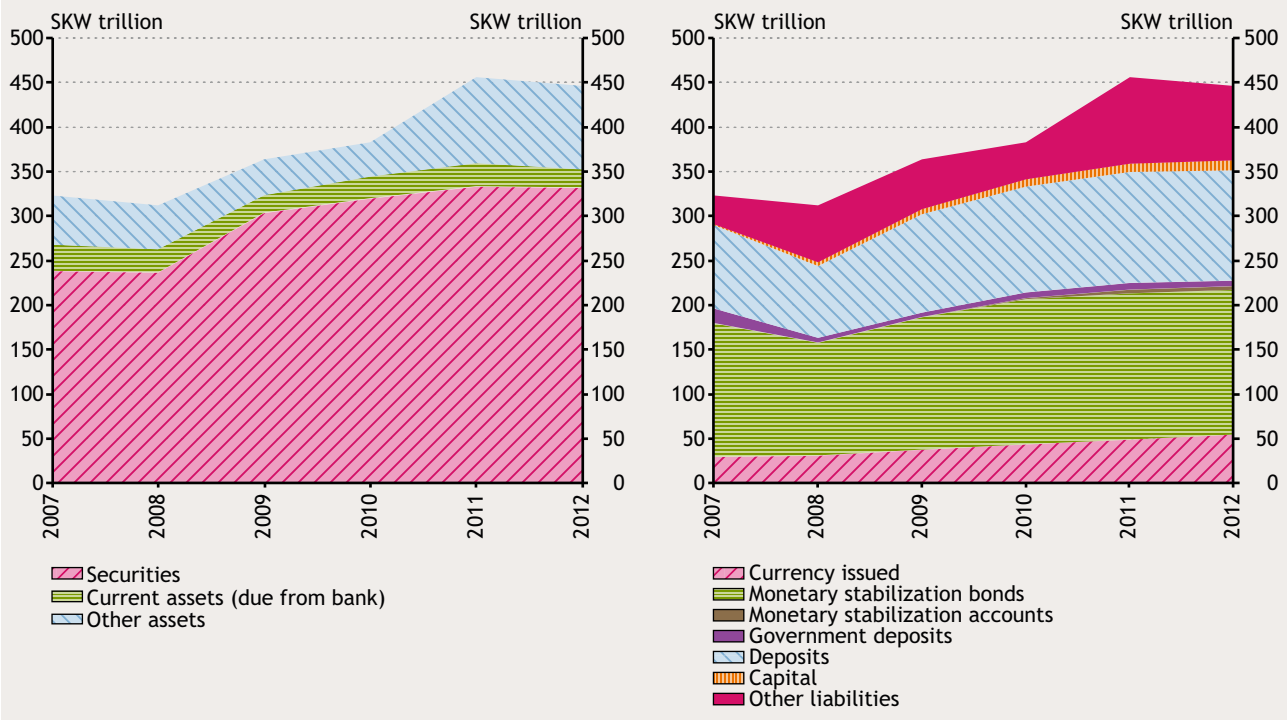
The liability-side instruments used by the South Korean central bank are among the most complex of all emerging central banks. Most of the reserves are financed by currency (5 per cent of GDP), sterilisation bonds (Monetary Stabilization Bonds, MSB, 14 per cent) and bank deposits (11 per cent). Although the largest item under liabilities is bonds, the base rate is the fixed rate of the one-week liquidity absorption repo or the minimum rate of the one-week liquidity injecting repo. The central bank operates a ± 100 bps interest rate corridor around the base rate.

On their current accounts with the BoK, credit institutions must raise 0–7 per cent minimum reserves for their debts with less than 2-year maturity, the rate depending on the type of the deposit. They may hold a maximum of 35 per cent of the reserve in cash. No interest is payable on the

reserves, although on one occasion since the outbreak of the crisis, in December 2008, the central bank paid KRW 0.5 billion on them, which improved their capital adequacy and credit supply.

As for open-market operations, the central bank can buy and sell securities to influence the liquidity in the system. At the moment, this is limited to the MSB, although it was expanded temporarily in 2008–2009 as a result of the crisis, to include the papers issued by the Korea Housing Finance Corporation (KHFC). The MSB was originally introduced due to the underdeveloped government securities market. Its maturities range between 14 days and 2 years, and the average maturity is currently 1.5 years. Since June 2009, the central bank has also issued MSBs with longer maturities to absorb liquidity, and at the same time it also first introduced interest-bearing MSBs, for which there are market building arguments too. Nearly 80 per cent of the structural liquidity management instruments have 2-year maturities. There are no conflicts surrounding issuing by the state and by the central bank, because Korea's budget deficit has been low recently, and even government debt is only 34 per cent of GDP. The total assets of the banking system is equal to one and a half times GDP, and therefore sterilisation by the central bank is less of a burden on banks' balance sheets. Furthermore, the Monetary Stabilization Account introduced in 2010 contributes to

Chart 9
Assets and the liabilities of the Korean central bank



interest rate transmission with variable-priced deposit tenders. The instrument is used for fine-tuning in the event of unexpected liquidity shocks.

The Korean central bank has a large number of non-conventional instruments, some of which it had been operating even before the crisis. Using the Aggregate Credit Ceiling (preferential credit facility for small and medium-size businesses), the BoK supplies each bank with a certain line of credit that must be used for financing small and medium-size businesses and other selected entities. The rate of interest on these loans to credit institutions is 100-200 basis points below the base rate. The limit for this instrument was raised across the banking system after the crisis broke out; even so, it accounts for barely 2 per cent of the central bank balance sheet.

The BoK has also purchased corporate bonds through the Bond Market Stabilization Fund in order to improve corporate financing terms, which helped prevent major declines in the total loan portfolio. A catalyst in the process was the participation in the scheme of the Small & Medium Business Corporation, a not-for-profit state organisation supporting small and medium-size companies. The central bank and the government joined forces to set up the bank recapitalisation fund with a maximum amount of SKW 20 trillion; the fund purchased a variety of subordinated and

hybrid bonds and equities to support the recapitalisation of the banks.

Bank of Korea also signed swap agreements with the US, Japanese and Chinese central banks back in 2008, but these have already expired. The foreign currency was used via several channels. A total of USD 26.6 billion was lent to the banking system via variable-priced swap and credit tenders. The central bank also used USD 10 billion of its own foreign exchange reserves. As the exchange rate weakened, the terms for corporate clients with foreign currency loans worsened; in such instances, the BoK relaxed the relevant capital rules to help extend the tenors. In addition to the above, it implemented a number of macroprudential measures, especially with the aim of reducing vulnerability arising from the external debts of the banking system.

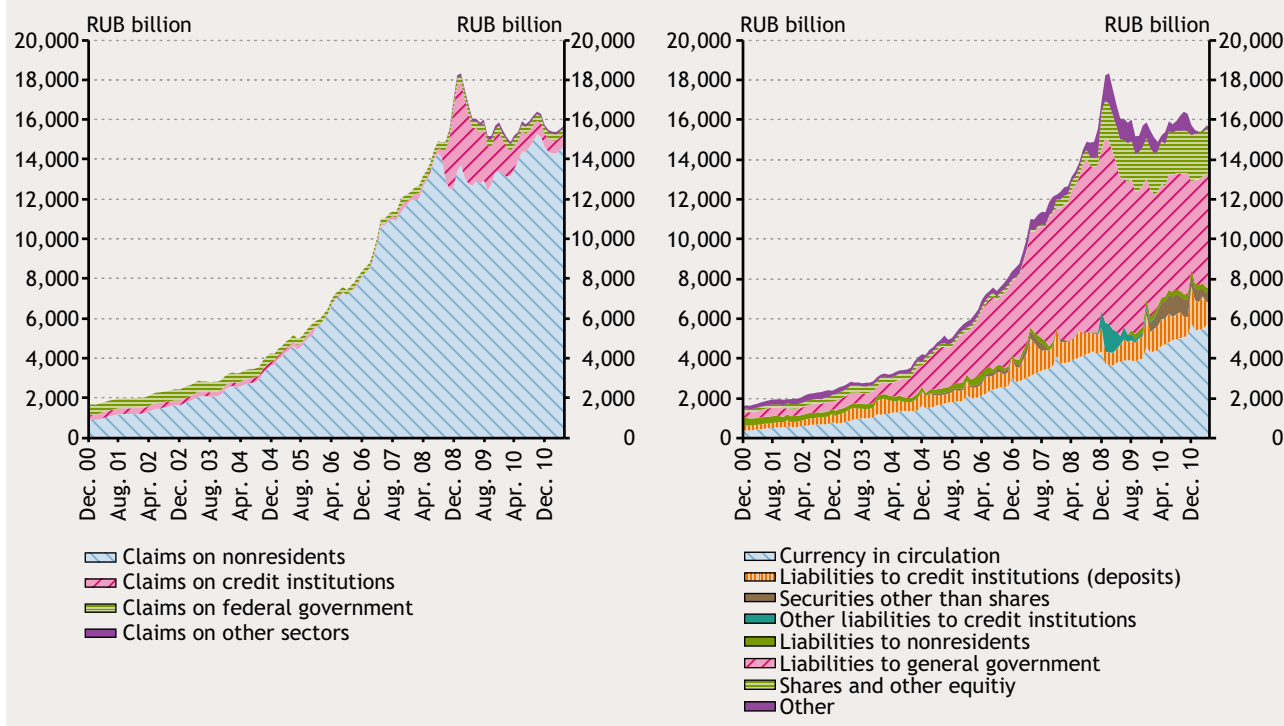
One unusual feature is that, according to the law on the central bank, the BoK may give secured loans to companies in an emergency, if the access to funds via the traditional channels becomes difficult. The Monetary Council decides on each specific case.

Russia

The balance sheet of the Russian central bank (Central Bank of Russia, CBR) has increased by around 20 per cent

Chart 10

Assets and the liabilities of the Russian central bank



nominally since the outbreak of the crisis, i.e. at a slower rate than other emerging central banks. At the same time, however, it has grown several-fold compared to the start of the decade. The asset side of the balance sheet is dominated by foreign exchange reserves, which grew in nominal terms (in RUB) more than fifteen-fold from the start of the decade to 2008 and reached 45 per cent of GDP. In the first years of the crisis, foreign exchange reserves decreased due to the central bank's intensive selling on the currency market with the aim of strengthening the RUB exchange rate, but by mid-2011 the bank replenished the reserves to the initial level. The country's short-term external debt amounts to 4 per cent of GDP, which means that foreign exchange reserves are ten times higher than the Guidotti rule.

The CBR finances its foreign exchange reserves primarily with deposits of the central government, currency and equity. The first item represents the largest item on the liability-side of the balance sheet as the state finances one third of the balance sheet mostly in foreign exchange (Reserve Fund RUB 1,800 billion, National Wealth Fund RUB 2,300 billion) and to a smaller extent in roubles.

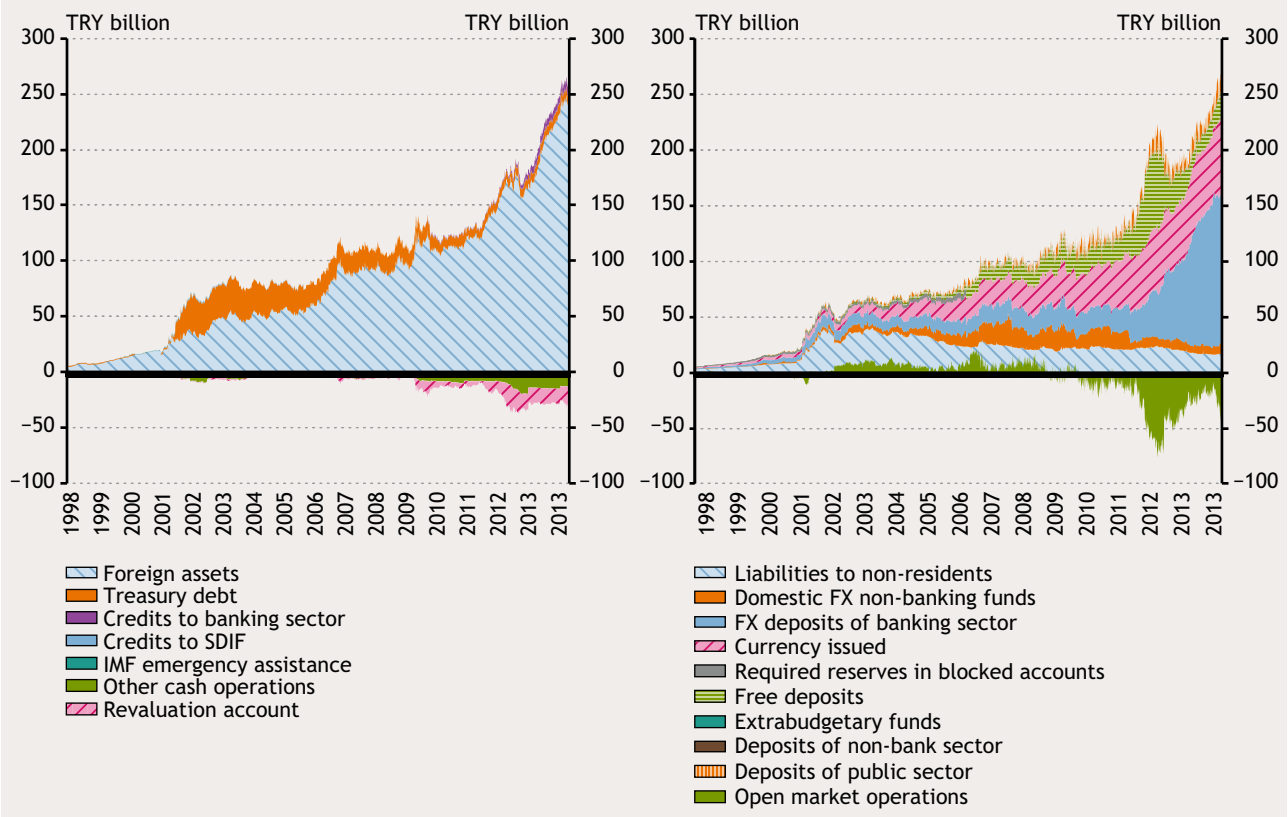
Monetary policy relies on a varied range of instruments, suitable for both supplying and absorbing liquidity. The CBR is active on both the active and passive sides, although with

the exception of the year 2008, the absorption of liquidity has dominated, mostly in overnight deposits. Banks can place deposits with the central bank for slightly longer maturities as well, tom-next or seven days. Sterilisation does not take up too many resources. Liabilities to banks account for less than 5 per cent of the total assets of the banking system.

Turkey

The balance sheet of the Turkish central bank (Türkiye Cumhuriyet Merkez Bankası, CBRT) has grown substantially, growing nearly three times in nominal terms (in TRY) between 2005 and the summer of 2013 to reach 14 per cent of GDP. At present, the asset side is dominated by foreign exchange reserves, which are equal to 15 per cent of GDP. There are also two negative items (money market operations and revaluation account) and loans to banks and government debt reported on the asset side. After the end of 2001, domestic government debt still accounted for 30-50 per cent of all assets; this ratio started to decrease in 2005. Since the central government now holds deposits of almost equivalent amounts at the CBRT, the central bank's net position vis-à-vis the state is essentially zero. The government's deposits with the central bank have no maturities and pay no interest, therefore the central bank achieves interest income from the government.

Chart 11
Assets and the liabilities of the Turkish central bank



There are substantially higher liabilities in the balance sheet than the government's deposits, with two of these dominating, namely foreign exchange from domestic banks (which includes the minimum reserves and voluntary deposits of foreign exchange) and currency in circulation. Other sources of funds for the CBRT include the voluntary TRY deposits of domestic banks, foreign nationals' currency deposits for terms of 1 to 3 years, domestic foreign exchange from sources other than banks and, as a negative figure, the value of open-market operations (securities repos). The low ratio of currency and the high ratio of bank deposits to GDP stands out in an international comparison.

The CBRT supplies liquidity as an asset-side instrument to implement its monetary policy focused on price stability (inflation target and special attention to external balance). The one-week repo policy instrument provides funding for commercial banks. There are also one-month repos, overnight deposits and credit, also emergency deposits and credit at penalty interest. The CBRT often uses a mixture of these instruments to modify monetary policy conditions. The central bank provides to the banking system EUR and USD in the form of facilities with high interest rates,

essentially acting as lender of last resort. The relevant maturities have been reduced from the previous one month to one week.

The minimum reserves scheme is rather unconventional. The reserve ratio was reduced in October 2011, but the CBRT still absorbs considerable funds from the banking system. Also in 2011, it allowed banks to keep some of their reserves in foreign exchange or gold; the banks are motivated to take advantage of this possibility because the minimum reserves bear no interest. Minimum reserves in foreign currency grew threefold and gold grew sixfold in the period between 2011 and 2013; the latest figures from the World Bank put total gold reserves at 15.9 per cent of all reserves. The measure has had the impact of weakening the lira and reducing TRY yields, especially on the FX swap market. The Turkish central bank used this instrument to improve financial stability, as the reserves can serve as a kind of buffer in the event of intense capital movements. We have seen therefore how much the reserve scheme has boosted the central bank's gross foreign exchange reserves (by about a third in 2012). However, as there are considerable forex deposits placed with the central bank, the net foreign exchange reserves amount to only a third of the gross

figure, and the country's Guidotti ratio calculated from this stood at around 100 per cent in the summer of 2013.

The government securities portfolio purchased back in 2001 matured in 2010, therefore the central bank started a further, limited round of secondary-market purchases the same year, in accordance with the original goals of monetary policy, to cover the liquidity surplus and the funds for repo operations. The central bank set a limit on the new portfolio equal to 7 per cent of its balance sheet and limited the term to 5 years. At the moment, the government securities held by the central bank account for 3.2 per cent of its total balance sheet.

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