

Framework for Developing Money Markets

in

Frontier and Emerging Market Economies¹



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¹ A collective of authors led by David Vavra (OGResearch) and composed of David Vavra, Barry Topf (formerly Bank of Israel), Zsolt Kondrat (OGResearch), Axel van Nedevee (EBRD), Jim Turnbull (EBRD), Matthew Saal (EBRD) and Aude Pacatte (EBRD)

Contents

Glossary	5
Introduction	8
Chapter 1: Money Markets in the Context of Monetary Policy Framework	10
A. Price Stability, Exchange Rate Flexibility and Money Market Development	10
B. Promoting economic development through price and financial stability	11
C. Monetary policy framework	13
Chapter 2: Role and function of the money market	18
A. Why money markets are important	18
<i>Financial Intermediation and Maturity Transformation</i>	19
<i>Managing liquidity</i>	20
<i>Pricing and financing conditions</i>	23
<i>Monetary policy transmission</i>	24
B. Central Bank and the Money Market	25
<i>Market Making and the role of the Central Bank</i>	25
<i>Operational variables and operational framework</i>	28
<i>The modern tool-kit of central banks</i>	30
i. Reserve averaging	35
ii. Key policy rate	36
iii. Main (refinancing or liquidity absorption) instrument	38
iv. Overnight or 1-day interest rate corridor of standing facilities	41
<i>Other important tools</i>	43
i. Fine Tuning Operations	43
ii. Lender of Last Resort	44
<i>Organizational underpinning of the monetary policy operational framework</i>	44
<i>Experiences and Challenges in the implementation of a new operational framework</i>	47
C. The Policy Rate as a Base Rate for other Short Term and Long Term Rates.	51
<i>The Target Interest Rate as the Anchor for Money Market Interest Rates.</i>	51
<i>The (Money Market) Yield Curve.</i>	52
Chapter 3: Role of the local currency money market	52
Chapter 4: Pre-conditions for an efficient money market	56
A. Use of Local Currency	56
B. Structure and efficient functioning of the banking system through the Money Market	60
C. Role of the Central Bank in financial sector development	62

D. Legislation to Support the Market	64
E. Efficient Payment and Settlement System	65
<i>Delivery versus Payment</i>	68
<i>Continuous Linked Settlement</i>	68
<i>Payment versus Payment in Foreign Exchange transactions</i>	68
Chapter 5: Building blocks of an efficient money market.	69
A. A Money Markets Primer	69
B. Characteristics of money market instruments	71
C. Instruments of the Money Market	73
D. Participants in the Money Market	80
E. Transactions and Functions	83
F. Interbank reference (benchmark) rates	84
Chapter 6: Technical Aspects of the Money Market	87
Appendix: Basic Risk Management	95

Table of Boxes

Box 1:	Trade-offs between macroeconomic goals.....	12
Box 2:	Why inflation targeting?	17
Box 3:	Commercial Banks as Creators of Money and Savings	18
Box 4:	The mechanics of liquidity management.....	20
Box 5:	Interlinkages with the FX-market.....	21
Box 6:	Pricing of bank loans and deposits using transfer pricings.....	23
Box 7:	Market Maker of the Last Resort	27
Box 8:	Why a flexible exchange rate?	28
Box 9:	Classifying CB operations: OMOs and the rest	32
Box 10:	Instruments of a typical IT central bank: Example of the Czech National Bank	34
Box 11:	Developing FPAS Frameworks.....	37
Box 12:	Structural liquidity shortage and surplus.....	39
Box 13:	Eurozone liquidity hoarding and ECB instruments	42
Box 14:	An example of the cost of using the Interest Rate Corridor (IRC)	43
Box 15:	Shift from RMT to IRT - the case of Brazil	48
Box 16:	Transition from reserve money targeting.....	50
Box 17:	Macroeconomic Causes of Dollarization.....	54
Box 18:	Funding sources for LCY loans.....	55
Box 19:	Funding from the money market – the Northern Rock debacle.....	58
Box 20:	Government and central bank involvement in promoting the use of deposits	58
Box 21:	Shadow banking	59
Box 22:	Foreign owned entities	61
Box 23:	National Bank of Poland (NBP) actions to promote financial markets.....	63

Box 24:	The Overnight Index Rate Swap	77
Box 25:	Money market instruments intermediating foreign investments	79
Box 26:	The government and the money markets	80
Box 27:	Overnight index swap fixes as a money market reference rate in emerging markets	86
Box 28:	Money market as a source of information	88

Table of Figures

Figure 1: De Facto Monetary Policy Regimes in LLMICs, 2003-2013.....	15
Figure 2: An illustrative stylized chart of the relative position of different central bank, commercial bank and interbank market interest rates	31
Figure 3: Separation of policy formulation and implementation	46
Figure 4: Unification of policy formulation and implementation	46
Figure 5 Increasing predictability of money market rates, Serbian and Georgian cases	47
Figure 6: A cross-currency interest rate swap	78
Figure 7: Financial Market Structure	83
Figure 8: Stylized example of moving value across currencies and over time	88
Figure 9: Market-Implied Path of the Effective Federal Funds Rate.....	89
Figure 10: Market-Implied Three-month Libor Path and Uncertainty	89
Figure 11: Yield calculation Adjustments.....	96

Glossary

ABCP	= asset-backed commercial paper
ABS	= asset-backed security
AE	= advanced economy
AM	= advanced market
BA	= bankers acceptance
BIBOR	= Bangkok Interbank Offered Rate
CB	= central bank
CCP	= central counterparty
CD	= certificate of deposit
CDO	= collateralized debt obligation
CDS	= credit default swap
CLS	= continuous linked settlement
CNB	= Czech National Bank
CP	= commercial paper
CSD	= central securities depositories
DNS	= designated-time net settlement
DVD	= delivery versus delivery
DVP	= delivery versus payment
GFC	= global financial crisis
ECB	= European Central Bank
EM	= emerging markets
EMT	= enhanced monetary targeting
ELF	= exceptional lending facilities
EROT	= exchange rate operational targeting
ERT	= exchange rate targeting
EURIBOR	= Euro Interbank Offered Rate
FCL	= Flexible Credit Line
FCY	= foreign currency
FRA	= forward rate agreement
FM	= frontier market
FSB	= financial stability board
FSC	= financial stability committee
FTP	= funds transfer pricing
FX	= foreign exchange
GC	= general collateral
GRMA	= Global Master Repo Agreement
HIBOR	= Hong Kong Interbank Offered Rate
HQLA	= high quality liquid assets
ICMA	= International Capital Markets Association
IRC	= interest rate corridor

IRS	= interest rate swap
IRT	= interest rate targeting
IT	= inflation targeting
ITL	= inflation targeting lite
LCR	= liquidity coverage ratio
LCY	= local currency
LIBOR	= London Interbank Offered Rate
LIC	= low income country
LLR	= see LOLR
LOLR	= lender of last resort
LT	= long term
LTRO	= long-term refinancing operation
MaPR	= macro-prudential regulation
MMLR	= market maker of last resort
MMMF	= money market mutual fund
MMO	= money market operation
MP	= maintenance period
MPC	= monetary policy committee
MRR	= minimum reserve requirement
MT	= monetary targeting
MRR	= minimum reserve requirement
NBFI	= non-bank financial intermediary
NBP	= National Bank of Poland
NDF	= non-deliverable forward
NSFR	= net stable funding ratio
OIS	= overnight index swap
OMO	= open market operations
O/N	= overnight
OTC	= over-the-counter
PD	= primary dealer
PIBOR	= Paris Interbank Offered Rate
PVP	= payment versus payment
QE	= quantitative easing
RM	= reserve money
RMT	= reserve money targeting
RTGS	= real time gross settlement
SIBOR	= Singapore Interbank Offered Rate
SIV	= special investment vehicle
SLAF	= standing liquidity absorbing facility
SLPF	= standing liquidity providing facility
SOE	= state owned enterprise
SME	= small and medium enterprise
TBC	= piso da taxa do Bacen
TBAN	= teto da taxa do Bacen
TED	= Treasury - Eurodollar

TLTRO = targeted longer-term refinancing operation
TRLIBOR = Turkish lire interbank offered rate
UIP = uncovered interest rate parity
WIBID = Warsaw Interbank Bid Rate
WIBOR = Warsaw Interbank Offered Rate

Introduction

This paper considers the role of the local currency money market in the financial system, the preconditions necessary to establish a money market and the building blocks required to develop the money market. It is intended as a guide for policymakers and financial sector experts working on the development of the financial markets in the emerging market and frontier economies, either as a complement to a broader policy reform and financial development agenda or an objective on its own.

The central message of this paper is that the development of resilient and well-functioning money markets is deeply intertwined with the development of a monetary policy framework based on a flexible exchange rate and a pursuit of low and stable inflation (such as inflation targeting), and vice versa. In other words, reforms focused solely on the money market mechanics will have only limited chances of success, if not accompanied by sustained efforts to achieve low and stable inflation using a predictable interest rate policy and a relatively flexible exchange rate. At the same time, the implementation of such policy frameworks will hardly succeed without efforts to build well-functioning money markets.

In developing our arguments we acknowledge the special situations in the emerging and frontier money markets. For instance, a particularly important feature of the financial systems of the emerging and frontier market economies is the dominant role of (retail) commercial banks.² In addition to their traditional function of creating money, commercial banks in these markets are also the main providers of saving instruments, play a leading role in the financial intermediation and maturity transformation of savings, function as the chief domestic creditor of the government, and are the key (and often the only) participants in the money and FX markets, both spot and derivative. In developed markets, most of these functions have over time become dominated by specialized financial institutions, which trade amongst themselves on the basis of their comparative advantage in realizing these particular functions.

The fact that the commercial banks play a dominant role in transforming savings into investments in the financial systems of the emerging and frontier market economies is one of the key drivers of the money market activity. From the money market perspective the most important of these transformations is maturity transformation. In this process, commercial banks make available financial resources for long periods necessitated by investment business needs, even though the individual savers and depositors are not willing to tie-up the funds for so long. Banks achieve maturity transformation by pooling a large number of diversified deposits. The effort of keeping the underlying deposit base stable is an important engine for money market activity, because it means that banks have sufficient certainty over the size of the deposit pool they can rely on to fund their long term loans to project their liquidity needs and lend or borrow cash from the markets to balance their books. Another aspect of maturity transformation, which is important for money market

² Nevertheless, banks retain a central role in all countries and not the least because of their crucial function in the payments system. Only relatively recently and in very advanced countries did non-bank and security markets obtain a significant role, and this is often thought of as an “Anglo-Saxon” phenomenon in countries such as the U.S., U. K. and Canada. Banks maintain a very dominant role in many advanced countries such as Germany, France and Japan, and of course remain dominant in most developing countries.

development, is the ability of commercial banks to extend the tenors of fixed rate loans efficiently, thereby minimizing the borrower's interest rate risk over the duration of the loan. The need to manage the ensuing interest rate risk on the balance sheet of the banks (instead of passing it on to the borrower) requires good liquidity and interest rate risk management as well as the development of various money market and risk management instruments.

The money market is defined as short term borrowing and lending activities for tenors and maturities less than 12 months. The primary function of money markets is to allow participants to manage short term cash flows and liquidity. The money market is the place where the treasury operations of central banks, governments, banks, non-bank financial institutions and corporations meet. It may be a source of funding or provide means to allocate surplus savings and hedge various risks. The money market also provides the conduit for the transmission of the most common monetary policy instruments and a foundation for the development of capital and financial markets more broadly.

In a country with its own unit of account, most of these functions but especially treasury and central bank operations are meant to be in the local currency. This paper predominantly deals with issues related to local currency money markets and only discusses foreign exchange markets to the extent that they interact with local currency markets. So for the rest of the paper when we talk about money markets we mean local currency money markets and will explicitly say if this is not the case.

Money markets develop over time, and vary in terms of instruments, institutions and regulation. Country characteristics, history, legal system, business culture and many other factors will all affect the way markets develop and function.

Modern money markets in developed economies established themselves in the decades following World War II as a result of restrictive banking regulations. During the first decades, the money market matched investors with surplus funds with short term borrowers through the commercial banks via unsecured lending over-the-counter. Rapid development over the last thirty years through globalisation and deregulation generated a large increase in demand for funds that could only be met by using the new instruments created by technological and financial innovation. This transformed money markets from over the counter unsecured borrowing and lending of short term funds among a few highly trustworthy institutions into a much more sophisticated market place with money market securities, secured lending and interest rate derivatives all available for multiple maturities and open to a wide array of participants.

An important stimulus to the development of the money markets was the growing role of government debt financing in many economies starting with the emergence of liquid treasury bills. The development of modern monetary policy operations was an additional spur to the issuance of short term government and central bank securities, as well financing through secured transactions such as the repurchase (repo) agreement. Increased economic and financial volatility; globalization and increased international capital flows; advances in financial theory and techniques and greatly increased computing power and rapid communications all contributed to rapid growth in the scope, scale and sophistication of financial markets, including money markets, in recent decades.

More recently, the global financial crisis (GFC) has underscored the importance of a deep and liquid money market as the precondition for a smoothly functioning financial system. Among other

changes, the crisis has placed greater emphasis on secured over unsecured lending, reduced the volumes of the interbank lending and the average maturity of transactions and transformed the nature of interbank lending. While many emerging market countries are struggling to create an interbank market, it is ironic that the Eurozone faced a similar problem after the onset of the GFC, in restarting its paralysed interbank market.³

The report is structured in the following way:

Chapter 1: investigates how monetary policy frameworks have evolved, why inflation targeting (IT) has become so popular in the developed and emerging market countries and why it is an important driver behind the development of well-functioning money markets.

Chapter 2: explores the role of the money market in a financial system that comprises the government, the central bank, deposit taking institutions (referred to as banks), non-bank financial institutions and non-financial participants.

Chapter 3: examines the preconditions necessary to establish and develop money markets if the local currency is accepted as a suitable means of exchange and has the confidence of market participants. It discusses the causes of and cures for dollarization and the role of the deposit base in building up a money market and highlights the key prerequisites in the area of payment systems and legislation.

Chapter 5: explores the main type of transactions, instruments and participants and then elaborates on the technological and legal background of functioning money markets including the different payment systems and the necessary legislation and regulation.

Annexes provide essential technical and operational details concerning the functioning of money markets.

Chapter 1: Money Markets in the Context of Monetary Policy Framework

A. Price Stability, Exchange Rate Flexibility and Money Market Development

The development and reforms of local currency markets are deeply interconnected with the choice of the exchange rate regime and the monetary policy framework. Local currency money markets generally thrive in an environment characterized by a flexible (market determined) exchange rate and policy oriented at achieving (internal) price stability.⁴ This does not mean that one cannot find functional money markets in economies with a fixed exchange rate regime and an eclectic monetary policy with multiple (possibly conflicting) objectives. However, it will certainly be more difficult to develop local currency markets under such conditions and also more likely that the money markets

³ Lorenzo Bini Smaghi, “Restarting a Market: The Case of the Interbank Market.”, speech at the ECB Conference in Frankfurt on December 1, 2008.

⁴ Some distinguish between internal price stability as stability of domestic prices and external price stability as stability of the exchange rate of the domestic currency.

will increasingly be based on a foreign (rather than domestic) currency, with negative repercussions for the financial stability of the economy.

There are a number of reasons why a flexible exchange rate, price stability and the money market development are interconnected.

First, exchange rate flexibility necessitates the development of an alternative nominal anchor and monetary policy instruments. As we show later, among several of such alternatives, the pursuit of inflation targets using interest rate policy is especially conducive to the development of the money market, because the central bank acts as the market maker in setting the price of short-term liquidity (O/N balances) and provides guidance on the evolution of this price in the future based on macroeconomic factors, thus reducing interest rate risk in both the short and long-term.

Second, pursuing stable inflation using an interest rate policy requires well-functioning money markets as the primary conduits of the policy transmission.

Third, a flexible exchange rate together with a strong record of consistent policy focused on price stability promotes savings in the domestic, rather than a foreign currency, because of the uncertainty in the real value of savings in a foreign currency. As we argue later, a stable local currency deposit base is one of the building blocks of functional money markets, which help the intermediation between the savers and borrowers as well as maturity transformation between short-term funding and long-term borrowing.

Finally, provided that income is derived in the local currency a need to eliminate the foreign exchange rate risk from the corporate and financial sector balance sheets spurs the development of many hedging instruments and money market activities.

Given this interdependence, it is therefore not surprising that we often observe, especially in the emerging market context, that the development of the money markets goes hand-in-hand with efforts to implement various forms of an inflation targeting regime and establish a substantially flexible exchange rate.

The implication for the reform agenda in the emerging and frontier markets therefore is that reforms focused solely on the money market mechanics will have only limited chances of success, if not accompanied by sustained efforts to achieve low and stable inflation using a predictable interest rate policy and a relatively flexible exchange rate. At the same time, the implementation of such policy frameworks will hardly succeed without efforts to build well-functioning money markets.

B. Promoting economic development through price and financial stability

Understanding the importance of price stability in the development of money market mechanisms is the first step towards establishing a resilient financial system.

All central banks care about multiple high-level objectives, both macroeconomic ones – price stability, the exchange rate, competitiveness, growth – and financial ones – financial stability and financial sector development.

Price stability refers to maintaining the general price level of goods and services stable and avoiding prolonged periods of inflation or deflation so that expectations about future price movements are also stable. The primary benefit of price stability is that it makes the future path of prices, including the nominal interest rate, and with it the real value of money predictable, thereby encouraging households and firms to engage in productive investments, which in turn fosters the sustainable growth of the economy.

By contrast, the definition of financial stability is less clear-cut. For our purposes, we understand financial stability as a condition in which the financial system – intermediaries, markets and market infrastructures – can withstand shocks without major disruption in financial intermediation and in the effective allocation of savings to productive investment.⁵

History shows that jointly accomplishing multiple macroeconomic objectives is a daunting task. When these objectives come into conflict, it can impair the performance of the central bank, as the different objectives would call for inconsistent monetary policy steps (see Box 1:). A central lesson of experience is that giving price stability priority can help the central bank to gain credibility, which in turn can be used to achieve the other objectives and better manage the trade-offs involved.

Box 1: Trade-offs between macroeconomic goals

There may be short-run trade-offs between the objectives, and the central bank should have sufficient flexibility to determine the extent to which a temporary inflation deviation may be warranted in order to promote its other objectives. For instance, very low inflation is likely to lead to low interest rates, which may exacerbate financial sector imbalances and precipitate asset price bubbles. Keeping the exchange rate stable for a long time can give rise to an increase in inflation volatility in the long term as well as lead to the accumulation of large unhedged open FX positions of the private sector. This makes the financial sector more vulnerable to exchange rate shocks and dealing with these shocks may finally call for measures that increase inflation (e.g. letting the peg go). Reducing interest rates to support growth and employment can result in an unchecked rise in inflation and inflation expectations, especially after supply shocks or when the level of potential output or natural rate of unemployment are difficult to gauge and subject to structural shifts. In such an environment a rate cut has the potential to be misinterpreted and thus to reduce the credibility of the central bank, which in turn, would lead to higher inflation expectations.

As for financial objectives, it is a generally accepted view that price and financial stability more or less complement each other. In fact, one can argue that price stability tends to promote financial stability in general⁶. Price stability and financial stability tend to mutually reinforce each other in the long run. This widespread view is supported by empirical evidence that many financial crises were caused or accompanied by major shifts in the price level. Moreover, historically most banking crises occurred during recessions often following periods of high inflation. However, price stability is not a sufficient condition for financial stability. Given the enormous costs of financial crises (deflation or subpar growth for years) it is probably optimal for central banks to err on the side of caution and deviate from the inflation objective in the short run in order to preserve price stability on the long term.

⁵ The IMF defines financial stability as a condition whereby the financial system is capable of facilitating (rather than impeding) the performance of an economy through pricing, allocating, and managing financial risks (credit, liquidity, counterparty, market, etc.), and of dissipating financial imbalances that arise endogenously or as a result of significant adverse and unanticipated events (Schinasi, 2004).

⁶ Bordo and Wheelock (1998)

That said, monetary policy and macro-prudential regulation have very separate and dedicated toolkits. Although these toolkits can be complementary and reinforce each other, a consensus seems to emerge that monetary policy instruments should be used to steer inflation, while macro-prudential tools should serve as the first line of defence in mitigating emerging financial imbalances. Indeed, the recent experience of many economies shows that monetary policy instruments are blunt and relatively ineffective tools for promoting financial stability, and therefore they should only be deployed as a last resort in that regard.

The important observation for the money market development is that price stability also reinforces financial development and thus strengthens financial stability. A credible inflation target with a flexible exchange rate promotes financial markets by making the interest rate trajectory more predictable and therefore useful for pricing longer-term financial instruments in domestic currency. It also reduces incentives for saving and pricing in foreign currency, and by reducing the dollarization of the economy it limits the FX currency mismatch of household and corporate balance sheets.

Especially in the EM context, the focus on price stability increases the resilience of the financial sector to swings in the exchange rate and capital flows. While it has been argued that a fixed exchange rate can also bring price stability, if credibly kept for a long period, the experience of many developed and emerging economies is that once in a while adjustments in the exchange rate parity are inevitable and the ensuing turbulences are difficult to manage, often leading to protracted economic crises. By contrast, the focus on price stability as opposed to exchange rate stability necessitates building mechanisms of controlling the omnipresent exchange rate volatility and its economic implications. Building these mechanisms involves the development of financial markets and instruments denominated in the domestic currency.

C. Monetary policy framework

The choice of the monetary policy framework to pursue price stability has important ramifications for the development of domestic money and financial markets. In particular, the experience from many EM and FM economies shows that inflation targeting (IT) and flexible exchange rate is more conducive to financial market development than exchange rate targeting (ERT) or monetary targeting (MT). This is, because both ERT and MT reduce the incentives for strengthening money markets, because they do not require all the functions money markets can provide.

A fundamental element of every modern economy is that the government has established a particular currency as the unit of account to be used in all public and private transactions. Maintaining trust in the unit of account over time plays a crucial role in facilitating the investment and spending decisions of households and businesses and thereby fostering sustained economic growth and broad-based prosperity.

Monetary authorities (typically the central bank) set up various frameworks to safeguard the real value of the currency and the choice of the monetary framework has important consequences for the development of the local money market and vice versa.

The monetary policy framework usually consists of measurable intermediate targets, whose values should help maintain the real value of the currency and a set of operational targets⁷, through which

⁷ The terms operational target and instrument are often used for the same meaning in the literature, which may cause confusion. This paper uses operational target for describing variables that the CB would like to set directly at certain levels

the policy aims achieving the intermediate targets. The reason for this set-up is that the central bank can control operational target variables with greater precision than the intermediate ones. It has even less control over the ultimate objective of price and currency stability. For instance, using money and FX market operations central banks can control reasonably well reserve money, the short term interest rate or even the exchange rate, which are the most typical operational target variable these days, but there are long and variable lags in the transmission mechanism from these operational target to the intermediate targets, which may be a level of the exchange rate, monetary aggregate or an inflation forecast (among others).⁸ Among the possible intermediate targets the inflation forecast – used as the intermediate target in IT regimes – is unique in that it incorporates all available news, including the information content of monetary aggregates and the exchange rate.

Table 1 provides a taxonomy of the most relevant monetary policy frameworks in terms of the tool-kit, operational and intermediate targets.

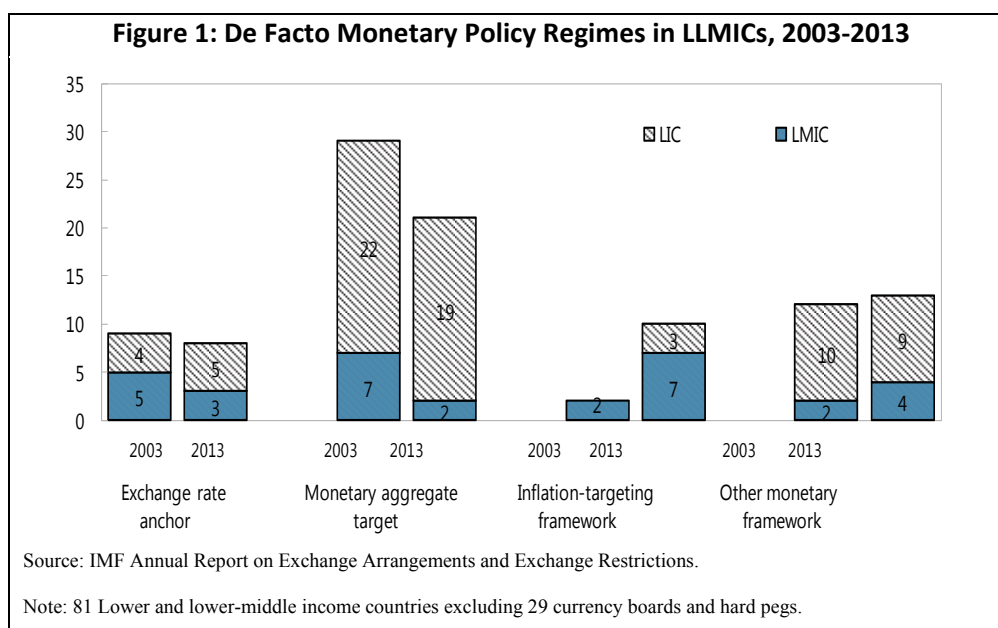
Table 1: Monetary policy frameworks

Monetary policy framework	Intermediate target	Operational Target	Tool-kit
Exchange rate targeting	exchange rate	interest rate/exchange rate	FX-transactions; O/N standing facilities; main refinancing or sterilization instrument; MRR (averaging)
Monetary targeting	monetary aggregate	reserve money	MRR (rate and averaging); main refinancing or sterilization instrument; fine-tuning operations OMOs
Enhanced monetary targeting	monetary aggregate	short term interest rates	MRR (rate and averaging); O/N standing facilities; main refinancing or sterilization instrument; fine-tuning operations OMOs
Inflation targeting lite	inflation forecast	short term interest rates	MRR (averaging); O/N standing facilities; main refinancing or sterilization instrument; fine-tuning operations; FX-transactions
Full-fledged inflation targeting	inflation forecast	short term interest rates	MRR (averaging); O/N standing facilities; main refinancing or sterilization instrument; fine-tuning operations;

Historically, the most common forms of monetary regimes were commodity standards and currency pegs. Though simple and transparent, they could not ensure that the real value of the unit of account remained stable. For instance, shifts in the global supply and demand for gold under the gold standard or shifts in the real exchange rate under a currency peg can and did induce swings in the aggregate price level.

like the reserve money or the short-term interest rate. Instruments are the specific money market tools used to achieve the operational target. The operational target is usually unique while there is a host of instruments to achieve it.

⁸ The exchange rate can be either or both an operational as well as intermediate variable. For instance, in Denmark the central bank uses interest rates as the operational variable to maintain a fixed exchange rate to the euro. In Singapore, the exchange rate is used as an operational target affecting inflation. Finally, in Ukraine it is both an operational as well intermediate variable.



Source: forthcoming IMF Board paper

More modern monetary frameworks work with a (at least partially) flexible exchange rate and emphasize (to different degree) inflation objectives of monetary policy. Inflation targeting (IT) regimes have become especially popular by setting (continuous) inflation targets as the only numeric policy objectives and following inflation forecasts (which thus become de facto intermediate targets), at the same time allowing the exchange rate to be rather flexible. Monetary targeting, by contrast aims at achieving price stability by setting and following intermediate targets for growth of various monetary aggregates, such as M2, at a periodic frequency (usually quarterly). However, it is not only the focus on price stability, but also the exchange rate flexibility, which are important for the development of well-functioning money markets (Box 8:).

In the context of emerging and frontier markets we observe a continuous move away from ERT and MT towards the enhanced monetary targeting (EMT) and inflation targeting-lite (ITL).⁹ Specialist Inflation Targeting regimes are becoming increasingly popular – even in the absence of meeting the criteria necessary for full-fledged IT regimes – and we can expect this trend to continue, following a similar experience by more advanced emerging market economies in 1990s and early 2000s. Box 2: provides some reasons for this trend.

Under EMT broad money is retained as the intermediate target, and periodic review of actual outcomes serve as the basis for assessing the need to modify the stance of monetary policy. Day-to-day monetary operations aim at stabilizing short-term interest rates (rather than achieving a reserve money target as is the case in conventional monetary targeting).

An Inflation Targeting Lite regime is an eclectic approach to inflation targeting, which emphasizes a special role for the exchange rate in the economy.¹⁰ ITL is typically characterized by having an explicit inflation target, using FX interventions to smooth market movements, but not fighting

⁹ However, in practice there is a continuum of monetary regimes in between that can be characterized as flexible regimes combining elements of monetary and economic analysis or FX intervention and an inflation target (i.e. two-pillar frameworks), see Laurens (2014).

¹⁰ Stone (2003)

fundamental shifts, as there are no FX targets. The interest rate policy is primarily used to target inflation, but on the margin the exchange rate consideration is also important.

Money markets play a crucial role in the process through which the operational targets affect the intermediate targets, and eventually the real economy and the ultimate objective, which is referred to as a transmission mechanism. Specific channels of monetary transmission operate through the effects that monetary policy has on interest rates, exchange rates, equity and real estate prices, bank lending, and firm balance sheets. Many of these channels work through the money market whereby changes in the market operations of central banks propagate through the money market to markets which directly affect spending decisions of individuals and firms, e.g. the bond market and the bank loan market. In the absence of a functional money market, the transmission of short-term money market rates to longer-term bond rates and to the marginal cost of loan funding will not work properly, and banks will adjust their lending and deposit rates only partially or with a lag.

Different frameworks have different demands on the money markets and their sophistication, because they accentuate different channels. Inflation Targeting is the most demanding, as the main operational variable is the money market interest rate and the main transmission channel involves movements in the long-term yield curve based on the markets expectations about the evolution of the short-term money market rates (see later in the text and Box 28:). For this reason, some literature argues that IT can only be implemented under well-functioning money and financial markets. On the other hand, money markets are less exigent in ERT frameworks, which can rely on the direct channel through the FX interventions and an exchange rate pass-through to inflation.

While it is true that the degree of money market development can be an important factor shaping the choice of the monetary framework, the process also works the other way round and different frameworks affect the money market development differently because of the different channels involved.

Experience from the last two decades suggests that the building of IT regimes is associated with an especially rapid development in the money and financial markets and a reduction in the extent of dollarization of the economy as a whole. Focus on inflation and interest rates reduces the uncertainty in both, leading to lower risk premiums and facilitating the development of the markets. As we will explain in Chapter 2:, the central bank is very active and predictable in providing and withdrawing liquidity to the market, ensuring that the money market rates stay close to the level of the operational target. The level of the interest rate operational target itself is linked to the inflation forecast – a link, which is a subject of intensive communication of the central bank and a scrutiny from the markets, helping make the path of the future interest rates predictable. Due to this predictability, changes in the policy rate, when clearly communicated and understood, will have a greater impact on market rates.

ERT is not as conducive to deep and liquid money markets, which are not a necessary conduit for the policy transmission goals. ERT central banks often do not manage money market liquidity too actively, the liquidity fluctuations being a by-product of the FX operations. The absence of an active and predictable central bank leads to market volatility and uncertainty, reducing volumes and increasing premiums and spreads. ERT regimes are prone to an accumulation of unhedged FX-positions and ruptures in financial markets, if large shocks cause shifts in the exchange rate, causing liquidity squeezes, reducing volumes and market making activities, and shortening of money market

transaction maturities. As we show in an appendix, the explicit exchange rate guarantees inherent in ERT frameworks also encourage the use of an alternative foreign currency in transactions and as a store of value, thus leading to dollarization of the money and financial markets. And while the money markets can also function in a foreign currency, the market making role of the central bank is circumscribed by the size of FX reserves and thus the markets tend to be more volatile. MT regimes treat liquidity operations in the money market as central to the policy transmission and they focus much less on the stability of the interest rates, which happen to be rather volatile as a result. High volatility of short term rates obfuscates the monetary policy signal¹¹, therefore it makes the transmission to longer rates uncertain, which results in a premium on long-term rates. This hinders the development of a yield curve and money market instruments but in extreme cases results in the total lack of a long term market.

This is not to say that a money market development is irrelevant under ERT or MT. In many cases these frameworks served as a spring board for a transition towards IT-like regimes, accompanied by intensive efforts to develop the money market. A survey of country experience in the next section shows that the implementation of the interest rate operational targeting was often taking place under pegs and monetary targeting without a regime transition in mind. The Czech Republic, for instance, followed monetary intermediate targets for a brief period after the shift to floating, when the interest rates were already the main instrument and operational target.

Nevertheless, both ERT and MT reduce the incentives for strengthening money markets, because they do not require all the functions money markets can provide. Especially the flexible exchange rate provides an essential stimulus for the development of LCY money markets, as we explain in Box 8: of Chapter 2).

Box 2: Why inflation targeting?

Inflation targeting has become increasingly popular over the last 25 years as a collection of practices regarding monetary policy and how to achieve price stability with a flexible exchange rate. Today more than 30 advanced, emerging and frontier economies subscribe to some form of inflation targeting. The examples include Canada and Japan among the advanced economies, Brazil and Russia in the emerging markets, and Moldova and Ghana among frontier market economies. Others, including the Fed and the ECB – while shying away from official declarations – nonetheless follow practices closely resembling those of the IT.

The proponents of IT appreciate the focus on anchoring inflation expectations through continuous building of credibility of the price stability mandate, more flexibility in responding to shocks and lower economic costs of monetary policy errors than with alternative regimes.¹² The practice also shows that IT regimes are remarkably stable and resilient compared to the alternatives.

¹¹ Unlike in IT regimes, the link between liquidity operations (the instrument) and broad money aggregates (intermediate target) in MT regimes is not very transparent, as the monetary targets are frequently revised and missed. These misses are sometimes deliberate when the macroeconomic situation would make the attainment of the target undesirable while at other times they are simply due to the high volatility of the velocity of money and the money multiplier, which in turn is the result of shocks to money demand. Consequently, MT is a highly challenging exercise in terms of both operations and communication as it is difficult to explain these misses as well as the changes in the monetary targets in terms of reaching the ultimate objective of price stability.

¹² Batini, N., K. Kuttner, and D. Laxton, 2005, “Does Inflation Targeting Work in Emerging Markets?” World Economic Outlook, Chapter 4, IMF.

The apparent popularity of IT regimes is understandable from the perspective of political economy. In the absence of a commodity standard or a hard peg, the monetary regime may exhibit greater susceptibility to short-term political pressures, e.g., boosting the money supply in order to finance government deficits or stimulating the economy in advance of a major election. These considerations provide a strong rationale for establishing a monetary policy framework in which the central bank has a clear legal mandate that assigns primacy to the goal of price stability. From the theoretical point of view, inflation is a monetary phenomenon and the central bank thus has the full control over it in the medium run, whereas real objectives – including the growth of employment and the longer-run level of the real exchange rate – are largely determined by nonmonetary factors and the central bank has no lasting effect on them.

Chapter 2: Role and function of the money market

A. Why money markets are important

In every economy money markets play several important functions. They help in managing liquidity and reducing the liquidity and interest rate risk of commercial banks, provide a source of funding and facilitate pricing signals by setting the marginal cost of funding, and serve as the starting point in the monetary policy transmission mechanism and efforts to safeguard liquidity and stability of the financial system.

In EM and FM economies the importance of deep and liquid money markets is more pronounced by the fact that most of the financial sector functions are served by commercial banks. The core of the money market in these economies is represented by the interbank market for central bank liquidity. The principal players are the commercial banks, the central bank and the government (see Section D in Chapter 5:), and only occasionally do other financial sector institutions or non-financial (corporate) entities also participate.

From a macroeconomic perspective of these economies, the commercial banks play a critical role in creating money and deposits (see Box 3:) and also in extending loans matching the needs of the borrowers and investors. A deep and liquid inter-bank money market supports the commercial banks in this financial intermediation function and in particular in the maturity transformation between savings and investments. By moving and managing liquidity among banks, money market transactions reduce liquidity and interest rate risks on a bank balance sheet. At the same time, the fact that the commercial banks play a dominant role in transforming savings into investments in the financial systems of the emerging and frontier market economies is one of the key drivers of money market activity.

Box 3: Commercial Banks as Creators of Money and Savings

Unlike the popular wisdom, commercial banks' main function is not to intermediate savings and investments, but to create money and savings.

In the traditional view, banks take in deposits from a large number of savers (mostly households but also companies) and channel these funds to profitable investment projects.^{13 14} This view rests on the assumption

¹³ An even earlier view, the "real bills doctrine" was that commercial banks provided working capital, not investment funds.

¹⁴ Cœuré (2012)

that the central bank directly manages aggregate money and credit stock in the economy, therefore, it is conceptually influenced by the central bank practices of following monetary or reserve money targeting rules. According to a more modern view, commercial banks create money (deposits) through lending. It rests on the fact that modern central banks do not target money and credit directly and will accommodate all liquidity needs emanating from the money creation (i.e. lending activity) of banks.

Formally, in a fractional reserve system, the banks always create money and in fact the bulk of the money stock is comprised of deposits with commercial banks. When a bank extends a loan to its customer it will create a deposit of equal size on the borrower's account at the same time as liabilities and assets should match continuously. It will have to increase its balances with the central bank by a certain percentage of the deposit¹⁵ it created (the fractional reserve) and this will represent an overall increase in reserve money as the central bank will provide the necessary additional liquidity.

The view that banks act simply as intermediaries, lending out the deposits that savers place with them, i.e. households create deposit by saving, is intuitive but wrong. When households choose to save more money in bank accounts, those deposits come simply at the expense of payments to companies for goods and services, which in turn would be deposited by the firms at banks. In other words, once created through the lending activity of commercial banks, the deposits stay in the domestic banking system and can disappear only in special circumstances: a) loan repayment, b) withdrawal in cash, c) payment for goods and services abroad.

Financial Intermediation and Maturity Transformation

Financial markets and intermediaries develop because they provide economically valuable services. They enable the transfer of capital from savers to borrowers, making it less risky, more convenient and more efficient. To a great extent they do this by transforming the form of capital in a way which makes it more attractive and valuable to both savers and borrowers.

Financial transformations are necessary because the needs and preferences of lenders and borrowers will seldom coincide. Most borrowers need to borrow for relatively long periods of time, whereas lenders prefer to have their money readily available. This can take several forms including denomination transformation, maturity transformation, and risk transformation. The simplest case of denomination transformation is where a bank aggregates a large number of small deposits, and transforms them into a sum large enough to lend to a corporation seeking to build a new factory.

From the perspective of the money market activity, perhaps the most important transformation is maturity transformation. Most lenders prefer to have ready access to their savings, whereas borrowers typically need assurance that they will have access to capital for a sufficient period to fund their projects or business. Maturity transformation enables both to meet their needs and in the EM and FM economies it takes place chiefly through commercial banks. A crucial prerequisite to the maturity transformation process is a stable funding base. Pooling a large number of diversified deposits enables banks to on-lend to borrowers for periods longer than any individual depositor would be willing to tie up his funds. The money markets are the conduits allowing the commercial banks to perform the maturity transformation function. They grow naturally, as the maturity transformation forces the banks to shift the liquidity around and manage the related risks.

¹⁵ It is usually low single digit and occasionally even voluntary in developed countries, but in EM countries it may be as high as 30%, and the ratios on domestic and foreign currency liabilities may differ by a wide margin.

It is important to note that maturity transformation involves both liquidity and risk matching, and both provide impetus for the money market development. Liquidity matching is needed as a result of the mismatches between the variable size of the liquidity available from the deposit pool and the timing of loan disbursements and repayments.

Risk matching is provided by tenor extension by banks extending a long-term fixed or (to a less extent) variable rate loan to a borrower. The borrower will usually want to know the cost of capital for a longer period of time than a depositor or small investor is willing to commit to, so the bank performs an intermediary role. Managing this interest rate mismatch is a key function of the bank and requires well-functioning money and derivatives markets and predictable interest rate policy of the central bank underpinned by a well-functioning system of operations (See Section B later in the chapter).

In the absence of well-functioning money and derivatives markets, banks may prefer to minimise the interest rate risk they are taking when performing maturity transformation by extending variable-rate loans to borrowers only (no fixed rate loans). Whilst this is preferable to no longer term financing facilities at all, the resulting interest rate risk will then inevitably be passed on to the borrower, which may inhibit the investment activity in those projects, for which it is important to know the funding costs over the life of the transactions. In general, all sectors of the economy benefit from a choice of competitively priced fixed or floating loan facilities resulting from a developed money market.

Managing liquidity

Liquidity is managed and priced in money markets, first and foremost in interbank markets. Liquidity in a narrow sense is equal to the balances held at the settlement (current) and reserve (including free and mandatory) accounts kept by commercial banks at the central bank.¹⁶ The reason for this definition is that the balances at these accounts can be used in settling commercial banks' obligations (to other banks, the government, the central bank or – indirectly – to any other domestic resident entity). The liquidity of all other assets and financial instruments is defined by how fast they can be converted to balances held by commercial banks at the settlement accounts of the central bank (or cash).

Box 4: The mechanics of liquidity management

The central bank is the bank of commercial banks, so commercial banks hold various accounts with the central bank, not just the settlement and reserve accounts. In a broader sense, liquidity may therefore also be defined as to include all net balances held by commercial banks at the accounts with the central bank, including the holdings of deposit facilities and open market instruments issued by the central bank. The reason is that the moves from one account at the central bank to another can often be done relatively quickly and easily.

It is important to realize that the total liquidity stock (in the broader sense) in the financial system cannot be changed unilaterally by an action of the central bank or a commercial bank. There must always be a transaction between the two involving some other asset. In practice, in many EM and FM economies the total liquidity stock changes most often through FX operations with the central bank. When the central bank buys FX from the commercial banks it is adding to LCY balances the banks hold with it and vice versa. The

¹⁶ In developed countries reserve obligations can be fulfilled using the settlement accounts.

composition of the liquidity between the narrow and broader definition can also change as a result of the central bank operations with commercial banks in LCY, such as when the commercial banks use the standing facilities of the central bank or participate in its open market operations using domestic financial instruments.

It is the liquidity at the settlement balances, which is exchanged in the trading in the interbank money market. Whenever a payment is made by a client of a bank to the client of another bank there should be a matching transfer between the two banks using their settlement accounts at the central bank. There are millions of transactions each day and at the end of the day some banks will have to send money on net terms to other banks while others will receive money on net.

Liquidity managers at a commercial bank need to make sure that the balance at its settlement account at the end of the day is sufficient to meet all settlement obligations falling due. Many of these liquidity needs can be forecasted in advance, because they have a predictable pattern reflecting the period of a year or month. For instance, wages are typically paid at the beginning of the month, taxes are paid towards the end, and so forth. Sometimes, however, liquidity needs will arise from an unexpected event, such as a single large transaction of an important client.

Liquidity management of banks uses the money market to smooth out the fluctuations in liquidity needs (see Box 4:). When the market participants are sufficiently heterogeneous in term of their clients and business activities, there is a good chance that the liquidity deficits of some banks can be paired with the liquidity surplus by other banks at any given day.

For each bank, periods of a liquidity surplus may be followed by periods of liquidity deficits and they can use a number of different transactions and instruments for managing these cycles, including secured and unsecured loans, government T-bills, short term central bank securities and so forth.

Without an interbank money market, managing liquidity would be much more difficult. Banks would have to rely only on their internal resources or the central bank, and to avoid potential liquidity gaps they would need to hoard excess liquidity. Such behaviour is not uncommon during crisis periods even in developed markets, as the situation among Eurozone banks after the GFC shows (see Box 13:). This would be increasing the price of liquidity at expense of a depressed lending activity and subpar growth in the economy. Without the ability to tap interbank markets, banks that do not have excess liquidity would often be forced to process their client transactions with multiday delays so as to find matching transactions within their own client base and thus minimize the recourse to the interbank bank. While clearly not efficient, such practices still exist (also in the FX spot markets) in many economies with shallow financial markets.

Box 5: Interlinkages with the FX-market

Spot FX transactions of commercial banks with the central bank are a major source of liquidity creation and destruction in most money markets in EM and FM economies, as FX operations are an important policy instrument in practically all policy regimes. Market participants in these economies are usually selling foreign currency (FCY) as they need more local currency liquidity with the growth of the economy and lending to satisfy MRR and settle their clients' transactions.¹⁷

Countries with un(der)developed money and financial markets often lack sufficient long term financing in local currency, forcing banks and non-bank financial intermediaries to longer term FCY funding sources that, in turn, are converted into LCY funding through NDF markets (where existent) or through FX-swaps with domestic

¹⁷ Except in cases of high level dollarization.

counterparties with enough LCY liquidity. Despite their short maturities and roll-over risk, FX swaps have become an especially popular source of LCY liquidity and funding in many EM money markets with insufficient volumes of collateralized instruments (e.g. when the government does not issue a sufficient amount of securities).¹⁸

At the same time, rather than searching for complicated ways of securing long-term financing in LCY, an alternative business strategy of providing FCY-denominated and linked instruments has become very popular in many EM economies, also because of lower interest rates, which made such loans seemingly cheaper (ignoring the FX risk) than the LCY alternatives. For instance, in Hungary, FX-linked LCY mortgages were financed by rolling over shorter FX-swaps with foreign counterparties.

During the GFC, liquidity stress was transmitted through foreign exchange markets in both EM and developed economies. After the Lehman default, counterparty risk jumped to extraordinary levels globally and many financial market segments dried up, including the interbank markets and FX-swap markets. In Hungary, for instance, the FX-swap market also dried up and as the CB did not have enough FCY-reserves. Hungary needed to turn to the IMF for assistance, but also relied on the “Vienna initiative” agreement that temporarily stopped the syphoning off of funds by parent banks from local subsidiaries.

Even EMs with stronger fundamentals struggled. In Mexico, the illiquidity in the foreign exchange market led to liquidity stress in the Mexican peso, exacerbated because of the prevailing hedging practices of Mexican corporates (e.g. options with knock-out clauses). In order to restore market functioning, the Bank of Mexico intervened in the foreign exchange market with more than a third of its foreign exchange reserves. Confidence among market participants was only finally restored when the authorities arranged swap lines with the Fed and activated the Flexible Credit Line (FCL) with the IMF.¹⁹

The crisis confirmed that central bank liquidity support in foreign currencies is fundamentally different from that in the domestic currency. Ultimately, market perceptions of a country’s solvency limit the ability of the central bank and the government to provide liquidity insurance in a foreign currency, even if they boost their precautionary FX-reserves holdings pre-emptively.

Money markets thus contribute to a reduction in the liquidity and credit risk premium for financial market participants, allowing for a smooth functioning of the payment system. Stable financing conditions in the economy are paramount for financial stability. If credit or liquidity risk gets very high, such as after the Lehman collapse, then most other financial markets stop working normally and some stop working completely. Liquidity and credit risk refer to different type of risks but they are correlated, especially when financial markets get distressed, and liquidity risk can easily transform into credit risk.

Trust among the market participants is an essential element of functional money markets. This is especially true for the unsecured money markets, where loans are uncollateralized, which means that interbank lenders are directly exposed to losses if their counterparty, does not repay the loan. To ensure that unsecured loans are paid back, lenders have an incentive to collect information about borrowers and to monitor them over the lifetime of the interbank loan. In this way, unsecured

¹⁸ A major drawback of the FX swap operations in EM and FM is their short maturity, increasing the roll-over risk, which may materialize especially during crisis periods, when the central bank will start mopping up the LCY liquidity from the market. This may be an especially serious issue in the case they are used to finance investments into government papers (in a search for a higher yield in a carry trade – See Chapter 6). A sudden reversal of these “hot” money inflows may expose the roll-over risk of the government’s financing.

¹⁹ BIS (2014)

money markets play a key peer monitoring role- everybody is watching everybody else.²⁰ The information banks acquire about each other may not be readily available to regulatory authorities and central banks and it may actually be the first sign of a bank getting into trouble when its limits are cut so they cannot get funding from the interbank market and are forced to turn to the central bank.

In secured money markets, the credit risk is mitigated by collateral and the haircuts on collateral values. The most typical collaterals are government securities (used in repo and reverse repo, or securities lending) and foreign currency (used in FX-swaps). This reduction in the credit risk facilitates credit extension, but it also requires borrowers to acquire, manage and hold collateral.

Pricing and financing conditions

Developments in money markets affect the financing conditions faced by non-financial corporations and households. Money market rates, such as LIBOR²¹, provide benchmark rates for the pricing of fixed-income securities, loan contracts and long-term interest rate and FX swaps and forwards throughout the economy. Many of the long term mortgage and project finance loans with a variable interest rate tie their interest rate to some money market reference rate. Without a relatively stable money market and low volatility of the short-term rates, the pricing of longer term assets and liabilities and the derivatives used for hedging would be uncertain. Therefore, these markets would not exist or would not be deep enough, the housing mortgage market would remain underdeveloped and project financing would be less efficient.

This is because the interbank market interest rates represent the marginal cost of funding for bank loans (or alternatively, marginal return on assets) and therefore the starting point of pricing deposits and loans. Banks still extend a large part of the total credit in the economy – more so in Europe where the bulk of financing is done through banks but even in the US where capital markets have a similar weight.²²

Box 6: Pricing of bank loans and deposits using transfer pricings

Banks determine the interest rates on loans and deposits through an internal pricing approach called funds transfer pricing (FTP). This mechanism tries to account for the cost of funds for the bank's business taking the relevant risks, like liquidity, interest rate and currency risks, into account. FTP is carried out by the treasury function of the bank.

The treasury function will usually assign a transfer price for a particular loan or deposit product based largely on the bank's funding costs (of the relevant maturity),²³ the bank's own credit, liquidity risk in the market and

²⁰ Rochet and Tirole (2011) and Cœuré (2012).

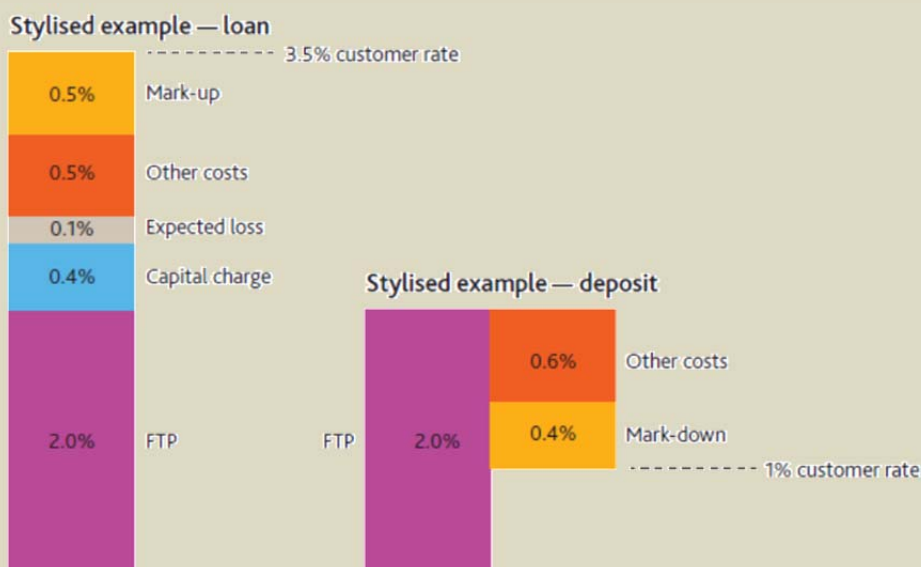
²¹ Although LIBOR stands for Londondon Interbank Offered Rate – it is also used generically to indicate a reference rate. To reduce confusion it has become the norm to differentiate it by country. As examples, BIBOR is the Bangkok Interbank Rate and TRLibor is the Turkish Lire Interbank Offered Rate

²² Some banks rely almost exclusively on wholesale funding through money markets although this is much less common in EM and FM economies. In principle, the only limiting factor of bank funding is the risk profile and the capital position, because the process of generating money and deposits (also for banks' funding) is in theory limitless (See Box 3:). However, an over-reliance on wholesale funding through the money market entails large financing risks for the individual banks as well as for financial stability for the economy as a whole, especially when the markets are not very developed.

²³ The marginal cost of funds is usually linked to the interbank rate. However, recently there is a trend towards using more complex methods that take other important sources of funding, e.g. deposits and wholesale secured funding, into account, as well, but the unsecured interbank rate will still be an important factor.

the bank's strategic priorities to incentivize certain types of lending or deposit-taking. A business line will decide the rate at which to extend loans or raise deposits, taking the transfer price into account. The lending arm will lend typically at a spread above the transfer price while the deposit-taking arm will price deposits with a spread below the transfer price.

Stylized examples of loan and deposit pricing²⁴



The size, the turnover and the cost of funding in money markets have a significant impact on the size of the balance sheet of financial institutions and the amount of credit they can extend. As such, money markets can contribute to pro-cyclicality and the so-called leverage cycles: at times of generalized optimism, high asset valuation, low haircuts and abundant liquidity in money markets can lead to higher leverage and credit expansion, whereas when adverse shocks hit the economy asset prices drop, haircuts increase and liquidity can dry up.²⁵

If liquidity dries up, it can force banks to de-leverage, thus affecting the supply of bank credit. Asset liquidation can impose externalities on other players in the financial system through fire sales and financial contagion – which is hugely value destructive and can take several years to remedy (see Box 19: about the Northern Rock debacle).

Monetary policy transmission

From the monetary policy perspective, money markets play a central role in monetary policy transmission because of the effects money market rates have on other interest rates and for other important macro variables in the economy.²⁶ When money markets function normally, the central banks can influence the longer-maturity rates by steering very short-term money market rates to keep them stable and close to the official policy rates. By focusing on stabilizing long term inflation the CB interest rate policy becomes predictable and the expected evolution of the short-term money

²⁴ Cadamagnani et al (2014).

²⁵ Geanakoplos (2010) and Coeuré (2012).

²⁶ The interest rate (in real terms) is a central variable of the economic theory, as it influences the behaviour of firms and household in their investment and consumption decisions and as a consequence affects future growth and inflation. Interest income in itself may be an important part of overall income. Changes in interest rates bring changes in wealth through the discounting of future cash flows (of both fixed income securities (bonds), and equities) and will cause changes in debt service, therefore affecting the assessment of the sustainability of debt levels and the solvency of borrowers.

market rates will be priced in the fixed income and other securities. A smooth functioning of money markets therefore guarantees that the impulse of monetary policy is transmitted across the financial system and to the real economy without impairment.

The development of the money, FX and other financial markets also provides important feedback loops for the evolution of the monetary policy frameworks. For instance, the development of the FX derivative and FRA markets puts pressure on the central bank to become more transparent about its policy course. Increasing transparency also indirectly fosters the lengthening of maturities and the reduction of the longer term risk premiums. By having longer term markets the central bank can get feedback about its perceived credibility and effectiveness in lowering inflation. This would make it easier for the CB to devise a communication strategy that can further stabilize expectations.

B. Central Bank in the Money Market

The capacity of the money markets to transmit monetary policy intentions depends not only on the monetary policy and exchange rate regimes, but also on the operational behavior of the central bank in the market. Various aspects of this behavior have profound implications on the activity and development of money markets and on their capacity to transmit policy intentions.

Under exchange rate targeting, liquidity is overwhelmingly managed through FX-transactions (spot, forward and FX-swap) with the central bank, so there is not much need for sophisticated local currency money markets and domestic interest rates become practically determined by the interest rate arbitrage (see Box 28:). On the other hand, targeting reserve money through liquidity volume operations is subject to frequent money demand shocks, which can lead to volatile and uninformative interest rate movements making the transmission of policy along the yield curve difficult.

Market Making and the role of the Central Bank

For the money markets to function properly, they must have a backstop in terms of a market maker of the last-resort and a guarantor of solvency and trustworthiness of the market participants. Central banks are the best informed actors in the money markets, and especially so in the EM and FM economies. As such, it is natural that they act as the market makers upholding the market activity, mitigating the pricing risks and, at the same time, ensuring that the participants are liquid and solvent.

In an effective money market potential market participants know with reasonable precision and without much effort the cost of depositing or borrowing liquidity. Trading is also facilitated, if the difference between the buy and sell price (the bid/ask spread) is low, because market participants know that if they sell the excess liquidity, it will not be too costly to borrow it back in the case a sudden need arises. It also means that the buying and selling prices are closer to the average price of liquidity and hence traders do not lose much compared to this average price, when they engage in trading.

A practical manifestation of transparent pricing is various money market interest rate indices, such as LIBOR, EURIBOR or others, which should be representative costs of liquidity on a given maturity. If these indices are widely respected as representative at very short (say 3 month) maturities, then

they can be used in prolonging the maturities of interbank transactions. They can be used as reference rates for longer-term credit floating rate contracts where the amount of interest is linked to the changing value of this reference rate, normally on a rolling three month basis. Furthermore, when the reference rate is relatively predictable, fixed rate instruments can develop as traders can better assess and absorb the interest rate risk, and a yield curve develops. Having LT fixed interest rates allows market participants to engage in financing long term business ventures and investments like housing and other investment projects with a greater degree of certainty as to their funding costs

Central to transparent price formation are market makers. Market makers are firms that stand ready to quote a price and trade specific instruments on a regular and continuous basis. If there are no such firms, the price of liquidity can be unclear and the markets tend to be very shallow, because it is costly to find out whom to trade with and at what price. Market makers are also the source for the benchmark reference indices.

The market making function is often a core responsibility of the primary dealer (PD) network, particularly in EM and FM. Primary Dealership is usually part of a formalized arrangement by the Central Bank and/or the issuing agency in charge of issuing and developing the government securities markets. PD can be drawn from both inside or outside the banking sector although in bank dominated financial systems they tend to be drawn from units or subsidiaries of existing banking groups. Finding regular market makers for unsecured interbank money markets can be more challenging as unlike securities, unsecured deposits cannot be sold, they have to stay on balance-sheet until maturity.

For market making to develop the markets must have sufficient volumes and the price of liquidity must not be too volatile, lest the market makers risk large losses. While the bid-ask spread is a compensation for the risk market makers take, it is often not sufficient in money markets during the earlier stages of market development where transactions volumes are light and uneven order flow creates volatility in pricing. In the times of stress, market makers may need to increase their bid-ask spreads to cover for larger possible losses or withdraw from market making completely.²⁷ At such moments, the money market usually collapses without the support of the central bank.

Central Banks and Government Issuing agencies should recognize these risks and look to create incentives in exchange for continuous price making by primary dealers in both government securities and related money market instruments such as repos. A successful primary dealer ship arrangement normally has a set of well-defined obligations and rights that accrue as part of the relationship. In exchange for price making in nominated instruments the PD may have special rights such as preferential access to the government security auction process, lender of last resort privileges, flexible collateral pledging arrangements with the central bank and securities and cash intraday overdrafts.

²⁷ It may also happen, however, that bid-ask spreads are unnaturally low, given the objective risks in the market, which may signal the market makers' misunderstanding of risks or reflect outdated trade conventions and a regulatory environment. In the emerging market context, such a situation may arise especially in the transition periods, when the central bank's behavior is changing between various policy regimes or when the regulatory environment is being overhauled.

The process of introducing a PD network is a delicate balancing act. If PD privileges are too generous then the PD can make extra normal profits and undermine confidence of other market participants in the system. However, if the obligations are too onerous, large losses can accrue from the PD function and force PD to exit the market making functions.²⁸ Any initiative to develop a PD network also needs to consider ancillary measures that limit the potential risk of collusive behavior between PD, including the specification of a government tender auction award system that encourages competition, amongst others.

Even with a formalized primary dealer system, the central bank remains potentially the most important market maker in the money market, especially in LCY money markets, where they backstop the market. It is the monopoly supplier of liquidity, in practice on any reasonably short maturity. Most central banks provide daily bid and ask spreads for unlimited quantities on the O/N maturity and are ready to step-up their market making role in case of serious market disturbances. Most recently, as a consequence of the GFC, the calls for the central banks to become the so called Market Maker of Last Resort (MMLR) have intensified (see Box 7:). This kind of operation is beyond the standard liquidity provision role of the central bank, but still rests on the CB's monopoly over liquidity supply. Nevertheless, MMLR also raises important moral hazard issues.

Box 7: Market Maker of the Last Resort

The Lender of Last Resort (LOLR) role of central banks entails emergency liquidity assistance to financial institutions in times of stress or crisis. When banks were the main providers of credit, the principle of the LOLR facility was that the Central Bank would lend freely (to banks), at a penalty rate and against collateral that would be good in normal times but may be impaired in times of crisis.²⁹ However, financial markets and non-bank financial institutions now provide a large chunk of credit and other forms of finance to non-financial corporations (and to financial institutions, as well). Credit is increasingly collateralized, provided through the issuance or the acceptance of tradable financial instruments (see also Box 21: on Shadow Banking). In an environment of collateralized funding the availability of collateral assets, rather than money market spreads, determines liquidity conditions.

As the US subprime crisis demonstrated, collateralized credit markets are driven by trust in collateral, not by trust in institutions, which makes the system inherently unstable because the value of collateral is endogenous. The value of the collateral asset depends more on the market's demand for collateral rather than the fundamental risk-return characteristics of that asset. This makes the collateral value highly pro-cyclical over a financial crisis, amplifying the real consequences of such crisis. In the US crisis example, the value of the collateral collapsed, as everyone tried to realize and sell the collateral at the same time, throwing the financial sector and the real economy into a downward spiral.

Therefore, a credit crunch or liquidity crunch today manifests itself as disorderly financial markets. Uncertainty leads to little or no trading in certain classes of financial instruments (like ABSs or CDOs of US subprime mortgages during the financial crisis), because there is no market maker with both the knowledge to price these financial instruments and the deep pockets to credibly post buying and selling prices.³⁰ The solution to this problem is that the central bank becomes the market maker of last resort (MMLR). The MMLR function can be fulfilled either by outright purchases and sales of a wide range of private sector securities, or by the

²⁸ This is not an EM or FM issue. Credit Suisse announced in October 2015 that it was exiting all European Primary Dealer roles as new regulatory rules were making the PD function uneconomic.

²⁹ Bagehot principle

³⁰ Buiter and Siebert (2008)

acceptance of a wide range of private sector securities as collateral in CB operations. Central banks can ensure that collateral already accepted in the market remained liquid by standing ready to quote two-way prices for the collateral assets at bid-ask spreads that are wider than in normal times but much narrower than in a crisis situation. Central bank collateral transformation (i.e. replacing private assets with CB liabilities) becomes vital.

As the market maker, the central bank has a leading role in affecting the pricing transparency and spreads (transaction costs), and thus the trading activity in the money market. Modern central banks therefore try to set-up their operational system so as to minimize the short-term volatility of market rates and choose their frameworks to make the future evolution of rates more predictable. This will not only contribute to the development of money markets, but also facilitate the transmission of the monetary policy instruments through the markets and financial system to the rest of the economy.

Operational variables and operational framework

As explained in Chapter 1:, in any monetary policy framework monetary policy is conducted by setting targets for various financial sector variables – operational variables – and using various operations as instruments in achieving these operational targets. The operational variables are variables under which the central banks have good control in that particular framework. Although practice can be much more varied, the three basic choices of variable are the exchange rate, the banks' aggregate liquidity and the short term interest rate. We will refer to the three monetary policy operational frameworks as exchange rate operational targeting (EROT), traditional reserve money targeting (RMT) and interest rate targeting (IRT) respectively. As we explained in Table 1, these operational variables can in principle be used to support any monetary policy regime, including ERT, MT and IT.

Exchange rate operational targeting

Exchange rate operational targeting amounts to conducting operations in FX with commercial banks, the government and eventually other entities, so that the interbank exchange rate is close to the target level. In an extreme case, the central bank will accept all bid and ask requests from commercial banks at the target rate. EROT has profound implications on the money market, because every FX operation with the central bank automatically changes money market liquidity.

An EROT CB can also use the money market in reaching the exchange rate target: by conducting operations with commercial banks through its main instrument or fine-tuning tool, it will increase and decrease LCY liquidity and thus affect the demand for FX in the interbank market. Although this method is much less precise in reaching a particular level of the exchange rate than outright FX interventions, it is nonetheless used widely and especially during periods of currency pressures.

Nevertheless, as we explain in Chapter 1 and Box 8:, fixing the exchange rate is fundamentally inconsistent with a development of deep and well-functioning money markets, as it distorts the incentives for moving LCY liquidity and currency allocation in the entire economy, and makes the money market a residual activity.

Box 8: Why a flexible exchange rate?

A flexible exchange rate provides an essential stimulus for the development of LCY money markets. The absence of exchange rate flexibility distorts the incentives of currency allocation in the entire economy and

money markets are one of the victims of this distortion. A credibly fixed exchange rate reduces the motivation of the population to save in LCY and thus promotes the extension of FCY credits even to households and businesses whose income is only in LCY. This creation of unhedged short positions exposes the household and corporate sectors to sudden swings in the exchange rate, thus putting moral pressure on the central bank to keep the exchange rate fixed.

This vicious circle creates moral hazard permeating the entire economy. While the banking sector's balance sheet (typically) has a closed position, it is still exposed to currency fluctuations through the heightened credit risk of its clients to adverse exchange rate movement. Yet, the systemic moral hazard enables the banking sector to underprice this risk, because they rely on the safety net of the central bank to keep the exchange rate unchanged. Households and corporates are more than willing participants in the mispricing as it enables them to pay lower nominal interest rates on FX loans than would be on the equivalent LCY loans. Box 17: further elaborates on how currency blind regulation reinforces the economy-wide moral hazard and financial dollarization.

Unlike in the flexible exchange rate, the main role of the central bank in a fixed exchange rate regime is to provide FX and not LCY liquidity. The central bank becomes the market maker of the last resort in the FX market with FX currency, of which it has only limited reserves, instead of being the market maker in the money market with LCY liquidity, of which it is the monopoly supplier. This makes the entire economy prone to boom and bust cycles as well as other exogenous events over which it has no control. .

As a consequence of exchange rate fixing, the local money market liquidity becomes residual to FX transactions of the central bank and the money markets stop playing their systemic role. The main focus of interbank transactions becomes the movements in FX liquidity and the future development of the exchange rate instead of the LCY interest rate. Domestic interest rates become necessarily more volatile and instead of guiding the expected exchange rate movements and the macroeconomic development (through the interest rate arbitrage), they become a derivative of the exchange rate policy (as evidenced from the behaviour of prices of FX swaps and forwards, see Box 28: in Chapter V).

In such circumstances, the money markets cannot really perform its role of supporting the maturity transformation in LCY: the money market rates do not reflect the macroeconomic situation, the LCY deposit base remains thin and intrinsically unstable, and the CB cannot be relied on as a credible provider of LCY liquidity, which is a hostage to its FX operations. A development of long-term LCY financing instruments is a non-starter under such conditions.

Breaking this vicious circle is not an easy task, which explains many authorities' fear of floating. It requires good macroprudential regulation, enforceable FX risk management practices, and above all a credible alternative nominal anchor in the form of inflation. Targeting a low level of inflation would eventual lead to low nominal interest rates, making the LCY nominal interest rate payments on loans more competitive relative to the rates on FX products. With inflation targeting LCY interest rates reflect the domestic business cycle (rather than the situation with FX reserves) and become more predictable.

Reserve Money Targeting

In traditional RMT, the CB conducts operations to achieve a reserve money target on a periodic frequency, the same frequency at which the intermediate target is set. The CB will usually offer to commercial banks refinancing or liquidity absorbing instruments in fixed-quantity tenders to achieve this target. The quantities and frequency of these tenders can change depending on the underlying liquidity shocks and also following the reviews of the quarterly reserve money targets, which may

need to change periodically to absorb shocks to money demand and velocity of money so that the intermediate target and the final goal is met.

In practice, RMT countries often experience large short-term interest rate volatility, which is more or less inevitable due to the characteristics of the operational design. The RM target can be defined in terms of the level of the RM, which calls for a corrective action after a shock leads to a deviation from the target. Even a money demand shock in a given period would lead to contractionary monetary policy in the next period, which would be accompanied by large swings in interest rates. By contrast, a target in terms of a growth rate of RM would basically lead to automatic accommodation of shocks, as past misses of the target would not demand corrective actions. Money market interest rates could be more stable, *ceteris paribus*. Another frequent feature of RM targets is that they are set as end-of-period (usually quarterly) targets with little regard to managing liquidity on a day-to-day basis or to how these targets relate to day-to-day liquidity management. This leads to particularly pronounced end-of-period interest rate volatility.

The interest rates volatility is even higher, *ceteris paribus*, when the central bank operations focus on keeping reserve money on a pre-determined path on a daily, rather than quarterly or monthly, basis. This generates fluctuations in excess reserves and short-term interest rates due to daily swings in the autonomous factors such as currency demand. It is also quite typical that banks are required to meet their reserve requirement on a daily basis. As discussed in the next section on reserve averaging, this in itself would lead to large daily fluctuations in the O/N interbank rate. In theory, the CB can offset the effect of these autonomous factors, but in practice an inability to forecast autonomous changes in liquidity conditions makes these fluctuations unavoidable.

To complicate matters, although the RMT is primarily about quantities, the CBs are still worried about the volatility of the resulting money market interest rate and its alignment with what the CB considers the appropriate policy stance. Indeed, it is not uncommon to see extreme weekly volatility of the interbank rate under RMT, sometimes in the magnitude of over 1000 basis points. For this reason, the reserve money targeting central banks sometimes adjust their operations to reduce the volatility. If the resulting money market interest rate is too volatile and seems to be out of touch with the fundamentals, the CB will have a tendency to intervene, which will further complicate the transparency of its operations.

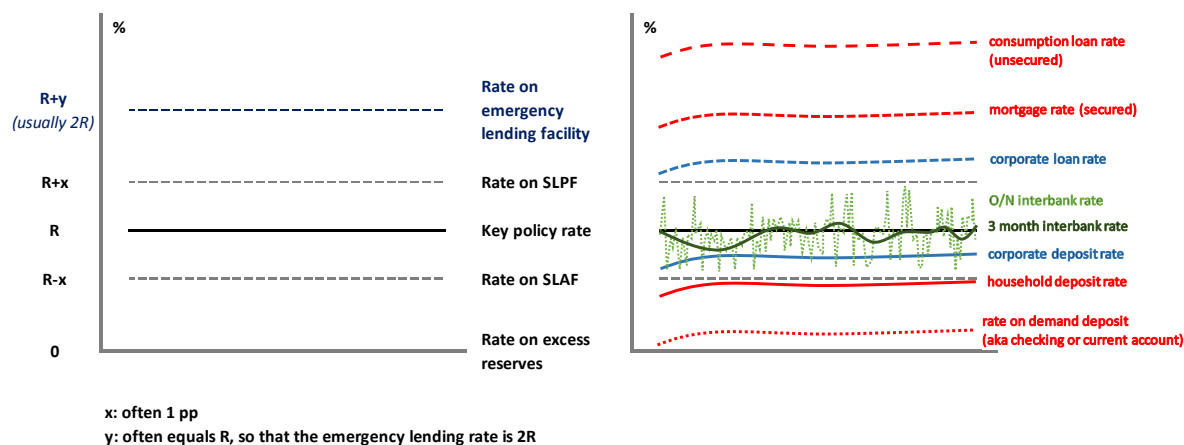
Under IRT the central bank targets the market interest rate directly using a signalling effect of its policy rate and by conducting liquidity operations in order to steer the relevant market rate towards the target level. IRT is the system of choice among inflation targeting central banks, although such banks also often use FX-interventions, as well.

The modern tool-kit of central banks

A modern system of monetary policy implementation is a capacity to control money market benchmark rates. This capacity affects the volatility of money market rates, bid-ask spreads of the other market makers and volumes of trading. It also affects monetary policy transmission, as the interest rate channel of transmission requires a deep and liquid money market, with large volume of transactions and continuous market making by several market participants. If the system works well, then the short-term interest rates fluctuate around a level chosen by the central bank within a specified corridor, and the level of this money market interest rate corridor then transmits into the

retail deposit and lending rates (see Figure 2: An illustrative stylized chart of the relative position of different central bank, commercial bank and interbank market interest rates for a stylized example).

Figure 2: An illustrative stylized chart of the relative position of different central bank, commercial bank and interbank market interest rates



To control the target interest rate at the appropriate level and, at the same time, reduce its volatility a modern central bank employs several main monetary policy tools that operate through or are facilitated by money markets. In the order of their importance for the money market activity, these are:

- Reserve averaging
- Key policy rate
- Main refinancing or liquidity absorption instrument
- Overnight or 1-day interest rate corridor (standing credit and deposit facilities)
- Fine-tuning operations

The first three tools are almost always a part of the central bank tool-kit. These may be complemented by fine tuning operations that inject or withdraw liquidity from the system at the central bank's discretion. Finally, an emergency lending or liquidity assistance facility (an instrument of the Lender of Last Resort (LLR) role of the CB) is also part of the tool-kit but this is seldom used for liquidity management reasons.

The above tools can be implemented utilising different types of instruments and through various operations (see Box 9:). For example, the main instrument can be a liability like a deposit, a reverse repo, a central bank CD, note or bond or an asset like a secured loan, repo, FX-swap. Because the toolkit is utilised to make an integrated whole in establishing a modern system of monetary policy implementation, and cannot really be introduced in isolation from each other.

Box 9: Classifying CB operations: OMOs and the rest

There is no universally agreed definition of open market operations (OMOs) but most often the term is used to refer to market operations conducted at the initiative of the central banks³¹, as opposed to standing facilities, whose use is at the initiative of commercial banks.

There are other applicable definitions, as well, used by international financial institutions dealing with monetary policy operational frameworks, e.g. the IMF³², but these are generally less useful from the perspective of building a modern system of policy implementation at emerging market central banks.³³

Traditionally, OMOs were conducted in the open market at the prevailing market prices and through bilateral transactions (classic OMOs). In the past few decades there has been a general tendency away from classic OMOs towards usage of multilateral auctions and a limited set of counterparties (primary dealers). The OMOs typically use the following instruments:

- CB lending (usually against collateral) through tenders³⁴;
- reverse transactions against domestic assets (repo and reverse repo of government or CB securities) or foreign assets (FX-swaps);
- outright sales and purchases of (government, CB or private sector) securities.

OMOs are basically equivalent to discretionary market operations of central banks and the selection of the type of instruments used by the CB is not a unique feature of OMOs. In fact, standing facilities can employ all of the instruments mentioned above³⁵. The main difference is the degree of discretion: transactions in standing facilities are initiated by the banks whereas OMOs by the CB.

OMOs are therefore a very broad category, involving basically all market operations of the central bank other than SFs, whether they are for rate setting, sterilization or fine-tuning. OMOs can include both (i) fixed rate tenders of reverse repos in a frontier economy where no liquid market for repos or the underlying security exist and (ii) outright purchases of very short-term government securities in a developed economy for liquidity management purposes (price-taking) on deep and liquid markets.

From the perspective of building a modern system of monetary policy implementation and money market reform, it appears more useful to differentiate CB market operations based on:

- a) Frequency (standing, regular or irregular)
- b) Maturity (O/N – 6M most commonly).
- c) Policy objective (whether they set the interest rate as the main operations or the SFs do, or the quantity as fine-tuning does)

³¹ CCBS (2006)

³² There are other applicable definitions, as well, used by international financial institutions dealing with monetary policy operational frameworks. For instance, Laurens (2005) makes a distinction between OMOs and open market-type (OMO-type) operations. According to their definition OMOs are market-based operations initiated by the central bank and the CB behaves as a normal participant in the money market, transacting OTC or hitting quoted prices. This means that the CB acts in a price taking fashion, though its operations will most probably have a non-trivial effect on prices. OMO-type operations, in contrast, are based on auction techniques regulated by the central bank. However, these other definitions as often seen as too convoluted and less useful from the perspective of building a modern system of policy implementation at emerging market central banks.

³³ Our paper puts emphasis on the functionality aspect of operations, but for certain other purposes another classification of the CB operations may be more useful.

³⁴ Traditional refinancing loans provided through bilateral transactions, and sometimes at preferential rates, are not market instruments.

³⁵ In theory only as SFs are not built on outright transactions.

- c) Mode (i.e. auction, window or a bi-lateral transaction)
- d) Effect on the underlying securities' market (reversed transactions have no/limited effect, outright transactions do influence prices), and
- e) whether they imply primary or secondary market activity (in many EMs in the early stages of financial liberalization there is no open market to conduct operations and CBs issue their own or government securities and operate in the primary market only).

From the perspective of policy implementation the most important distinction is whether a particular operation sets the price of liquidity or, alternatively, sets the quantity of liquidity at the prevailing market price. In practice, there may be important technical details that make one instrument more desirable than the other in the specific circumstances, but from a monetary policy point of view the question is whether the instruments and operations are price-taking or price-setting. The second most important distinction is whether the operation is initiated by the CB or commercial banks. Table 2 classifies the three CB operation tools above from these two angles.

Table 2 Price discovery and initiative in central bank operations

		price discovery	
		price taking	price setting
initiative	CB (OMO)	Fine-tuning (variable rate tenders; classic OMO)	main operation (fixed rate tenders)
	banks (SF)		SLAF and SLPF

From the perspective of money market functioning, other characteristics of the central bank operations are also important. They include frequency, maturity, mode as well as the impact on the secondary market and the price of the underlying securities. Table 3 classifies the modern central bank tools in these categories. Box 10: provides an example of the instrument toolkit of an Inflation Targeting Central Bank.

Table 3: Central bank operations from the perspective of money market functions

	frequency	maturity	objective	mode	effects on secondary market or security price
o/n corridor	always open	o/n	set price	SF	cap yields in a range
main operation	regular	1 or 2 week	set price	auction	serves as the center of gravity for yields
fine-tuning	irregular	variable	set quantity	classic OMO or auction	push yields back towards the policy rate

Box 10: Instruments of a typical IT central bank: Example of the Czech National Bank³⁶

The instruments of the Czech National Bank's (CNB) monetary policy consist of open market operations (main instrument), automatic standing facilities, minimum reserves, FX interventions and extraordinary facilities.

Repo tenders, utilizing a general trading agreement accepted in the financial market, is the main instrument for steering interest rates. The CNB absorbs excess liquidity from banks and in exchange transfers collateral under the form of eligible securities. The basic duration of these operations is 14 days, and the two parties agree to reverse the transaction after this period. Therefore, the two-week repo rate (2W repo) is the key monetary policy instrument in the CNB's OMO toolkit. OMOs are conducted according to variable rate tenders: the declared repo rate serves as the maximum limit rate at which banks' bids are accepted, under the American auction procedure. The lowest interest rate bids have priority and successively higher rates are accepted until the exhaustion of the daily forecasted liquidity surplus. If demand exceeds this forecast, the CNB can either refuse the bids at the highest rates or reduce them pro rata. They can also run an additional tender, if the situation in the market is such as to threaten the fulfilment of the interest rate operational target. Fine-tuning instruments such as forex operations and securities operations, rarely used, have the purpose of smoothing the effects on interest rates caused by unexpected liquidity fluctuations in the market.³⁷

Overnight liquidity management is performed through automatic (standing) facilities for depositing or borrowing money. The interest rates applied form a corridor for the short-term money market rates. Deposits are remunerated at the discount rate, which generally provides a floor for the corridor, while the Lombard rate of the marginal lending facility provides a ceiling. All banks that have a repo agreement with the CNB have the option of using overnight facilities, however lending is very rare in the Czech case due to a systemic excess liquidity.

Every bank, building society, foreign bank branch and also every credit union is required to hold minimum reserves, a pre-specified volume of liquid funds, in its account with the CNB. There is an averaging provision, minimum reserves should be maintained on average over the maintenance period, (i.e. the average of the end-of-day reserve balances should reach the minimum reserve requirement). The maintenance period is 4 or 5 weeks – starting on the first Thursday of the respective month and ending on the Wednesday before the first Thursday of the following month. Since July 12, 2001 the funds on this account have been remunerated at the two-week repo rate but excess reserves remained unremunerated. An intraday credit facility was introduced after the reserve requirement was lowered to the current level.

³⁶ See CNB website for reference.

³⁷ For instance, the CNB used to have a 3M repo tender to absorb the liquidity on a longer maturity. This repo tender was auctioned in a price taking fashion as not to signal policy intentions, but one of the reasons for abolishing this instrument were the difficulties market participants had in understanding the difference from the main 2W repo instrument.

FX interventions might be used under certain circumstances as a support to the interest rate as the main instrument (operational variable). Although they are not a regular instrument under inflation targeting, the CNB had been using them occasionally before 2002 and then again from late 2013. In particular, in December 2013, the Czech National Bank, having had the policy rate at “technically zero” for some time and under a threat of deflation, put a floor on the exchange rate movement, thus loosening the policy stance. Despite this policy, the use of FX interventions in preserving this floor has not been needed for much of the period, as the markets understood the move as a credible part of an IT framework.

i. Reserve averaging

Reserve Averaging means that banks do not have to meet the minimum reserve requirement (MRR) level every day. Rather, the obligation is to meet the MRR on average over the whole maintenance period (MP). Averaging acts as an added stimulus for money market activity, as banks with structural surplus can lend to other banks, even for longer maturities, knowing that they will be able to manage any potential cash shortages through averaging. The economies whose central banks do not allow for the averaging (or only partially) typically find their money markets illiquid, with activity typically concentrated at the shortest tenors only.

MRR regulations require banks to hold deposits at the central bank equivalent to a specified percentage of their liabilities. Historically, there were examples that MRR had to be fulfilled on a separate account from banks' settlement accounts but nowadays banks can typically use their settlement accounts for this purpose. Traditionally, the MRR rate was much higher than banks' inherent need for keeping positive balances with the CB for payment purposes so that the MRR system created additional demand for reserve money from the central bank. However, in developed countries there was a shift towards lower and lower MRR rate and in certain cases, such as the UK, Canada and New Zealand, it has reached levels around or below the settlement balances that banks need for payment purposes.

Traditionally, MRR was a form of risk management tool, since it defined the minimum level of liquid assets to be held to ensure that the banks will be able to provide clients with cash upon request. Later the MRR became used by central banks as a policy instrument, as its rate defines how much liquidity is absorbed by the MRR and a change in the rate has a profound effect on the overall liquidity situation of banks, and hence on the level of the interest rate too.³⁸ However, in modern central banks, other, more efficient and more flexible instruments are utilised to absorb liquidity and MRR is again being used primarily as a prudential instrument. For instance, New Zealand and Hungary have allowed the banks to set their own individual MRRs within certain limits³⁹.

In EM and FM economies MRRs are still used to manage overall liquidity in the system especially, if there is a large surplus. In China they are also used to signal policy changes or to affect the exchange rate dynamics. MRRs continue to be attractive as a policy instrument in these economies, because they are typically unremunerated and therefore considered as a cheap sterilization instrument.

³⁸ Other important features of MRR are the length and the starting date of the maintenance period (MP), the overlap between the calculation and the maintenance period, and currency of MRR. For example, the length and starting date of the MRR period should take the monthly seasonality of payments into account and, if possible, should start just before the period of large liquidity increasing flows e.g. public sector salary payments. More on how the MP should be constructed see Maehle (2014)

³⁹ Hungarian commercial banks can decide twice a year on the choice of the appropriate level of MRR but this choice is limited to rates of 2%, 3%, 4% and 5%.

From the money market perspective, the drawbacks of MRRs are the propensity to inhibit money market activity and disrupt the process of a transparent price formation. In many economies, the MRRs have to be substantively fulfilled every day, so that unless the aggregate liquidity in the banking sector exactly matches the MRR, there is not much scope for interbank trading. Moreover, the practice of not remunerating reserves distorts money market rates, because it effectively sets the marginal return on liquid assets to zero. This in turn complicates the efforts of the central bank to steer market rates towards a particular operational target level. Unremunerated reserves also affect the spread between the deposit and lending rates and acts like a tax on banking intermediation/services.

Allowing for reserve averaging and remunerating the reserves at close to policy rates are essential tools of mitigating the distortive effects of MRRs on the money market. Averaging allows the banks to use their reserve accounts at the CB to smooth out liquidity shocks during the maintenance period by going under the MRR level on some days and having larger reserves on other days. If a bank faces an unforeseen liquidity drain on a given day within the MP it can correct for its effect on its reserve compliance by adjusting its reserve holdings on subsequent days by selling securities from its portfolio, not renewing maturing CB deposits, borrowing more from the interbank market or borrowing from the SLPF. Banks will be motivated to hold more reserves on days they expect the market interest rate to be lower and fewer reserves on days when they expect the rate to be higher thereby making commercial banks' demand for reserve balances more interest rate sensitive and the interbank market rate less sensitive to shocks to the demand for and supply of reserves.

Without averaging, the banks have to fulfil the MRR every day and there is no way to use the reserve account flexibly. Thus, if on aggregate the whole banking sector is in surplus then banks would push the interbank rate down (to the SLAF rate) whereas interbank rates would shoot up if banks were in shortage.

With averaging, such a situation occurs only at the end of the maintenance period (MP). If banks knew in advance what the actual liquidity situation would be on the last day they would have pushed the interbank rate close to the rate of one of the standing facilities in the preceding days through intertemporal arbitrage. Theoretically this could seriously compromise achieving the operational target level of market rates. However, usually there is great uncertainty about the future aggregate liquidity situation due to the lack of information at the individual banks' level and also due to unexpected shocks. To alleviate deviation from the target level, central banks have an idea of aggregate system liquidity and will usually conduct liquidity operations on the last day of the MP to correct the imbalance. In any case, central banks usually publish their forecast of the aggregate liquidity situation to help banks' liquidity management and thus anchor market rates better to the operational target level.

ii. Key policy rate

While not an instrument per se, a key policy rate is nonetheless a principal component of the operational framework of any modern central bank. In a well-functioning system of policy implementation announcing (or even anticipating) a change in the key policy rate has an important signalling and price discovery effect on the money market. In well-functioning IRT systems, especially

for IT-lite central banks, the money market rates begin quickly converging to the level of the policy rate after a change is announced.⁴⁰

As a consequence, a quick check of whether a central bank's policy implementation works properly is to check the distance of the short-term market rate from the declared policy rate. In many emerging market economies, the declared policy rates do not reflect the situation in the market and are therefore do not even constitute *de facto* policy rates. The usual culprits lie in the absence of the other components of the modern toolkit, such as an adequate main instrument (see below) or in the complexity and irregularity of the overall regulatory and policy implementation framework. For instance, many central banks prefer to have a policy rate defined in terms of a rate on liquidity providing operations. However, if the banking system is in a structural liquidity surplus, then such operations are seldom used. In such situations, the best proxy for the *de facto* policy rate is the average market rate of transactions for the *de facto* policy rate tenor, as it most correctly embodies the combined effect of the multitude of CB operations and regulations.

Changes in the key policy rate are used to signal changes in the policy stance of the central bank and its policy intentions. As such, it forms the focal point of policy communication, whereas the other elements of the instrument framework are typically known only by market specialists. For example, an IT central bank sets its key policy rate so that its medium-term inflation forecast reaches the inflation target level or a range on a given horizon⁴¹. If the CB feels that risks are mounting for a higher than target inflation rate at the policy horizon, it will raise the policy rate. In determining the appropriate policy rate, the central bank will take into consideration all fundamental macroeconomic data and possible risks. The CB policy rate is a means to affect market rates at the short term, while long term rates will be influenced by the expectations about the future path of short term rates.

The appropriate level and changes of the key policy rate should be determined based on a thorough assessment of the macroeconomic situation and future risks against the objectives of the central bank. In IT regimes, the level of the key policy rate will be based on medium-term macroeconomic forecast, which comprehensive analyse the macroeconomic situation, and show the level of the rate consistent with reaching the inflation target on a given policy horizon under particular circumstances, such as the price of oil, world economy situation or domestic fiscal expansion. This is not a mechanical exercise – it involves complex interactions of many experts with technical forecasting tools and policy decision-makers, which should ensure that all available information has been considered and that the forecast embodies all relevant policy risks and preferences. To accomplish that task, IT and other central banks have been building comprehensive Forecasting and Policy Analysis Systems (FPAS), which have become a ubiquitous backbone of modern monetary policy formulation (Box 11:).

Box 11: Developing FPAS Frameworks

An FPAS (forecasting and policy analysis system) equips central banks with the tools and procedures necessary for providing policymakers with a coherent assessment of the current state of the economy, a recommended

⁴⁰ In fact, if the CB's communication is transparent, then money market rates on the maturity of the operational target will converge to the expected policy rate even before the actual policy decision.

⁴¹ In practice, it can take several changes in the key policy rate in the same direction, until it finally reaches the level that is consistent with the medium term inflation target.

policy path to achieve the policy objective, and a medium-term forecast consistent with such a path.⁴² Typically, the system consists of a core medium-term forecasting model and other satellite models, staff trained in conducting model-based policy analysis and communicating its outcomes to policy makers, and forecasting and policy analysis processes. The main objective of an FPAS is to inform the policymakers on the possible future paths of the policy instruments necessary for achieving the central bank objectives.

FPAS frameworks have been adopted by dozens of advanced and emerging markets, regardless of the monetary policy framework in place. Although mostly associated with inflation targeting regimes, a number of exchange rate anchored regimes have also found FPAS beneficial in guiding policy decisions related to short-term interest rates, a rate of crawl or reserve requirements.

The implementation of FPAS in emerging and frontier market economies is not without obstacles, including limited availability and reliability of the macroeconomic data, the lack of capacity for medium-term policy analysis, the absence of dedicated forecasting teams and insufficient managerial attention to the forecasting processes. However, because FPAS can rely on simple, easy to set-up and maintain models, these challenges can be overcome, as the experience of many emerging and frontier market central banks attests to. A number of international financial institutions (such as the EBRD and the IMF) provide much technical assistance to central banks in this area.

Although the signalling effect of the policy rate on the money market rates can be very strong, in practice the CB needs to engage in actual liquidity operations (main and fine-tuning operations) and employ a number of other supporting instruments (interest rate corridor and reserve averaging) to foster the transmission of the policy rate to the market rates. Many central banks also remunerate the MRR at the policy rate to further entrench its acceptance in the market.

In terms of central bank money market operations, a key policy rate features prominently in IRT systems, as the target rate for the money market rates, but it is also found under RMT and hybrid systems. It is usually a rate applied on the main refinancing and liquidity absorbing operations (see below), but sometimes it also has an accounting and legal role and is not tied to a particular operation of the central bank. For instance, if the main operation is a 2-week repo tendered in an American auction, the policy rate would typically be the limit bid rate of that auction. If the main operation is a one-week deposit facility, it is the rate on this facility. Occasionally, the policy rate is the rate of one of the standing facilities defining the interest rate corridor (in the EM and FM context typically the floor). In some AE central banks the policy rate is a target variable⁴³ achieved through liquidity management operations.

iii. Main (refinancing or liquidity absorption) instrument

The principal purpose of the main instrument of the central bank is to articulate its policy stance. In most cases the rate on this instrument is the policy rate, although there are some exceptions, as explained earlier. The main instrument may be either a liability (liquidity absorbing facility) or an asset (liquidity providing facility) of the CB depending on the structural liquidity situation of the banking sector.

⁴² Douglas Laxton, David Rose, and Alasdair Scott (2009). *Developing a Structured Forecasting and Policy Analysis System to Support Inflation-Targeting (IFT)*. IMF Working Paper WP/09/65.

⁴³ By way of example the Fed has an O/N target while the Swiss central bank has a 3 month CHF LIBOR target

Box 12: Structural liquidity shortage and surplus

Money markets in most EM and FMs operate under the so-called structural surplus of liquidity, meaning the banking system as a whole is permanently over-liquid and needs to deposit the excess liquidity at the central bank every day.

If the CB is a net borrower from the banking sector, i.e. its lending to banks is smaller than banks' deposits and their holdings of CB debt, then there is a structural liquidity surplus of the banking sector. The large liquidity surplus is usually the result of either FX-intervention (a build-up of FX-reserves) or lending to the government (monetary financing) or LOLR operations (bank rescue).⁴⁴ In a structural liquidity surplus economy, individual banks may still be in shortage but, on aggregate the banking system will have liquidity surplus. Banks cannot change this situation on their own as their net financing position is an item on the CB balance sheet and can only change if the Central Bank undertakes an opposite transaction. Eliminating the surplus could call for large scale sales of government securities or reduction of the FX-reserves, which may not be feasible for political reasons or financial consideration (large potential losses).⁴⁵

It is a widely held, but largely unproven, belief that the CB can have a better grip on the banking sector, if there is a structural liquidity shortage and banks are forced to transact with the CB. When there is a structural liquidity surplus it is the banks' decision to invest into CB assets or choose to hold a higher amount of reserves than necessary. This could lead to less efficient liquidity management and less interbank trading. This belief sometimes leads EM and FM central banks to an excessive use of MRR and issuance of government papers for the purposes of liquidity sterilization. Central banks of Turkey and Macedonia have in the past used various such operations in turning the structural liquidity surplus into deficit.

However, the evidence that monetary policy under structural liquidity surplus is less effective is scant and inconclusive at best. In fact, there is much evidence showing that monetary policy can work very well under a structural liquidity surplus for long periods. The central banks of Switzerland, the Czech Republic and Israel are among many such central banks with a credible and effective monetary policy with large liquidity surpluses.

In a liquidity shortage situation the central bank provides just enough liquidity for the banks to meet their MRR obligations and the estimated necessary voluntary reserves buffer. Under liquidity surplus the CB acts in a similar fashion by withdrawing as much liquidity to allow the banks to just meet the MRR and the reserve buffers. Both systems can achieve the core purpose of the main instrument to set the policy rate that will determine the marginal cost of funds of banks (see Box 6:).

Unlike the deficit situation, however, a structural liquidity surplus entails large costs of sterilization for the central bank (or the government). If the central bank operations are effective in targeting money market interest rates as the operational policy variable, this essentially means paying this rate of interest on the most of the liquidity balances the commercial banks have with the central bank. Especially in the EM context these quasi-fiscal costs of monetary operations sometimes can stand in way of effective monetary policy.⁴⁶ However, these quasi-fiscal costs cannot be eliminated. Even if the government agrees to issue enough securities to turn the structural deficit into a surplus, it will have to bear the costs. The only way to eliminate these costs is to sell a large portion of the FX reserves and thus destroy the excess liquidity for good.

⁴⁴ Gray, S. (2006)

⁴⁵ Macedonia, Thailand and Turkey are among the relatively few examples of countries, which have actively changed a structural liquidity surplus into a deficit by either issuing additional government papers used solely for the sterilization purposes and/or shifting the government accounts from the commercial banks to the central bank.

⁴⁶ And not only there. The pressure of Swiss cantons on a profit redistribution from the central bank has had an important bearing on the central policy in recent years.

As a result, many countries with a structural surplus opt for the arrangement, in which the central bank and the government somehow share the losses of the liquidity sterilization. While technically the losses can accumulate on the central bank balance sheet without impairing the technical capacity of the central bank to conduct good policy (as in the case of Czech Republic, Chile and Israel), the depletion of the central bank capital can eventually lead to public and political pressure. Hence, it is preferable, that the government and central bank reach an ex-ante agreement on how these losses will be shared or a mechanism of the central bank recapitalization.

As a rule of thumb, the main policy instrument should not be available permanently. Banks are supposed to do their homework in terms of forecasting their own liquidity situation, use the flexibility of the averaging provision of the MRR and, if there is a liquidity need or surplus, then utilise the interbank money market. If the CB ensures that the overall liquidity situation is consistent with the MRR, including the potential response of the CB to unforeseen shocks, then the banks should be capable of managing their liquidity.

That said, the central bank usually opens the main instrument once or a few times a week so that there should be a sequence of maturities of the main instrument within the maintenance period allowing the banks to adjust their reserve levels. Only during the time of increased market uncertainty or at the time of crisis, when the central bank feels it needs to increase its market making role, would the main instrument be offered every day.

As the main instrument is only available at discrete times, it is usually operated as an auction or tender, though opening it as a standing facility intermittently is also possible. Under a RMT regime the CB usually sets the quantities of the tenders and accepts all (reasonable) bids. Under an IT regime the CB sets the interest rate on the main instrument and, as a basic principle, accepts all the bids on the auctions.

It is also possible that the CB has the option to cap the quantity of the auction despite setting the interest rate. This was the practice of the ECB before the crisis and was intended to exert pressure on banks' liquidity management in order to do their job efficiently and use the interbank market as much as possible. However, while such practices may increase the efficiency of the system of policy implementation in good times, they also increase money market uncertainty by undermining the market making role of the central bank. For instance, the practice of limiting the liquidity provided in regular auctions of the main instrument could have contributed to the hoarding of liquidity by Eurozone banks and overuse of the LTRO facility in recent years (see Box 13: on Liquidity hoarding and ECB instruments).

The maturity of the main instrument is typically 1 or 2 weeks, but may also be linked to the length of the MRR maintenance period and the sophistication of the markets. Any operation that has a longer maturity than the length of the MP drains or supplies liquidity for the rest of the MP, exerting a large average liquidity effect through the MP, and thus may prove too large due to liquidity shocks between the operation and the end of the MP. As a result, it cannot be used flexibly by the banks to manage their liquidity. However, if the maturity of the main instrument is lower than the length of the MP then the liquidity provided (absorbed) will mature (become available) during the same MP,

so that the main operation will have a smaller average liquidity effect and banks can use it more flexibly.

At the same time, economies with a more developed financial sector see a need for shorter maturities of their main instrument. The market on the 1W or 2W maturity may, in more developed markets, be quite competitive and therefore more difficult for the central bank to influence (unlike for the O/N maturity, in which the central bank is the monopoly provider of settlement balances).

Using the main instrument for liquidity management is cost effective compared to the use of standing facilities, as these incur an additional cost as a penalty on banks. Still, if a bank finds itself in an inadequate or unexpected liquidity situation it can turn to the standing facilities as they are always open and still cheaper than not meeting a payment obligation or the MRR.

iv. Overnight or 1-day interest rate corridor of standing facilities

Interest rate corridors are today a ubiquitous part of almost any central banks' instrument framework. From the money market perspective, they define the market making obligations of the central bank, and help reduce the uncertainty of the market participants and the volatility of the market rates by capping the potential deviation from the policy rate. There is no viable alternative instrument for this market making function, as these facilities are an equivalent of a bid-ask spread of a market making commercial bank.

The corridor is in most cases at the shortest maturity of the money market, overnight or 1-day. This is the maturity where the central bank has a monopoly over the supply of liquidity and also the maturity where most of the interbank trading is taking place as banks try to constantly adjust their reserve position to the planned level in the face of unexpected liquidity shocks. On the last day of the MRR MP, the incentive is also to trade overnight, as banks often want to avoid the liquidity effect of longer term operations that carry over to the next period.

The top of the corridor is the rate on the standing liquidity providing facility (SLPF) while the bottom is the rate on the standing liquidity absorbing facility (SLAF). The SLPF is usually secured by collateral while the SLAF can be unsecured as the CB has no credit risk towards domestic banks.

These facilities are open for the banks after the close of trading. When banks know their positions, they can adjust their reserve holdings to the desired level. They represent an alternative to interbank o/n trading for banks and thus effectively limit the moves of the interbank rate as there is no incentive for banks to borrow above the SLPF and lend below the SLAF when they can always use these facilities at the end of the day. Longer term interbank rates and other rates may move out of the corridor as these do not compete directly with the standing facilities.

A corridor system effectively reduces interest rate volatility by cutting off the extreme moves in the O/N interbank rates. By limiting the occurrence of extreme interbank rates it makes the future path more certain and strengthens transmission. Sometimes even O/N interbank rates move out of the corridor but these instances are always the manifestations of some kind of market failure or the breaking down of the interbank market. The main reasons for O/N interbank rates being above the corridor is either the shortage of collateral (so that some banks cannot use the SLPF and are forced to accept higher borrowing rates) or a mistrust among banks towards these facilities.

An important feature of these facilities is that they are always available at the end of the day under strictly predictable conditions at the initiative of the commercial banks provided they possess the necessary security/collateral for the SLPF. This “no-questions-asked” characteristic provides an element of insurance and safety net for the liquidity management of banks. Doubts about the central bank’s intentions to honour its obligations under SLAF and SLPF inhibit money market activity of other players and increase the volatility of the interest rates. The most typical example of such doubts is the fear that the recourse to SLPF may trigger the supervisory attention of the central bank and therefore carry a stigma among the other market participants. Sometimes, the commercial banks do not believe the central bank will accept unlimited liquidity under the SLAF. Such doubts may cause the market rates to fall outside the interest rate corridor and occasionally may lead to market failures, especially during a crisis (Box 13:).

Box 13: Eurozone liquidity hoarding and ECB instruments

The GFC led to profound changes in the financial and money markets. Money market liquidity dried up as banks and non-financial institutions sought to hoard liquidity on an unprecedented scale. . Cash piles at European non-financial institutions amounted to EUR 1.1 Trn in the middle of 2015, up 40% from 2008, as companies continue to deleverage, hoard cash and delay investments. Indeed, the banking system’s hoarding of liquidity reflected both the overall uncertainty in the market as well as the fact that the appetite to borrow in the commercial sector fell to record lows.

Conventional instruments and maturities were proving their limitations. The ECB, uncertain about the size of this precautionary liquidity demand and trying to allay fears about liquidity (and solvency at the end of the day) extended the maturity of its long term liquidity providing instruments in several steps to 3 years and shifted to full allotment in its credit auctions (LOLR function). Nevertheless, lending to the real economy remained anemic, especially to SMEs, and the ECB first relaxed collateral requirements dramatically and later, in early 2015, announced a large scale asset purchase program, or QE as popularly known (MMLR function).

While the ECB made enormous amounts of liquidity available through LTROs, TLTROs and later the asset purchase programs, it simultaneously used the deposit facility to mop-up the excess liquidity in the short-term. The banks participating in LTROs were willingly running losses on these operations by depositing the proceeds on the less-remunerated accounts of the ECB.

This liquidity hoarding demonstrates the lack of trust among the banks in the system as well as perhaps the uncertainty the banks may have felt about the ECB’s liquidity policy in the future. The QE program was planned to last until September 2016, with a total amount of at least €1.1 trillion (similar amount to the estimated cash hoardings). Despite the extremely accommodative monetary policy, interbank interest rates remained higher than in the US until 2012 and government bond yields in the periphery of the Eurozone remained higher for even longer, reflecting the uncertainty regarding the fiscal solvency and the future of the monetary union.

The width of the corridor can play an important role in the development of the interbank market for liquidity. There is a trade-off between encouraging interbank transactions and limiting interest rate volatility. A wider corridor will encourage more interbank trading, as the penalty for a bank using one of the standing facilities is larger. This will encourage banks to trade amongst themselves, but possibly result in greater volatility of the interest rates. A narrow corridor will limit volatility, but also limit interbank transactions, as banks will have less of an incentive to trade with each other, and be more likely to use the CB standing facilities.

The corridor is usually symmetric around the policy rate, but there are exceptions. In a symmetric corridor banks are penalized by the same amount whether they have excess liquidity or a shortage at the end of the MP. They would lose the same amount by depositing funds at the SLAF rate than borrowing from the SLPF.

In certain cases there is a reason for asymmetry. For example, if the CB would like to bring the interbank market to life in an excess liquidity situation, the CB may move the SLPF rate closer to and the SLAF rate farther from the policy rate (Box 14:). This creates incentives for banks to deposit more money on the main instrument (as the penalty of not doing it is larger) and then transact more with each other.

Box 14: An example of the cost of using the Interest Rate Corridor (IRC)

Let's assume that the policy rate is 5% and the IRC is +/- 1 pp, i.e. the SLAF is at 4% while the SLPF is at 6%.

- If the bank is in a liquidity shortage situation at the end of the MRR MP then it will have to borrow from the SLPF at 6% and leave it on its reserve account, earning it 5%, to fulfil the MRR. The marginal cost of this operation, the penalty of not managing its own reserves properly, is 1%.
- If the bank is in a liquidity surplus situation at the end of the MRR MP, then it will have to deposit the excess reserves on the SLAF at 4%, otherwise it would receive zero on it. However, the cost of these excess funds was 5% because of borrowing from the CB (in a structural liquidity shortage situation) or not depositing it (in a structural liquidity surplus situation) with the CB earlier at the policy rate. The penalty is again 1%.

Now, assume that there is a structural liquidity surplus in the banking sector and the IRC is shifted to be asymmetric around the policy rate. If we assume the SLPF at 5.5% and the SLAF at 3% with the policy rate being 5% like in the previous example, then the penalty of being short at the end of the MRR is only 0.5% while the penalty of having excess liquidity is 2%. Thus banks are motivated to use the central bank's liquidity absorbing instruments more and then turn to the interbank market, and finally to the SLPF at the end of the maintenance period to cover their subsequent funding need. Hoarding liquidity during the MP would cost 4 times as much in the current example.

Other important tools

i. Fine Tuning Operations⁴⁷

Sometimes, large unexpected liquidity shocks may require the central bank to intervene in the interbank market, especially if the shock is close to the end of the MRR maintenance period. The CB will usually have a clear view on the position of the banking sector relative to the MRR level and also has a forecast on the evolution of liquidity until the end of the MP.

When the CB identifies a large liquidity shock, it must decide whether the banking sector will be able to smooth it in the remainder of the MP. If not, there is a case for intervention. This would be done through a non-regular, short-term operation, preferably not extending over the MP. If the markets

⁴⁷ In some developed countries, the CBs use or used OMOs on a daily basis to manage liquidity (US, UK). These CBs operate in the context of an existing highly developed interbank market and, for traditional reasons, have a very short term maturity liquidity providing facility or MRR averaging is absent. This is not relevant for most other CBs.

are developed enough, the CB can conduct this operation through a repo or reverse repo instrument, an outright sale or purchase of short term securities, or a deposit or credit auction but the exact form is not critical. The use of open market operations for fine tuning can also encourage the development and use of short term securities.

ii. Lender of Last Resort

The liquidity providing instrument of the interest rate corridor is often seen in terms of being a 'Lender of Last Resort' (LOLR) facility. If banks are unable to find a counterparty to get necessary funding to meet the MRR by the end of the MP they can always use the SLPF. However, the real objective of the IRC is to minimize interest rate fluctuation.

More importantly, the LOLR is more accurately seen as a facility to provide liquidity when a bank is in trouble and its inability to access interbank funding is not due to its poor liquidity forecasting and management practices but to a genuine increase in perceived credit risk (fears by other market participants that they may not get back their money) or a lack of collateral (which itself is usually a result of an increased credit risk, as the counterparties would only deal with the bank on a collateralized basis). An exceptional need for liquidity might also be the result of an operational failure, for example in computer or communication systems or a failed securities trade.

There are facilities, usually called emergency or exceptional lending facilities (ELF), for such cases and these may not require collateral. However, the interest rate on these facilities is much higher than the rate of the SLPF and chances are that the CB will have a very hard look at the bank's BS and liquidity position to assess whether there is a solvency problem, if this facility is used. Often, the CB will already have information about problems with the bank by the time the ELF is taken up.

Organizational underpinning of the monetary policy operational framework

An important aspect of building a modern system of policy implementation is the organizational underpinning of these various functions and the related decision making processes inside the central banks.

The best practice at the central banks pursuing active monetary policy is that all policy decisions significantly affecting the monetary policy stance are done by the highest decision-making body of the institution, which may be the Board, the Governor or a Monetary Policy Committee.⁴⁸ The monetary policy stance is loosely understood as an expression of a combined effect of all monetary policy tools and instruments on the economy in a given state of the business cycle. More precise measures usually examine various market interest and exchange rates (expressed in real terms relative to their fundamental levels). However, depending on the monetary policy regime and the implementation toolkit, the stance can be influenced by rates on CB instruments, money market operations and liquidity, FX interventions and market liquidity as well as administrative tools and environment (such as the

⁴⁸ In several central banks the MPCs serve as advisory bodies to the Governor who makes the final decision. Such MPCs are typically made from internal senior staff of the Bank. Nevertheless, it is a good practice even in such banks for the Governor not to over-rule the MPC policy recommendations. In other central banks MPCs have a more formal role, may involve external members, and appointments are part of political process of the country.

t regulation). As a consequence, all decisions with a significant impact on the policy stance should be made at the highest level.

A common problem in emerging market central banks is that many decisions critically affecting the policy stance, such as interest rates on important liquidity operations, are not decided on the highest level, but by the staff and management of the departments responsible for monetary policy implementation (Market Departments). This is especially likely to happen, if the system of policy implementation involves a number of idiosyncratic instruments and operations, which are difficult to coordinate properly. For instance, it is quite common to see that an MPC decides on the level of the key policy rate, but the rates on the main instruments are different and determined by the Market Departments at their discretion. The result is disconnect between the key policy and market rates, and, as a consequence, reduced effectiveness of the decision making bodies of the central banks.

The modern CB toolkit described above is easy to implement since there are only a few regular decisions affecting the monetary policy stance. In a full-fledged IT regime, for instance, the only regular decision affecting the policy stance is the level of the key policy rate. In IT-lite regimes, FX interventions and (less often) administrative tools are also regular monetary policy stance decisions, but the focus on steering money market interest rates still simplifies the decision-making on daily operations of the central banks tremendously.

Once the decisions about the instruments affecting the policy stance are made, the daily high-frequency operational decisions can be made by the Market Departments without the involvement of the CB top decision-makers. These would include the amounts tendered at the main instrument auctions, frequency of the auctions or the activation of fine-tuning operations. If the central bank also acts in the FX market, once the objectives and the parameters of the intervention program are decided by the top decision makers, Market Departments can decide on the timing, mode and (sometimes) amounts offered, while making sure that the implications for the domestic money market liquidity are properly reflected in the money market operations (such as by increasing the volumes of liquidity withdrawals after buying FX in the market) so that the money market interest rates remain close to the key policy rate.

The decisions affecting the monetary policy stance must be based on the appropriate analysis, a process called monetary policy formulation (as opposed to implementation). Modern central banks separate organizationally the processes of monetary policy formulation and implementation. The proposals for monetary policy stance decisions are formulated by the macroeconomic analytical or research departments (Economic Departments), while the decisions are implemented by the Market Departments, as shown in Figure 3: Separation of policy formulation and implementation. Both departments, of course, communicate with one another while performing these functions, but it is important that the two responsibilities are clearly separated and underpinned by a dedicated organizational structure. For instance, when the Economics Department prepare the monetary policy decision, they consult the Markets Department as regards the market intelligence and

situation, and the transmission of the instruments. They should also seek an opinion of the Market Department on the proposed policy change. Nevertheless, they remain in charge of the process.⁴⁹

It is a good standard for the Economics Department to build a forecasting and policy analysis system (FPAS – see Box 11:), designed to assist in formulating policy aimed at stabilizing domestic inflation. It is also a good practice that the policy formulation process culminates in a staff recommendation on the setting of the instruments affecting the policy stance, which is presented and explained to the policy-makers.

A frequent issue in central banks without an FPAS is that the role of the economic analysis and forecasts in setting the policy stance is diminished and the key role in formulating policy shifts devolves to the Market Department, as depicted in Figure 4: Unification of policy formulation and implementation. This can lead to confusion between implementation and formulation, high-frequency decisions and involvement of the top decision-makers in daily market operations. The policy overall becomes reactive and backward-looking, focusing on the market reality of the particular moment instead of medium-term stabilization of inflation and inflation expectations through predictable policy changes.

Figure 3: Separation of policy formulation and implementation

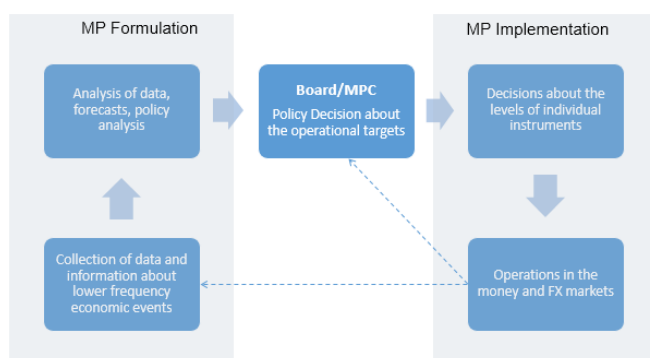
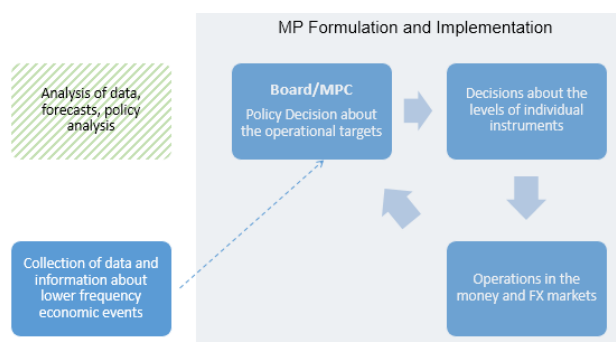


Figure 4: Unification of policy formulation and implementation



As for the internal organization of the Market Departments, it has become a good standard among central banks to integrate all trading functions into one department. This includes the operations with FX reserves as well as domestic bond, money market and domestic FX market trading operations. The organizational integration of these functions helps the efficiency of the individual operations, because the traders can more easily internalize the events in the other markets. Moreover, it promotes a faster learning process of the staff. Even the central banks, in which all these functions are not in the same organization unit, have found it beneficial to establish one common trading desk.

Many central banks have also set-up dedicated organizational units focusing on the analysis of the implementation of policy instruments and money markets with functions similar to a middle-office in a commercial bank. These units perform liquidity forecasting, help coordinate various monetary policy and treasury-bill operations, and elaborate the design of monetary policy instruments,

⁴⁹ On the other hand, changes in the system of the monetary policy implementation, such as a width of the corridor or a change in the maturity and frequency of CB transactions, should be prepared by the Market Departments, consulted with the Economics Department and approved by the top decision-making body.

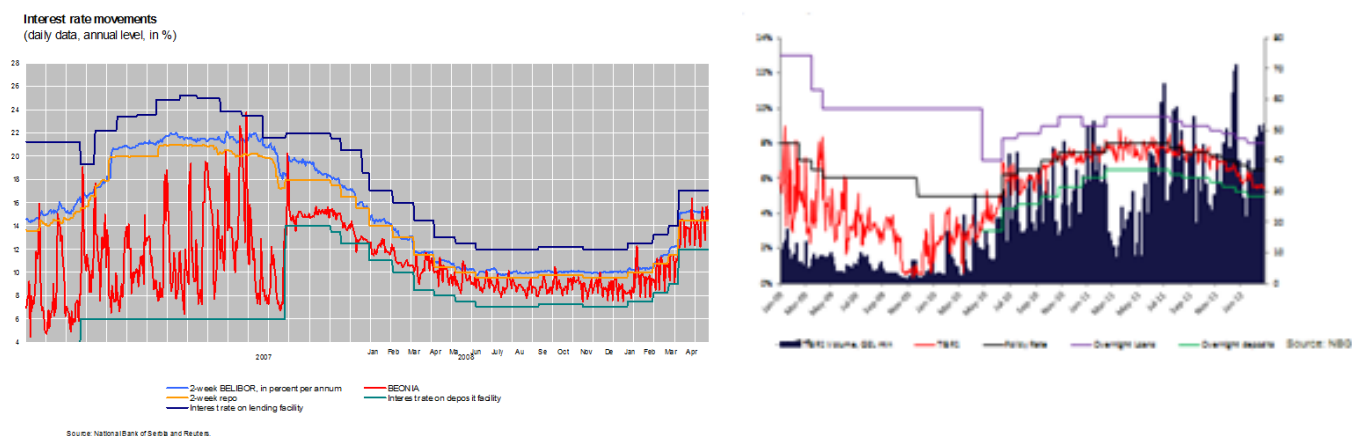
including the reserve requirements.⁵⁰ They also provide an ideal counterparty for the communication with Economics departments in charge of policy formulation.

Experiences and Challenges in the implementation of a new operational framework

In many country cases, the modern Central Bank tool-kit evolved over long periods, sometimes lasting close to a decade. This is especially true for EMs transitioning to more modern policy frameworks in the 1990s (Czech Republic, Poland, and Brazil). Those countries transitioning later tended to take less time to implement the new operational frameworks, which may reflect both the fact that the state-of-the art was better known (than in the 1990s) as well as the benefits of learning from the previous experience of the first wave of countries. This was the case for Serbia, Georgia and Moldova, which were able to put in place some of these elements very quickly, sometimes in a matter of months.

The intention to steer (a loose form of targeting) market interest rates, rather than set volume based operational targets derived from intermediate money targets, emerged very early in many of these countries, irrespective of the regime. A number of countries, such as in Chile, Brazil, Israel, Costa Rica or Poland, followed various combinations of intermediate targets, including the exchange rate, monetary aggregates and inflation. A survey of country experience shows that the implementation of the interest rate operational targeting often took place under pegs and monetary targeting without a regime transition in mind (Examples include Israel, Poland and Brazil). As noted previously, the Czech Republic continued to follow monetary intermediate targets for a brief period after the shift to floating, when the interest rates were already the main instrument and operational target.

Figure 5 Increasing predictability of money market rates, Serbian and Georgian cases



In terms of sequencing, it appears that the early transiting countries went from targeting base money to free reserves to market interest rates. Reserve averaging was also an early feature in many

⁵⁰ In general, such units regularly (at least annually) evaluate the functioning of the individual monetary policy tools, make proposals for their parameters (such as the reserve requirement rate and width of interest rate corridor) and for the introduction of new instruments. They carry out liquidity forecasting and make proposals for fine-tuning operations or the issuance of central bank papers, if necessary. They analyse past trends and the very short-term outlook for the domestic FX and money markets based on the banks' reported data and other available market information (Reuters, Bloomberg). This unit may also serve as a secretariat for the meetings on OMOs, which usually take place every week.

countries (Israel, Costa Rica and Poland). However, the supportive elements and the know-how of controlling market interest rates effectively took much longer to develop. Initially, the countries would steer the market rates by conducting volume based operations within some kind of a corridor, often an indicative or one-sided one (Poland and Brazil, see Box 15:). The linking of the rate on the main operation to the operational target level decided by the monetary policy decision making body usually took another year or two. Only at that point did the required reserve requirements lose their importance as an instrument. The corridor was typically the last to have been finalized, especially as regards tying the rate of the deposit facility to the policy rate (Poland, Brazil), as this increased the costs of sterilization. The remuneration of required reserves typically lagged, because of its negative effect on the profitability of the central bank.

Box 15: Shift from RMT to IRT - the case of Brazil

The monetary policy committee (MPC) of the Brazilian central bank started using elements of interest rate targeting to support the (crawling) peg and money intermediate targets since 1996. This was well before the financial crisis of 1999 and the introduction of a float and inflation targeting.⁵¹ In fact, although the Bank was setting intermediate targets in terms of M4 and a number of operational reserve-based targets every quarter, it was doing so in order to influence the interbank rate and communicate these interest rate intentions to the public. During the peg system, the MPC also set targets for two interest rates on discount loans—TBC and TBAN. They worked as a system of bands for interest rates (TBC was the lower rate, but the volume of its operations was limited according to reserve deposits). By arbitrage, this led to the formation of the *selic* – the overnight interest rate, which served as the market benchmark interest rate (the rate on overnight repo operations between banks involving government securities as collateral) and the de facto operational target for monetary policy, which was meant to stay within the broad corridor.⁵² The interest rate corridor became the *de facto* main policy instrument in the period before the financial crisis of 1999.

Nevertheless, the monetary authority still heavily relied on non-remunerated reserve requirements (the main sterilization instrument – as high as 75% of net demand deposits) and used volume-based open market operations in the conduct of monetary policy alongside frequent foreign exchange interventions, which in practice were important liquidity providing and withdrawing operations.⁵³ In fact, in August of that year, because of the external financial crisis, the Central Bank suspended the TBC operations.

The final step towards targeting market interest rates took place only after the float was adopted, in March 1999, when the Central Bank ended TBC and TBAN and began setting targets for the *selic* overnight rate in the context of adopting an Inflation Targeting regime. In this way, the *selic* rate, which has historically worked as the main reference for the other interest rates in the economy, became the operational target.

There is evidence that a regime change such as a shift from a fixed exchange rate regime to float or adopting inflation targeting obviates the change in the operational framework. This is clear from the experience of the countries adopting inflation targeting after 2000 such as Serbia, Georgia, Moldova and Ukraine. For instance, Georgia and Serbia were able to implement an IRT system of policy

⁵¹ The Bank relied on monetary programming to establish intermediate targets and to communicate its intentions to the market in this period. It published quarterly targets (within an acceptable margin of error) for the monetary base, for the amplified monetary base, which includes federal securities in the market and reserve requirements at the central bank, for M1 and for M4, the broadest monetary aggregate concept. Targets for these aggregates were chosen so as to give the market and economic agents additional information on the Bank's intentions with regard to the desired interest rate path.

⁵² In other words, the MPC was not setting the target levels for the *selic* rate until 1999.

⁵³ The central bank also engaged in operations in the forward market.

implementation within several months, with practically immediate benefits in terms of reduced volatility of market interest rates (see Figure 5).

In certain cases, however, the use of the interest rate operational target precipitated a regime change, especially with flexible capital accounts, as happened in the Czech Republic during 1996-1997. In some cases, money and interest rate operational targets coexisted for a while, but interest rate targets were quickly taking precedence, while money targets were basically kept for legacy and legal reasons. In Brazil the operational money targets were set with the perspective of a particular interest rate trajectory or movement. In Poland the operational decisions also increasingly paid attention to the desired interest rate movement.

The experiences point to the following challenges in the implementation of the new framework:

- *The control of the CB's own balance sheet.* All countries adopting interest rate operational targets had control of their own balance sheets and were largely void of fiscal dominance.⁵⁴ This seems to be a basic prerequisite for progress.
- *The absence of market instruments.* In some countries, there was little LCY government bond issuance, no benchmarks and very underdeveloped financial markets. The central banks often issued their own papers, first as marketable sterilization instruments and later for collateral purposes. The central banks also played a key role in setting standards of market based transactions, promoting unification of trading platforms, instituting master repo agreements, promoting the establishing of the reference rates and improving general market infrastructure.
- *Costs of sterilization.* Many central banks faced large sterilization costs and were therefore reluctant to institute a standing deposit facility and/or remunerate reserves. These profit concerns occasionally compromised their main operations. It took a long period before the profit concerns subsided. In due course, many EM central banks learnt to live with a substantial negative capital, including Costa Rica, Slovakia, Chile and Israel.
- *De facto versus de iure key policy rate.* In practically all cases the central bank had always been setting some interest rates on certain operations such as refinancing, discount windows, and accounting rates. These would often be mistaken for what are now called key policy rates. In most cases these rates had little relevance for the formation of market rates, and therefore were not key policy rates in the true operational target sense. The de facto policy rate was the market rate, which took some time to realize.
- *Price setting versus price taking operational mechanisms.* While the desire to steer market interest rates emerged early, the operational mechanisms were not clear. In particular, the authorities would often choose volume-based instruments for that purpose in a price taking fashion. As this was clearly insufficient to stop volatility in market rates, various forms of fine tuning operations and loose corridors appeared. Only later would the central banks recognize the necessity of price setting operations in a form of close to full allotment tenders or deposit tenders at the level of the operational target. It also required some time to realize that longer-term operations such as liquidity absorption needed to be undertaken as a price taker so as not to distort the yield curve. In some cases, it took a long time before the markets understood these differences.

⁵⁴ Although marginal financing of the government, was sometimes allowed as in the case of. Serbia.

- *The trade-off between a narrower and wider interest rate corridor.* Initially, central banks were reluctant to institute narrow interest rate corridors for the fear of inhibiting market mechanism (and to reduce sterilization costs). It was not uncommon to start with corridors as wide as 1000 basis points, which were gradually reduced, as the central banks became more comfortable with the new regime
- *Banking system stability and decoupling of monetary policy from supervision.* In several cases, it was difficult to streamline refinancing procedures for the fear of destabilizing the banking system, with obvious moral hazard repercussions. At the other extreme, the recourse to refinancing facility would be stigmatized by supervision, leading to inefficiencies in rate setting. It typically several years to separate monetary policy implementation from supervision, the former keeping banks liquid, with the latter keeping them solvent.

Box 16: Transition from reserve money targeting

Central banks can start implementing interest rate-based monetary policy during a transition to an IT regime, even if reserve money is still the intermediate target. However, steering the money market rates directly by introducing an effective key policy rate may be cumbersome under the reserve money framework. First, the policy rate level needs to be determined to be consistent with the intermediate money target. Ideally, the rate should also be determined in a forward-looking manner taking into account inflation forecasts and objectives, as well as the developments in the rest of the economy. Overcoming these obstacles puts substantial demands on the analytical system supporting policy decisions, often surpassing the capacities of the EM and FM economies in the early stages of the transition.

An intermediate step can therefore be an interest rate corridor, which introduces some policy flexibility for the CB, since it allows the rates to move within the corridor without the need for instant policy action. When the interest rate moves persistently towards the edge of the corridor it signals the need for a policy decision. Interbank rates being stuck at either edge of the corridor for a longer period signals an inconsistency between the interest rate and the reserve money target. This conflict can be resolved through either a revision of the reserve money target and/or shifting the interest rate corridor. However, choosing the right action and how to communicate it represents a major challenge.

This challenge can be best approached by devoting more resources to analysis and communication. There is a need for analytical capacities that make possible (i) a thorough understanding of the shocks affecting primarily money demand including volatility of the velocity of money and the money multiplier, but also aggregate demand and supply, (ii) an early identification of these shocks and (iii) a credible forecast of inflation and output. This would enable the CB to formulate a view on whether the inconsistency between the RM intermediate target and the interest rate operational target is more likely to be due to fundamental reasons or shocks to money demand. If the inconsistency was due to money demand shock then the interest rate operational target should be maintained and the shock should be accommodated (intentional miss of the target). If the shock is fundamental in nature then the (uncertain) inflation outlook would probably also change and shifting the IRC would be considered.

In such a situation, communication channels would also need to be beefed up for the CB to be able to credibly describe the monetary policy dilemma. Devising escape clauses for the RMT-regime (similar to the ones used in the early stages of IT) might also help. However, communication with regard to the RM-target will always prove difficult, because RM targets *per se* are very remotely related to anything of interest for the public.

Another way of facilitating the transition to an interest-rate-based operational target is to move from an end-point reserve money target to a quarterly average and to introduce a range for this quarterly average target.

Initially, the width of the target range should reflect the observed volatility in the money market liquidity and the central bank's capacity to meet the target. Over-time, as the central banks moves towards the interest rate operational target, the width of the money target range would increase, while that of the interest rate corridor decreases.

The lessons for EM and FM economies wishing to modernize their operational frameworks appear to be the following:

- The basic prerequisite is that the central bank has control over its own balance sheet and the currency composition. This includes not only direct financing of government, but also *ex ante* profit transfers to the budget.
- An efficient payment system infrastructure is an indispensable prerequisite.
- The system can be put in place very quickly. The main hurdle is likely to be the acceptance of losses from sterilization and the possible pressure from the government on this issue.
- It is important to realize early on that the *de facto* policy rate is the market rate and that the remuneration of the reserves is an important factor determining the market rates.
- The new system is less dependent on good liquidity forecasting, because the main instruments are close-to-full-allotment tenders (be it volume or multiple price tenders).
- An effective framework for monetary policy implementation requires trust, which is a much longer process than the implementation of technical elements. Changing the conditions too quickly in an unpredictable fashion, frequent recourse to moral suasion or perceived supervisory implications can cripple the efforts to implement policy effectively.
- The framework can coexist with intermediate monetary targets as well as with fixed (highly managed) exchange rates for a limited period (Box 16:). However, it is not clear from the experience for how long they can coexist, especially in the environment of relatively developed and globally connected financial markets.
- Ideally, the new framework should be in place before a transition to a different monetary policy regime.

C. The Policy Rate as a Base Rate for other Short Term and Long Term Rates.

The Target Interest Rate as the Anchor for Money Market Interest Rates.

The interest rate (especially the real interest rate) is a central variable of the economic theory. It influences the behaviour of firms and household in their investment and consumption decisions and as a consequence affects future growth and inflation. Interest income in itself may be an important part of overall income. Changes in interest rates bring changes in wealth through the discounting of future cash flows of both fixed income securities and equities and will cause changes in debt service, therefore affecting the assessment of the sustainability of debt levels and the solvency of borrowers.

Short-term interest rates are a major input into the pricing of deposits, fixed and variable rate long-term loans, and FX derivatives. Also, short-term rates have an important role in determining the level and the changes of longer term rates as they represent the foundation for pricing long-term interest rates, FX swaps and forwards. Without a relatively stable money market, the pricing of longer term fixed rate assets and liabilities and the derivatives used for hedging would be exceedingly difficult. A ramification of this difficulty would be that industry sectors that are

dependent on long term finance such as the housing mortgage market and infrastructure finance would remain underdeveloped. Thus there is ample reason for the central bank to care about the level of short term interest rates. The interest rate on the main instrument, the policy rate, is the marginal cost of funds (or a marginal return on assets) for the banks, so this is the centre of gravity for interbank rates and also the benchmark that banks use when pricing their deposits and loans. Depending on the policy regime, short rates depend to a large extent on the policy rate and its expected path in the future.

The (Money Market) Yield Curve.

The level of market interest rates typically depends, among many other factors, on the residual maturity of the underlying financial instrument. The relationship between interest rates and the maturity is referred to as the term structure of interest rates and is depicted by the yield curve. Most of the time the yield curve refers to the risk free rate⁵⁵ and is calculated from government securities prices.

Short term yield curves can also be calculated from a variety of financial instruments such as Forward Rate Agreements (FRA), Overnight Index Swaps (OIS), interest rate futures or interbank money market rates, including reference rates such as LIBOR.

Chapter 3: Role of the local currency money market

While the money market can in principle function well using both foreign and domestic currency, there are several reasons why it is better to develop efficient local currency money markets.⁵⁶

Central Bank as lender of last resort

First of all, the central bank can only reliably perform its functions as the LLR and the MMLR in local currency, because its stock of foreign exchange is limited – unlike for the domestic currency of which it is the monopoly supplier. The experience of the Global Financial Crisis has demonstrated that local currency financial systems tend to be much more stable than those dominated by a foreign currency, in which the central bank cannot backstop the liquidity of individual entities, speedily resolve their solvency and guarantee bilateral transactions and operations. The central bank can always backstop the solvency of the government during a crisis, as long as its debt is dominated in the local currency.⁵⁷ And because the central bank's stabilization role in the money market and

⁵⁵ It is also possible to devise yield curves at different (but homogenous) risk levels, such as yield curves for "A"-rated or "BBB"-rated credit. Additionally interest rate swap markets can also be used to create longer dated yield curves.

⁵⁶ The money markets in highly dollarized economies largely function in a foreign currency, including the operations with the central bank, even though the FCY is not legal tender (Liberia is a rare example of a country with two legal tenders). In both Cambodia and Peru, the central banks offer CDs denominated in the dollar in various maturities, which can also be used as collateral, and interbank deposits in USD are common. In Peru, FX repo and swap transactions (also with the central bank) are common and the central bank influences the dollar interest rate in the interbank market. The central bank also functions very much as the market maker of the last resort in the interbank FX and dollar money markets by adjusting its very high level of reserve requirements levied on the FX denominated portion of the balance sheet of the commercial banks. It has also functioned, at least partially, as the lender of last resort in the dollar, although its main lending dollar instrument was discontinued in 2003.

⁵⁷ While domestic government debt default events actually form about 20% of all defaults (Brazil in 1992 and Russia in 1998 are the largest), there are very few examples of the government defaulting on its local currency debt in a flexible exchange rate regime.

financial system works largely as an insurance based on expectations, such a consideration is important even in the countries with relatively large stocks of foreign exchange reserves, such as Russia or Kazakhstan. For this reason, domestic money markets based on the use of foreign currency tend to be very unstable and shallow, which then contributes to the fragility of the entire financial system.

First step towards a financial system based on the local currency

Second, a local currency money market is the first step towards a financial system based on the local rather than a foreign currency. The local currency money market creates a captive demand for local currency instruments and papers, first in the short term, but eventually also in the longer-term. The commercial banks seek alternative (and better priced) allocations of the free local currency liquidity, which they otherwise keep in their accounts with the central bank. The government is the first natural supplier of such instruments, because its revenues are chiefly in the domestic currency and the central bank is sometimes the banker of the government. Eventually, other business entities with local currency revenues will contribute to demand for local currency instruments, as long as their price is well established and there is confidence in the local currency unit as a store of value.⁵⁸ Central bank's operations in the market form the main source of price discovery. With a functional money market, a regular issuance of government bills and bonds in sufficient quantities will help establish the local currency yield-curve as the benchmark curve for pricing other local currency instruments.

Transmission of monetary policy

The third reason for establishing local currency money markets involves the transmission of monetary policy instruments. When the money and financial markets are dominated by foreign currency, monetary policy cannot fulfil its mandate for price and macroeconomic stability. While the CB can set interest rates and conduct open market operations with the money market participants in local currency markets, these represent only a small part of the domestic financial markets and most calculations of households and firms about their consumption and investment decisions are rooted in foreign currency. Instead, the central bank has to conduct monetary policy through various administrative measures and macro-prudential instruments, such as reserve requirements differentiated across currencies, ratios constraining the balance sheet composition of the banking system, and a set of controls on foreign capital flows. However, experience shows that while such measures may be useful in guarding financial stability, they are too blunt for an effective counter-cyclical monetary policy, which should react quickly to shocks and deal with an uncertain future environment. Instead, changes in the interest rate (and eventually also the volumes) of the central bank operations in the money market are the pillar of an effective monetary policy, because they will affect the marginal returns on the banking sector assets or costs of funds and are reflected in lending and deposit rates for local currency-denominated loans and other instruments affecting economic activity.

Support de-dollarization

⁵⁸ The typical examples will include pension and building society funds, investors in purely domestic market production (such as breweries or milk farms) and service sector (e.g. department stores) capacities.

Finally, a high degree of financial sector dollarization raises moral hazard challenges, both during tranquil times as well as during episodes of turbulence. Dollarization limits the use of the exchange rate as a crisis management tool because of the vulnerabilities created by FX mismatches on the private and public sector balance sheets. Often the FX risk is concentrated with household and corporate borrowers – not the banking sector. A sharp devaluation could trigger defaults of borrowers exposed to currency risk, which in turn deepens banking problems.

As a consequence, policy makers have many reasons for reducing the financial dollarization of the economy both from a macroeconomic perspective, as well as from the perspective of developing LCY money markets. However, to be successful in reducing dollarization policy needs to address its root causes, which are both macro and micro-economic.

As regards the macroeconomic causes, dollarization of the financial system and other economic transactions is a product of monetary policy focused on keeping a fixed exchange rate and neglecting the objective of keeping inflation low and predictable (see Box 17:). Often it is the legacy of monetary and economic turbulence and weak institutions, because it is a rational self-insurance of economic agents against hyper-inflation.⁵⁹ Recent explanations have also emphasized the macroeconomic volatility and the moral hazard leading to an institutional bias towards foreign currency, market environment or currency blind prudential regulation (See Box 8:). Moreover, financial dollarization generally prospers in the economies with a high level of “real dollarization” such as the pricing of goods in euro, that generally results in higher exchange rate pass-through effects.

Box 17: Macroeconomic Causes of Dollarization

High level of inflation and exchange rate targeting. Monetary policy that does not manage to bring down the inflation rate, while closely steering the exchange rate tends to increase dollarization incentives. Likewise, a disinflation policy (both reducing and stabilizing inflation) via an exchange rate stabilization policy that stabilizes the exchange rate faster than inflation would also increase dollarization incentives.

Macroeconomic volatility. High volatility of inflation is a cause of dollarization, if it is high relative to that of the nominal exchange rate depreciation. The role of expectations and credibility is also important. When agents do not believe that recent good performance will change the medium term environment, dollarization hysteresis can result, even if macro policies have already changed fundamentally but expectations have not.

Fear of exchange rate floating caused by balance sheet mismatches. In a highly dollarized environment the central bank may be tempted to peg or control tightly the exchange rate to protect the economy from the balance sheet effect of depreciations: monetary policy becomes hostage to the “fear of floating”. The implicit socialization of the risks attached to currency mismatches via the exchange rate policy may generate moral hazard and hence reinforce dollarization.

Underpricing of credit risk of unhedged borrowers. Borrowers and lenders may underprice indirect credit risk induced by foreign currency lending to unhedged borrowers. By embedding a negative risk premium into interest rates, this may increase the myopic incentive to borrow in foreign currency. The often higher recovery value of FX-denominated claims in case of joint devaluation and bankruptcy also strengthens lenders’ incentives for foreign currency lending.

⁵⁹ Ize, A. 2003

Public policy choices distort incentives in favour of foreign currency. As previously noted, the regulatory and institutional environment is often conducive to under-pricing of foreign currency-related credit risk. “Currency-blind” supervisory frameworks failing to account for risks from indirect currency mismatches may let “negative risk premia” widen the interest rate wedge in favour of foreign currency lending. Likewise, the existence of a “currency blind” safety net, such as a deposit insurance framework that does not discriminate between local and foreign currency deposits, or the existence of a lender of last resort facility in foreign currency reinforce the attractiveness of foreign currency lending (Broda and Levy-Yeyati, 2006). Interest rate subsidies given to FX loans also strengthen dollarization. Many countries provide some kind of interest rate subsidies on deposits or loans – often for special purpose vehicles (such as building society programs) or special interest groups (SMEs, start-up families). In dollarized countries such subsidies are often also provided for FX deposits and loans, thus contributing to the dollarization bias. Furthermore, some countries allow public companies to run unhedged open FX positions, reducing the supply of local currency deposits as well as demand for long-term local currency instruments.

Among the micro-economic causes, the two of the most important root causes of dollarisation are connected to the underdeveloped local currency and hedging markets, and to the dominant presence of foreign-owned banks:

- Combined with abundant and easy access to foreign funding, underdeveloped domestic markets may reduce the relative price of foreign currency loans. A lack of trust in local currency savings instruments often combines with a lack of high credit-quality investment vehicles in local currency. The result is a dearth of long-term savings in local currency. Easy access to abundant foreign currency liquidity from abroad (through parent banks or remittances) may therefore result in high interest rate differentials between local currency-denominated and foreign currency-denominated financing. In addition, the lack of a liquid government bond and bill market denominated in local currency beyond the shortest maturities means that pricing benchmarks for financial instruments denominated in the local currency and hedging products are missing.
- A well-functioning, deep and liquid, foreign exchange market (spot and forward) with a reliable price discovery reduces the need for using foreign currency as a precautionary tool, as it provides a ready market access to funding and hedging facilities. Without a well-functioning foreign exchange market, local companies will seek financing in alternative currencies and thus incur foreign exchange risk. In the absence of developed hedging instruments, the best hedge for importers is to set prices in foreign currency.
- The dominant role of foreign-owned banks in capital flows can also be a factor in dollarization. In the context of a market failure (in particular, an absence of instruments to hedge the foreign currency risk on banks’ balance sheets) and of strong prudential constraints on net foreign currency open positions, banks might prefer to transfer the foreign currency risks to customers and to maximize the asset expansion potential stemming from their privileged access to parent bank funding in foreign currency (see Box 18:).

Box 18: Funding sources for LCY loans

The lack of LCY funding sources is one of the factors contributing to a high level of dollarization in many emerging and frontier economies. Provision of long-term credit instruments, such as mortgages or fixed-rate loans is hampered by uncertainties in the short-term interest rate as well as the lack of availability of refinancing for such long periods. The absence of a reliable benchmark yield curve is an embodiment of this

uncertainty. For entities with FX funding (see Box 5:), there is a need to hedge the resulting exposure to local currency.

The remedies are not easily available. Only a few EM and FM currencies have liquid NDF markets as a sufficient and reliable source of LCY funding.⁶⁰ For other currencies, a pooling of FX risks across countries and several institutional investors, such as in dedicated funds like TCX, may provide some reprieve, but is unlikely to be sufficient for funding large-scale LCY lending activity.

Coordinated efforts by the central bank and the government provide a better chance, but must be sustained for a long-period of time. First, a regular issuance of benchmark T-bills and T-bonds in sufficient volumes and fungibility is a must for establishing a credible yield curve for pricing of long-term LCY credit instruments. Second, the central bank must be very transparent and predictable as regards the conditions for providing refinancing and the interest rates. This is very difficult to accomplish without a flexible exchange rate and inflation oriented monetary policy framework, because otherwise the central bank will never be trusted to keep the refinancing available, in the event of a currency crisis. The interest rate policy is also much less predictable without a transparent policy process, such as in IT-like regime. Third, the recourse to central bank refinancing should not carry a stigma and be subject to a heightened supervisory attention. Fourth, special schemes can be designed to facilitate the funding options for LCY credits, such as accepting an expanded list of LCY instruments collateral in refinancing operations.

Chapter 4: Pre-conditions for an efficient money market

A. Use of Local Currency

Monetary policy framework

As discussed in previous sections, the monetary policy framework is the cornerstone of efficient LCY money markets.

Deposits as a Reliable Source of Funding

A stable deposit base in LCY is the primary source of funding and the first line of defence safeguarding the liquidity of a commercial bank over a long-term period. Deposits are typically made by a large number of small individuals and business entities, and tend to have long effective maturities⁶¹. This is especially the case, if they serve as a dominant savings instrument, often the case in emerging and frontier markets with an underdeveloped financial sector. As such, the deposits are therefore ideally suited to mitigate the maturity mismatch between the commercial banks assets and liabilities. Finally, deposits tend to be much cheaper than the alternatives, such as the loans from other market participants and the central bank, as well as equity capital.

The stability of deposits helps the commercial banks in overcoming the maturity mismatch between the commercial bank's assets and the liabilities, thus reducing the roll-over risk in funding. Banks

⁶⁰ One of the important conditions for an NDF market is a reliable exchange rate price discovery in the domestic market. The exchange rate from the domestic inter-bank FX market will often be the exchange rate at which the NDF transactions will be cleared. Hedging the risk from the NDF market locally also requires a functioning money market. A dysfunctional domestic FX and money markets will therefore lead to disruptions in the NDF markets.

⁶¹ Even if the deposits are formally short-term, a relatively large share of them is stable (aka core deposits), despite individual deposits being withdrawn all the time on aggregate there is a threshold or minimum level that tends to be maintained continuously.

need certainty in funding otherwise they face the risk of not being able to realise assets quickly enough to pay back their short-term creditors, or, if they were forced to do so, would have to do so at distressed prices.⁶² Banks can insure against this risk by holding a buffer of liquid assets, because the loan portfolio is not very liquid and tends to be concentrated to a few industries or customers. The current and reserve accounts with the central bank are by definition the most liquid of such assets, but usually earn little interest.

The currency composition of deposits is important. As explained earlier, abundant FX deposits do not contribute to a systemic stability of the domestic financial system and also inhibit money market activity. They facilitate extension of FX denominated loans and the central bank can backstop the funding of this activity (in case of deposit withdrawals) only to the limit of its FX reserves. This represents an important systemic risk, particularly in fixed exchange rate regimes.

As a source of funding, deposits are practically essential in EM and FM economies. As discussed in Chapter 2, while money markets may provide alternatives to deposits, through loans from the central bank or other money market participants, this is unlikely to be a reliable source in EM and FM markets, especially where credit limits are constrained and the banking sector is segmented. Unsecured credits may not be available or will be limited in the size and maturity.

Even if available, wholesale funding from the central bank or other market participants (including the parent company or international credit markets in case of foreign banks) do not form a adequate funding base for assets with long-term maturities in under-developed markets.⁶³ They are much more expensive than deposits and have very short maturities, while carrying a significant roll-over risk for the commercial bank (see Box 19:). When money market credit lines are severed, which can happen quite suddenly as the GFC amply demonstrated, the borrowing banks are immediately illiquid and have to draw on the emergency facilities of the central bank. Perpetuating such a situation will not work and the insufficient liquidity is likely to spill-over to solvency issues, even when the underlying business and credit portfolio are sound.

From a macroeconomic perspective a stable deposit base reflects trust in the LCY and the stability of the banking sector, which is essentially a product of macroeconomic policies striving to smooth the business cycle, keep the exchange rate flexible, and inflation low and predictable.

⁶² The Basel III regulation specifies the Liquidity Coverage Ratio (LCR) as a central tool to promote the short-term resilience of banks in the face of liquidity shocks in order to survive a significant stress scenario lasting 30 calendar days. LCR regulation demands banks to have high quality liquid assets (HQLA), such as cash or assets that can be converted into cash at little or no loss of value in private markets, equivalent of at least 100% of their net cash outflow in 30 calendar days. This time should be enough to make appropriate corrective actions by management, the supervisors or the central bank. For more see BIS (2013).

⁶³ The objective of the Net Stable Funding Ratio (NSFR) regulation is to reduce funding risk over a longer time horizon by requiring banks to fund their activities with sufficiently stable sources of funding in order to mitigate the risk of future funding stress. The amounts of available and required stable funding specified in the standard are calibrated to reflect the presumed degree of stability of liabilities and liquidity of assets. In general, longer-term liabilities are assumed to be more stable than short-term liabilities and retail deposits are assumed more stable than wholesale funding of the same maturity. Thus the NSFR limits overreliance on short-term wholesale funding. For more see BIS (2014b).

Box 19: Funding from the money market – the Northern Rock debacle

The case of Northern Rock is a prime example of how a sudden stop in short-term lending caused by a credit crunch in international interbank markets can, within a matter of weeks, drive a financial business otherwise deemed sound and solvent to the point of near collapse, save for the *deus ex machina* intervention of the lender of last resort. Northern Rock, the UK's fifth largest mortgage issuer in 2007, had grown rapidly on a business model that relied almost exclusively (3/4 of its funding base) on raising short maturity funds from money markets by issuing MBS and other instruments, rather than borrowing it from retail customers. The dangers associated with this huge maturity mismatch became apparent in August 2007, when money markets seized up worldwide following widespread losses made by investors in the US subprime markets, making it impossible for mortgage specialists like Northern Rock to meet its impending obligations. Despite being deemed "sound and safe" by the FSA and the British Bankers' Association, the bank faced a full-blown liquidity crisis and was forced to call upon emergency lending from the Bank of England, a gesture which triggered the first bank run in the UK in over 150 years. Apart from an example of the dangers of a model overly reliant on a wholesale funding through the money market, the 2007 episode also points out to the failure of the authorities to prevent the bank run by taking immediate and decisive action to rein in lending rates in an unstable interbank market.

Because of their importance as a stable funding source, deposits are aggressively sought by commercial banks. They are also subject to much regulation, protecting both the depositors and banks (see Box 20:). Central banks and other authorities are interested in promoting the use of deposits as a means of payments and savings. They introduce legislation giving depositors extra legal protection over other instruments. Deposit guarantee funds, guaranteed by the government (and, eventually, the central bank) are a quite ubiquitous form of protecting the depositors today.⁶⁴ Sometimes, the government's promotion of the deposit base is less obvious (Box 20:).

The regulator also tries to protect the banks from sudden deposit withdrawals. In some countries, regulation prevents premature withdrawal of time deposits. Such a regulation is most needed in fixed exchange rate regimes, whose stability is inherently dependent on the public's trust in the fixed exchange rate parity. A loss in this trust leads to LCY withdrawals and switching into FCY, undermining the stability of the banking system, which the central bank can backstop as the lender of the last resort only temporarily. The need for such regulation in floating exchange rate regimes is practically non-existent.

Box 20: Government and central bank involvement in promoting the use of deposits

Governments often engage in supporting certain kinds of household savings, by subsidizing interest rates). Subsidies to savings for housing loans or building society schemes are quite popular instruments, which incentivize the savers to a regular and predictable deposit pattern, thus contributing to a stable and reliable funding base for the banks. Ideally such incentives should be limited to instruments denominated in local currency.

However, other forms of government interventions may actually interfere with the stability of the deposit base. For instance, policies that allow savers to break term deposits may on one hand inspire more trust into the deposit as a savings instrument, but at the same time also undermine funding certainty for the banks,

⁶⁴ The deposit guarantee funds are usually replenished from mandatory contributions of the commercial banks. When out of cash, the funds issue their own marketable securities (such as promissory notes), seek lines of credit from an IFI, or receive a loan from the government in term of T-bonds, which are then pledged at the central bank in return for refinancing.

encourage depositor switching in and out of foreign currency, and be disruptive to the smooth functioning of the money market.

Sometimes central banks also actively engage in substituting the cash back into deposits by offering various savings instruments directly to the public, thus circumventing the banking sector. Such actions have ambiguous effects. First, they do not directly instill trust in the banking system. Second, they can inhibit the lending capacity of commercial banks and curtail the credits to the economy, as they create competition to the savings products of the commercial banks and thus divert the potential deposit stock in the banking sector. However, this competition effect can occasionally stimulate more money market activity from the commercial banks and decrease their monopolistic margins, especially in highly concentrated banking sectors. Overall, such central bank activities are ill-suited for restoring the deposit funding base of the banking sector.⁶⁵

Another challenge to the stability of banks' deposits may be a strong system of non-banking financial institutions, so called shadow banks (see Box 21:). Shadow banking can thrive if banking regulation is too tight. A too high unremunerated MRR creates an additional wedge between deposit and loan rates, which may be circumvented by non-bank financial institutions. In general, if the banking regulation incurs high costs for banks then there is going to be a drive to find a way around the regulation and there will be a proliferation of shadow banking institutions that will offer bank-like services at more competitive rates than banks. This can undermine the deposit base of the banks and increase credit and liquidity risks, but it can also spur activity and encourage development of the financial system and its instruments.

Box 21: Shadow banking

The money market does not comprise banks alone. The market can attract lots of other non-bank financial intermediaries for the purposes of short-term borrowing, lending and hedging. Some of these are closely linked to banks through ownership or business relationship and many may actually provide services that very much resemble that of banks. These institutions may be unregulated or much less regulated than banks, normally because they do not take retail deposits. Instead, they rely on short-term funding provided by money markets through collateralized lending or other sources, such as contractual funding schemes and other non-deposit liabilities. However, the flipside of the coin is that these institutions lack access to central bank funding or safety nets such as deposit insurance and debt guarantees. This would not create a major problem except for the close relationship and interdependence with banks and the potential huge leverage

Shadow banks are leveraged financial intermediaries whose liabilities are broadly perceived as similar to bank deposits, with liabilities that are seen by the public as liquid and redeemable at par.⁶⁶ As the IMF puts it less formally, a shadow bank is a financial institution that looks like a bank and acts like a bank but is still not a bank.⁶⁷ Shadow banks borrow short-term funds in the money markets and use those funds to buy assets with longer-term maturities. Just like banks they undertake maturity transformation. They also make liquidity and credit risk transformations.

The main risk factor linked to shadow banks is their potential for huge leverage. As shadow banks are less regulated than traditional banks they can increase the rewards they get from investments by leveraging up much more than the banks and providing financing to clients who would be refused by banks. This activity can

⁶⁵ In Poland in the 1990s and Serbia in the 2000s, the central banks issued direct savings instruments to households to foster a more competitive environment in the highly oligopolistic and concentrated banking sectors. The Polish authorities were generally positive about the effects of these temporary actions, while the results in Serbia were less clear-cut.

⁶⁶ McCulley (2008)

⁶⁷ Kodres (2013)

lead to risks mounting in the financial system. Unregulated shadow institutions can be used to circumvent the strictly regulated mainstream banking system and therefore avoid rules designed to prevent financial crises.

B. Structure and efficient functioning of the banking system through the Money Market

In money markets, efficiency is usually measured by bid–ask spreads or the price volatility. A narrower bid–ask spread and lower volatility implies *ceteris paribus* a more efficient market. These indicators are also used to assess the liquidity situation in the money market. Higher bid–ask spreads may also reflect lower liquidity. Among other factors, the efficiency of the money market depends on the ownership of the banks, the diversity of business models and the competition in the banking sector. In EMs, it is often the case that the banking sector is highly concentrated, dominated by a few large institutions, which are quite often state-owned. Such an environment reduces efficiency and trading volumes in the money market

Competition normally leads to increased efficiency, lower costs for clients through lower interest rate margins on banking products or lower bid–ask spreads in money markets, improvements in the quality of services through better and faster execution of orders, and a wider range of financial services provided suiting a wide range of clients with different risk–return profiles. However, in highly concentrated markets, competitive behaviour may inhibit trading, as cartel-like agreements may be forged to drive competitors out of the market by depriving them of the access to liquidity.

Ownership has strong linkages with competition and efficiency. For instance, banking sectors dominated by state-owned banks can be less competitive and efficient than those based on privately owned institutions. State ownership often dampens commercial orientation and is a source of many other distortions, sometimes because it has a privileged access to central bank facilities.

Foreign ownership of banks is usually accompanied by increased efficiency in the money markets. Foreign banks bring expertise, new management and corporate governance practices and new and innovative technology. Because of their recourse to their parent banks they often have higher credit ratings so foreign owned local banks can tap additional external liquidity and funding sources. The crisis also demonstrated that in some jurisdictions foreign parent banks may serve as a backstop to their local subsidiaries and thus alleviate the LOLR problem of the central bank or the costs of bail-outs. This can provide vital support to the functioning of the money market in the case of a local financial crisis.

Moreover, diversity in business models among banks matters. Retail banks tend to have liquidity surplus while wholesale banks fund themselves from the money market more often⁶⁸. If the money

⁶⁸ Retail banks target individual customers (retail clients) whereas wholesale banks focus on corporate or other big customers (corporate clients). Retail banks typically give out small sized loans in large quantities whereas wholesale banks engage in providing a relatively small number of large loans. Retail banks usually have lower cost of deposit and charge higher lending rates because retail clients do not have bargaining power while wholesale banks are forced to offer better terms to corporate clients as these customers are typically more competitive, better informed and have alternative options in non-bank financial services. On the flip side, however, corporate clients tend to use much more of the high margin financial services of the banks such as treasury services, investment advice, and cash management services, for which the banks usually charge fees.

market does not function properly or turns illiquid then wholesale banks are more likely to suffer. In EM and FM, the banks are often not so well diversified and have very similar liquidity needs and funding sources. This reduces the activity in the money market to a minimum, because all the participants are on one side of the trade- either lenders or borrowers. If the structural liquidity surplus is distributed evenly among few banks with a similar client profile, then the only natural counterparty to their liquidity operations is the central bank.

At the same time, however, a large diversity among the banks' business models and liquidity needs is not a sufficient condition for the development of efficient money markets. Foreign ownership, notwithstanding its other beneficial effects, can lead to market segmentation and the reduction in, or in extreme cases the lack of, credit limits among individual market participants. Foreign banks often undertake treasury operations through centralised group treasuries and not at the local branch level. They also will push their own business lines which may include hard currency financing in preference to local currency offerings. Additionally, mistrust or a lack of understanding of the business models or the soundness of business practices in a country can mean that the credit lines for transactions with local banks are already severely constrained.

While different market segments will have different liquidity and funding needs, they will not trade with each other in the absence of adequate credit limits. The foreign bank branch may then be forced to rely on the parent company's capital and financing resources rather than tap the local markets. Such a situation may exist, even if there is enough collateral, as the counterparty risk limit is not eliminated by the use of collateral.⁶⁹ Thus, foreign ownership may not lead to an active and efficient money market.

Box 22: Foreign owned entities

The foreign owned financial sector entities (including occasionally banks) often lack a ready access to LCY deposits and liquidity. Although their capital is denominated in the local currency (by regulation), much of their funding comes from abroad (from a parent company or a wholesale funding market) and is denominated in a foreign currency. Indeed, often it is not their business strategy to actively engage in a costly competition for local currency deposits and many entities, such as providers of micro-finance or consumer credits, do not even seek a banking license to be able to collect deposits. Nor are they interested in accumulating relatively liquid local currency assets, such as local government papers. Instead, they have abundant FX liquidity.

The lack of local currency funding practically precludes these entities from engaging in retail lending in domestic currency, because it would involve large and a risky net open FX position.⁷⁰ Their business strategy is therefore tilted towards providing FX denominated lending instruments. However, such instruments in most cases simply pass-on the currency risk to the end-user, whose underlying revenues and assets are usually in local currency. However prudent these credit institutions may be in providing and pricing such loans, the FX risk of the end-user is very often underpriced.

In order to provide LCY loans, such entities need to find a reliable source of LCY funding. The most common form is to use either an NDF market or FX swaps with the local money market participant or the central bank

⁶⁹ It is also not uncommon to see limits on exposures to the central bank in LCY in many FM economies, which is completely unfounded, because the central bank can never default on its obligations. In such cases, it may be difficult for the central bank to act effectively as the market maker. At the same time, it will be difficult to establish a functional repo market because of the binding credit limits.

⁷⁰ Banks will typically face strict regulatory limits on open FX positions, defined in terms of liquid assets, the overall balance sheet and the on and off-balance sheet items.

using their FX liquid assets as collateral. In many countries, however, the central bank is reluctant to engage in FX swap operations or does so at a premium, which may lead to money market distortions. Foreign entities with FX liquidity have to undertake swaps with other (typically domestic) banks, which have abundant local currency collateral (such as T-bills) to pledge in exchange for the central bank liquidity. The banks holding eligible local currency collateral thus earn a premium from transferring the local currency liquidity from the central bank to the entities (and money market participants) with FX liquidity.

While this business model works fine during normal times, it may go awry during more turbulent periods, as it is essentially exposed to the availability of local currency liquidity from the central bank. In the period of stress, such as when the exchange rate is under market pressure, the central bank is likely to tighten the local currency liquidity and/or increase the FX liquidity in the market place, by reducing the amount of auctioned refinancing credit, increasing the interest rates and volume on liquidity absorbing operations, reducing FX reserve requirements and selling FX in the market. During such periods, the central bank will most likely stop accepting the FX as collateral and sever the existing swap lines as will other market participants scrambling for local currency liquidity. As a result, the money market participants relying on such transactions as a source of domestic currency liquidity may quite suddenly be cut off.

The paradox of their situation is that while foreign entities are likely to have abundant FX liquidity, which is otherwise scarce in the market at that moment (hence the depreciation pressure), they face difficulty in converting the FX assets into local currency, which prevents them from extending LCY loans and exacerbates the exchange rate stress. As explained above, prudential concerns and risk management prevents them from obtaining the FX liquidity in the spot market, because a sudden increase in the share of the local currency assets would open a short FX position on their balance sheet. Faced with such prospects, many commercial banks would find the business model based on extending FX loans much more appealing and less risky.

As a consequence of the unpredictable and unreliable access to LCY liquidity, the central bank is faces a more volatile FX market and more dollarization of the economy. This underscores the benefits of actively playing the role of the MMLR in LCY. CBs should understand the mechanics of financing FX-denominated loans, the financial instruments used for currency transformation, the main participants and the linkages in the background to be able to assess the risks involved. CBs should stand ready to step in if the financing chain breaks down, and need to have the necessary instruments and related regulation in place. And above all, should be ready to provide liquidity at all times under well-defined and predictable conditions.

C. Role of the Central Bank in financial sector development

Central banks have a crucial role in promoting the development of money and long-term financial markets (**Error! Reference source not found.**). Emerging market central banks usually face underdeveloped money markets and often manage the overall liquidity very tightly. This approach undermines the incentives for the private sector participants to turn to each other for liquidity and nips money market development in the bud. To foster the progress of money markets the central bank has to step back and should create incentives for banks to interact by making its own operations less frequent and arranging them so as not to inhibit the price making activity of other market participants.

Initially, CBs can act as a catalyst in bringing the interbank market to life. The first step is to create a monetary policy operational framework and liquidity conditions that are conducive to interbank transactions. If this is not enough, then the CB can help the banks to make the first step by

organizing a centralized money market where all the transaction are done vis-à-vis the CB as a central counterparty thereby mitigating fears about insolvency or resolving a largely fragmented and oligopolistic market structure. As the turnover and the transaction volumes grow, the central bank can gradually withdraw from this activity – although this can prove politically difficult in practice.

An important institutional element is the regular issuance of fungible government debt, without which the local currency yield curve could not develop, thus undermining the role of the interest rate transmission channel. Central banks sometimes take on an activist role in persuading the governments to commit to a regular T-bill issuance at benchmark maturities and sufficient volumes. Indeed, in many countries the primary T-bill auctions were organized by the CB in the beginning and the CB acts as an advisor to the government in debt management issues. The central bank can also take part in the development of a functioning secondary government securities market that can provide collateral for interbank and other money market lending. Measures to enhance liquidity can also include a primary dealer channel or an auction system for rate setting purposes on a transparent platform or the stock exchange (see Chapter 1).

The basic market can be augmented by efforts to create a functional FX spot and forward market, both as a source of liquidity as well as funding for LCY instruments. This also involves allowing for some exchange rate volatility irrespective of the policy framework with the exception of tight pegs, which would kick-start the process of building FX markets and become a spur to FX risk management and liquidity management capacities of commercial banks.

A less recognised but nevertheless important role for the central bank in the early stages is in promoting good standards, practices, codes of conduct as well as helping to establish the market infrastructure such as trading platforms, contractual frameworks such as repo master agreements, and benchmarking indices. Allowing foreign investors and banks to participate in the financial markets can also add market liquidity and provide transaction counterparties in otherwise one-sided markets.

Box 23: National Bank of Poland (NBP) actions to promote financial markets

In Poland the central bank played an important role in the evolution of the financial markets mainly by creating infrastructure and institutions, setting standards and creating incentives for market participants. The system of unified bank accounts in the NBP, which was crucial for the money market, was established in 1993-94, facilitating the introduction of averaging in the required reserve system at the end of 1994.

Simultaneously, the payment system was developed. The NBP supported market development with the early introduction of re-purchase operations in 1993. A book-entry system for T-bills and NBP-bills was introduced in 1995. The NBP (in cooperation with commercial banks) also promoted the setting of market standards and encouraged banks to engage in market operations. In 1993, the system of money market primary dealers was introduced.

A further significant stimulus to the development of financial markets followed the introduction of the interest rate targeting operational framework, exchange rate flexibility and inflation targeting in the second half of 1990s. The WIBOR and WIBID reference rates became reliable market indicators, providing reference prices for settlement in derivatives instruments such as Forward Rate Agreement (FRA) and Interest Rate Swaps (IRS). FX swaps and London based NDF markets began to flourish too, providing funding and liquidity sources to the market.

D. Legislation to Support the Market

In addition to the general legal framework, recognising fundamental legal concepts such as the rights of title, transfer of ownership and enforceability of judgement, may require specific legislation to be enacted to ensure smooth market function. Areas that often need to be addressed include bankruptcy procedures, finality of payment and settlement, status and use of collateral, finality of payment, netting⁷¹ and set-offs⁷², the status of repo transactions, the nature of trusts, the extent of fiduciary responsibilities, amongst others.

Securities law is itself a considerable undertaking, with much of it concerning conduct of business and consumer protection. Financial legislation will often determine the structure of financial markets, such as Glass Steagall in the U.S. which separated commercial banking from investment banking for most of the last century and the E.U. Second Banking Directive which created the single European Market for Banking. Other legislation, often enacted in the wake of a financial crisis, seeks to remedy market failures and reduce risks to the system. Recent examples include Sarbanes-Oxley and Dodd-Frank in the U.S.

Financial regulators and regulations are usually based on legislation, although much of their activity is in the form of directives, by-laws and administrative measures rather than legislation. Tax law also needs to define the treatment of money market activities, including capital gains (if any), current (interest) income, and inflation and exchange rate differentials.

Transactions are agreed in a number of ways: on exchange or platform or over the counter (OTC), electronically or by voice or other communication systems, directly or through brokers. They customarily become binding at the point of trade agreement. However, the actual financial flows – payments and transfer of securities – take place afterwards, on the agreed value date and in the agreed manner (for example, delivery instructions for purchase of securities).⁷³ In order for the transaction to be completed and finalized, a number of "back-office"⁷⁴ functions must be accomplished. Finality of settlement is an important feature of any financial system, as it reduces risk and uncertainty. Without finality, a transaction can be "rolled back" or reversed, greatly increasing the settlement exposure and market exposure of the parties involved.

In addition to the legal framework, efficient trading, market practices and settlement procedures require standardised documentation and clearly defined contractual terms. This is especially important for secured lending. Sometimes, these rules of trade refer to international standards developed by regulators or trade organizations. For instance, the International Capital Markets Association (ICMA), Global Master Repo Agreement (GRMA) is widely accepted and has annexes

⁷¹ The ability of a bank or other institution to view all assets and liabilities of a counterparty in an aggregate manner, and settle only the "net" amount.

⁷² The ability of a bank or other institution to set an asset it holds against the liability of the same party in the event of default.

⁷³ Securities are "held" primarily in an electronic form by a custodian institution, which could be a central bank, a commercial bank or a specialized safe-keeper. These institutions maintain records and deal with payments, receipts, taxes and other needs.

⁷⁴ To distinguish them from "front-office" functions of deal-making and transacting, and "middle-office" functions of risk management.

dealing with local issues added. Master Repo Agreements should be agreed between the central bank and local financial institutions and between local financial institutions to help develop the interbank market. In addition, special legislation is sometimes enacted to remove legal ambiguities regarding collateral and repo activity.

The GFC has spurred efforts to make securities and derivative trading and over the counter trading in general more open and transparent. As opposed to exchange trading, which is conducted publicly, OTC trading is opaque, known only to the parties directly involved. As a result, there is limited data regarding trading volume, open positions and other information which could help to limit the build-up of hidden risks. Regulators are now requiring trades, even if conducted over-the-counter, to be reported within a set time period to a regulator or industry association⁷⁵. Despite the clamouring calls for greater transparency, it is now recognised that market makers require some opacity in data reporting to protect themselves from predatory trade practices of other market participants, particularly in less liquid markets.

In addition to existing settlement practices through Central Securities Depositories (CSD), there is also a global regulatory movement for certain transactions- particularly derivatives- to be registered and settled through Central Counterparties (CCPs) in an attempt to reduce settlement risk and ease market disruption in the event of a counterparty default. (

E. Efficient Payment and Settlement System

Payments and money transfers are executed through the payment system. An efficient payment system infrastructure is indispensable to the efficient functioning of the interbank, money, and capital markets. A weak payment system can result in an inefficient use of financial resources and a loss of confidence in the financial system, which in turn would seriously impair the transmission mechanism as well.

Payments in the money market are almost invariably made electronically.⁷⁶ Originally, payment systems were based on multilateral netting, as in a clearing house. Instructions were accumulated over time, and at set times each bank's total position was computed (payments and receipts), and one net payment made from each bank to each other bank. This was sometimes done manually, but with the introduction of electronic systems this could be done on a batch basis, several times a day. The disadvantage of a netting system is the time delay involved between instruction and execution; and the lack of finality: there is no way of knowing if a payment will actually be made until the completion of the clearing cycle, or even later. Lately, there has been rapid growth in digital payment systems (often mobile phone based), peer to peer payment systems and other innovations, many with a significant impact in developing or frontier markets. With few exceptions they have not yet assumed systemic roles, but they warrant continued monitoring and assessment.

A key function of the payment system is to insure the finality of settlements, so that transactions made over payment networks will be complete and not subject to reversal even if the parties to the

⁷⁵ The Thai Bond Market Association (ThaiBMA) is often held up as an example of effective trade reporting in EM. The Association has managed to navigate the difficult issue of protecting market makers in debt instruments whilst still ensuring added transparency by implementing a lagged reporting requirement based on the liquidity of the instrument.

⁷⁶ Retail payments can of course be made in a variety of ways, including cash, check, credit card and more. However, the final settlement of all these methods is in the wholesale payment system.

transaction go bankrupt or fail after settlement. It is assurance that even in times of financial system uncertainty or crisis the transaction being undertaken will occur. Policies can be directed to implement settlement systems that provide finality of settlement and reduce settlement risk. To facilitate the finality of the settlement, it is important that the payment system can handle the transactions in a reasonably short settlement time. For instance, large value payments can cause sizeable liquidity shocks, so it is crucial that banks have information on them as soon as possible.

Real time gross settlement (RTGS) systems were developed to address some of the settlement issues, especially given the increase in the volume and value of transactions over the last decades. RTGS systems provide greater assurance of payment finality and uninterrupted financial market operation. They enable continuous (instead of at the end-of-the-day) settlement of payments on an individual order basis without netting debits with credits. As such, RTGS systems are especially suited for low-volume, high-value transactions, because they give an immediate view of the changes in banks' position. These systems are usually run by central banks. RTGS systems also lower the settlement risk⁷⁷ relative to national payment systems, as the processing of transactions on a gross basis makes them possible to effect the final, i.e. unconditional and irrevocable, settlement continuously during the processing day.

RTGS systems vary widely in their architecture and technical details. Where they are operated by central banks, as they frequently are, they require more sophisticated management than net payment systems. From an operational point of view, each individual payment must be settled and cleared, rather than a single or limited number of net payments. Since settlement risk is reduced, a larger number of members might choose to use the system. Moreover, management of payment traffic- the volume and order of matching and settlement -become vital for the central bank as manager, and commercial banks as users of the system. The pricing of access to RTGS is also an issue, as is the extent to which the central bank encourages use of the system. Some central banks incentivise use of the system through favourable pricing, or simply require payments over a certain size to go through the RTGS by limiting the maximum amount of payments through other (net) systems.

The price of lower settlement risk is a larger need for liquidity, which stimulates money market activity. Large volume, low value transactions are usually processed in the national payments systems that are Designated-time Net Settlement (DNS) systems, i.e. transactions are processed in batch mode and on a net basis during the night. These call for less liquidity need but have higher inherent settlement risk. DNS systems can also be enhanced to process transactions several times during the day, however, there is a global shift to real time payments even for smaller value retail payments. This would call for even larger liquidity needs but fast processing of transactions means the banks have a clearer picture about their position during the day, so that they can better manage their liquidity, whereas households and firms can hold lower settlement balances.

As noted, an RTGS system eliminates interbank settlement risk but increases the need for intra-day liquidity. In a net payment system, intra-day credit is implicitly provided by the paying bank to the payee bank. In an RTGS system, there is a constant need for intraday credit to allow the smooth processing of instructions, since there will be some imbalances of liquidity amongst members during

⁷⁷ Only if together with "Delivery versus payment" (DVP) capabilities

the settlement day. Without some provision of liquidity by the central bank, “gridlock” could ensue, disrupting the payment system.

In the strictest RTGS system, there is no provision of liquidity: a payment instruction is executed if and only if the payer has a sufficient balance; otherwise the order is queued or rejected (and has to be resubmitted). A more common approach is for the central bank to allow overdrafts on settlement accounts. The central bank will need to determine the conditions under which an overdraft is permitted, which will usually involve provision of sufficient and suitable collateral; maximum size and duration of overdrafts; and interest charged, if any. Automated real-time liquidity systems have been developed to support the smooth operation of RTGS systems. These systems can be based on pre-allocated and pledged collateral, “floating” pledges of collateral, or same-day transfer (Buy-and-sell) of government securities.

Collateral policy and management is an integral part of an RTGS system. All the usual issues related to collateral management need to be resolved - eligibility, valuation, haircuts, maintenance and failed settlement procedures. The exact form of the system will be determined by the legal framework, regarding rights of ownership, documentation, transfer, substitution, and liquidation. Eligible collateral in payment systems will usually be very narrowly defined in order to maintain the highest degree of liquidity and safety. Although most operations will involve domestic assets, foreign assets can also serve as collateral, although this can complicate management. This will require the central bank and commercial bank to both maintain suitable accounts and agreements with an international clearer. In other cases, central banks can manage collateral in their domestic systems for a foreign central bank. The most prominent example of this is the Correspondent Central Bank Model (CCBM) used in the Euro-system and which supports the TARGET payment system.

Security clearing and settlement can be done by central banks for domestic securities, such as the Fedwire in the U.S., or by private clearing banks. Internationally, institutions such as CEDEL and EUROCLEAR settle and safekeep securities as well as provide ancillary services such as security lending and margin management.

The central bank should also take the parameters of the payment system and the patterns of government payment flows into account when designing its instruments and its operational guidelines. The o/n or 1-day standing facilities should be available for banks after their position is already known. The advantage of o/n facilities is that after their settlement in the morning the funds are available during the day. The main instrument should be available after large intraday payments are already made, e.g. in many European and African countries the SWIFT messages arrive in the early afternoon.

A number of settlement procedures have developed over the years to reduce settlement risk. These are above all the delivery-versus-payment, delivery versus delivery, payment-versus-payment and continuous-linked-settlement.

Delivery versus Payment⁷⁸

Delivery versus payment (DVP) is a securities industry settlement procedure in which payment for a security is made only if the security is delivered to the purchaser's account, and vice versa. Any time difference between the two gives rise to settlement risk, as one leg of the transaction could proceed without the other. DVP stipulates that cash payment must be made simultaneously with the delivery of the security. It may also involve transfers of two securities done in such a way as to ensure that delivery of one security occurs if and only if the corresponding delivery of the other security occurs. (otherwise known as delivery versus delivery or DVD).

Continuous Linked Settlement

Continuous linked settlement (CLS) is a settlement system for foreign exchange trades that mitigates settlement risk⁷⁹. The system is run by the CLS Bank International which is owned by a number of international financial institutions. All transactions, primarily but not only spot FX transactions, settle through the CLS Bank during a single 5 hour window when all RTGS systems in the CLS settlement currency jurisdictions are open and able to make and receive payments. This enables simultaneous settlement of the payments on both sides of a FX transaction.

The CLS Bank is based in New York but maintains accounts in the various countries for whose currencies it settles trades.

Payment versus Payment in Foreign Exchange transactions

Transactions are settled on a payment versus payment (PVP) basis. Each party delivers the currency it owes to the CLS Bank. That payment is not released to the counterparty unless that counterparty deposits the offsetting payment for the transaction. Multilateral netting allows each participant in continuous linked settlement to make just one net payment per currency each day.

Direct participation in continuous linked settlement is limited to the financial institutions that are shareholders of the CLS Bank who are known as settlement members. Financial institutions in transitioning economies can become User Members that are sponsored by settlement members. User members submit settlement instructions for themselves and their clients but their transactions flow through the accounts of their sponsoring settlement members, who act as correspondent banks. The settlement of the payment instructions and the associated payments are final and irrevocable.

⁷⁸ For a discussion of the various types of DVP systems see "Delivery versus Payments in Securities Settlement System" BIS Basle 1992 pp 16-25 which provides a useful classification system that is still used today. The type of DVP system implemented determines the need for intraday overdrafts, securities borrowing and lending regulations and a variety of other measures to smooth the passage of securities transactions through the settlement cycle

⁷⁹ Also known as the "Herstatt" risk, named after a German bank which failed in the middle of the business day, defaulting on one side of numerous foreign exchange transactions. With the growth of global foreign exchange transactions exceeding USD 5 Trillion daily in 2014, the possibility of a disruption in settlements in the FX market posed considerable systemic risks.

Chapter 5: Building blocks of an efficient money market.

A. A Money Markets Primer

Short term borrowing and lending in the money market takes place in either secured or unsecured form. The advent of the global financial crisis has placed more emphasis on secured lending through collateralised agreements or through the clearing of interbank transactions on the accounts held by the banks at the central bank. Viability of the interbank market relies on the certainty that settlements will be honoured when interbank loans mature. Heightened credit risk and the lack of trading limits will stop banks from dealing with each other so it is important to foster an environment where banks will trust each other to establish trading and credit limits for secured and unsecured lending.

Unsecured Lending conducted in an interbank market, is a principle component of a well-functioning money market. Unsecured lending is easily undertaken, but since it depends solely on the ability and willingness of the borrower to repay, it is risky. Therefore, banks have to be confident of the creditworthiness of other banks in the market. Banks need to establish "lines" with each other - bilateral trading limits or quotas defining amounts which can be traded. Since most interbank trading will be very short term, even overnight, credit assessment is relatively easy.

As long as banks were confident in each-others' creditworthiness, unsecured lending could take place easily and with few complications. However, the GFC gave rise to heightened credit concerns amongst banks, and lessened their willingness to extend unsecured loans. At the height of the crisis liquidity dried up almost completely, and markets basically ceased to function. Concerns have eased but remain elevated - as a result interbank markets are now essentially intermediated to a much greater extent by central banks. Banks with excess liquidity deposit it with the central bank, and banks seeking liquidity borrow from the central bank. In this fashion, the central bank in essence replaces the impaired confidence amongst banks with its own risk-free standing.

Secured interbank lending has greatly increased since the GFC. Although secured lending, especially using repos, was already a large and well developed market prior to 2008, most activity took place in the simpler and less expensive unsecured market. During the GFC, banks become reluctant to lend to each other in the wake of the crisis and demanded collateral from borrowers to secure loans. This is carried out primarily through the use of Repurchase Agreements (see Chapter 5:).

Government securities play an important role in secured lending in the interbank market. A deep and liquid government securities market provides most of the collateral for secured lending via repurchase agreements. Secured lending greatly reduces the risk in the market, but it does entail certain complications, such as haircuts, margin payments, more complex settlement and more strenuous administration. A frequent concern is the availability of sufficient and suitable collateral; if lending becomes primarily secured, the lack of collateral can be a serious constraint on the efficiency of the market. The treatment of collateralized lending in calculating use of counterparty limits also needs to be refined. Secured lending is considerably less risky than unsecured lending, and should be subject to its own (more liberal) limits, or be included in limits but with a lower risk weighting. In

addition, obtaining and holding collateral to meet potential borrowing needs can complicate bank asset-liability management.

The money market is comprised of both **marketable and nonmarketable** instruments. Marketable instruments, (generally securities), can be sold or transferred from owner to owner. They provide liquidity and flexibility; therefore, the return (interest or yield) on a marketable instrument will generally be less than that of a nonmarketable instrument with otherwise identical characteristics. A nonmarketable instrument (such as a bank deposit) cannot be sold⁸⁰; it is therefore generally intended to be held to maturity, and will pay a higher rate of interest than an identical marketable instrument to compensate the holder for its illiquidity.⁸¹

Money market obligations can be either **secured or unsecured**. A secured instrument has, in addition to the contractual obligation of the borrower to pay the debt, additional assurance of some sort that the payments will be made; this can be in the form of collateral, a lien on an asset, a guarantee or pledge against a cash flow. An unsecured obligation has no assurance of repayment other than the contractual obligation of the debtor⁸², and depends entirely on the debtor's ability to repay. Since a secured obligation is less risky than an unsecured obligation of the same nature, it will generally have a lower interest rate or yield.

Derivative Instruments are financial products whose value is a function of ("derived") from an underlying asset. These include forward or future contracts, whose value is a function of the current ("spot") price of an asset; options, the right to buy(or sell) an asset at a given price; and swaps, the exchange of cash flows derived from different assets. The range and complexity of derivative products has increased enormously in developed markets.

Collateral plays an important function in the money market in several roles. Many commercial loans are secured through pledging of collateral, and the entire repo market is built around availability of suitable collateral. The valuation and management of collateral (including margin on exchange traded and OTC transactions) has become more important as the GFC gave rise to greater demand for collateralized transactions. The lack of sufficient and suitable collateral can be a substantial obstacle to financial market development.

Collateralized obligations have tangible assets backing them; in the case of default, the creditor can liquidate the assets in lieu of payment. They are less risky and therefore will have lower yields than otherwise identical but non-collateralized instruments. Margin is a form of variable collateral; when the market value of an obligation changes by a certain amount, collateral is added or withdrawn (the "margin") – to ensure that the value of collateral is maintained at the desired level. Collateral is frequently valued with a "haircut": the value of the pledged asset is reduced by a certain amount to

⁸⁰ Financial innovations have provided "work-arounds" whereby non-marketable instruments can be transferred; for example, through novation (an agreement to replace a party to a contract with a new party), or securitization such as pass-through or Loan Participation Notes.

⁸¹ In fact, many marketable securities developed as outgrowths of banking markets. Banks began to "discount" various obligations, by "discounting" promissory notes, bills of lading, and accounts receivable. Eventually, instruments such as banker's acceptances and letters of credit became formalized, and practices such as factoring and re-discounting of notes emerged. Secondary markets developed, and eventually original issue securities such as commercial paper emerged as alternatives to pure bank financing.

⁸² There can be differences in the strength of the obligation from a legal viewpoint: obligations can be more or less senior (priority in order of repayment), i.e. subordinated.

ensure that it covers the obligation even if its value changes. If collateral is less creditworthy or its value is volatile, the higher the haircut applied.

In addition to the instruments themselves, there are differences in the ways they are issued and traded. The initial issuance of a marketable security will be in the **primary market**, where the instrument is sold by the issuer, the debtor (or an agent on his behalf) to an investor. The issuance can be in a tranche – a preannounced and set amount sold to the market. There can also be a "reopening" of a tranche when additional securities identical to an existing one and with the same ISIN, are sold at a later date. Securities can be issued through a "tap" where the issuer sells securities over time as market conditions permits and as supply and demand develops. This is frequently the case for CDs and CP. Tranche issues can be sold through a number of procedures, including underwriting, syndication or auction. Each type has advantages and disadvantages. Auctions especially come in several variations, including English, Dutch, Single price, and discriminatory. Once a security is issued, if it is marketable, it can be bought and sold in the **secondary market**. Issuance in the primary market creates a liability for the borrower and an asset for the lender. Trading in the secondary market leaves the outstanding assets unchanged; only ownership changes, and the debtor is not affected.

Securities can be either **publicly issued or issued as private placements**. Public issues must usually meet certain regulatory requirements such as issuing a prospectus and thus involves extra costs. A private placement is, as the name suggests, non-public, usually issued to a limited number of large "sophisticated" or "professional" investors, and thus do not incur the costs or visibility associated with public issues. However, they usually cannot be registered on an exchange and are less liquid, therefore they tend to have a higher yield than a public issue. In some markets, a private placement can be "seasoned" a certain time after issue and become eligible for purchase by a wider range of investors⁸³.

Marketable instruments can be traded in two types of secondary markets: **over-the-counter or exchanges**. Over the counter markets have no centralized location or trading venue. Trades are made bilaterally between parties by various means of communication – primarily telephone, other voice, or electronic messaging systems. Exchanges are organizations which provide a platform for trading according to specified rules and standards. Although they were originally physical locations, trading on most exchanges is now conducted electronically. In either over-the-counter or exchange markets, there can be "market-makers" with either a formal or informal obligation to provide liquidity to the market. They do this by being ready to buy and sell instruments (within certain criteria) from customers.

B. Characteristics of money market instruments

Financial instruments have numerous characteristics which determine their **risk, return and liquidity**. Foremost amongst them is the **credit risk** associated with the obligation: the probability that the borrower will repay the capital and interest of his obligation, or in inverse terms, the probability of default, full or partial. This is a function primarily of the creditworthiness of the

⁸³ This is the case in Poland where a Private Placement can be listed on the Catalyst platform of the WSE, provided it satisfies the listing requirements related to the number of investors and disclosure.

debtor⁸⁴, but can be affected by collateralization, guarantees, or the quality of underlying assets in securitized instruments. A debt in domestic currency of a sovereign issuer is generally considered default risk free.⁸⁵ Since money market instruments are by definition short term up to one year, the credit assessment is not as difficult as for longer term securities. The greater the credit risk, the lower the rating and the higher the yield, in order to compensate the lender for the increased risk.

Investors (especially financial investors) often simplify the trade-offs involved in their decisions using various **risk-return characteristics**, which can be compared across different types of instruments and investors. The Sharpe ratio, expressing the expected financial return from the investment over its volatility, is one such popular indicator. Investors with a higher risk tolerance levels will require relatively low reward for the risk they are taking and their investments will tend to have relatively low Sharpe ratios, and vice versa. Although rather simplifying, Sharpe ratios can be also be used for pricing financial market instruments. For instance, if a Sharpe ratio is known for certain instrument type, it may be applied to determine the value of a similar instrument, if the volatility of its price is known.

The return or yield on a money market instrument can be in either of two forms: **a discount, or an interest payment**. In the first case, the instrument is issued at a discount (a price less than 100% of its face value) but redeemed at maturity at par (100% of face value). The difference between its redemption value of par and its purchase price provides the return on the investment (or cost to issuer). An interest bearing instrument pays an explicit interest rate (the "coupon rate") based on the principle. A discount instrument has no intermediate cash flows. Since money market instruments are short term, there is frequently only one interest payment, together with repayment of the principle, at maturity. However, some instruments can pay interest periodically: weekly, monthly, quarterly or semi-annually. For a full discussion of yield definitions and calculation see Technical Aspects of the Money Market

The **liquidity** of an instrument is another crucial characteristic determined by the instruments own attributes, the market in which it is traded, and general economic conditions. Liquidity refers to the ease with which the particular instrument can be converted to a central bank liability (or a commercial bank deposit) at close to its 'fair' value. A larger amount outstanding, ease of trading (for example, a large number of market-makers, standard terms and denominations), well-known issuer name and low credit risk will increase liquidity, as will the initial placement method and nature of its' investors. The denomination of issuance will determine the type of investor, with small denominations providing easy access for retail investors, while large minimum denominations will tend to restrict distribution to large investors and institutions. Originally all money market instruments were issued in physical form (hence the terms "money market paper" "certificate of deposit", "coupon") and could be either registered or in bearer form. Today, almost all financial assets are dematerialized- issued in electronic ("book entry") form- which lessens operational risk and increases tradability.

⁸⁴ Often represented by the "rating" assigned by one of the specialized agencies, such as S&P, Moody's, or Finch

⁸⁵ Although history shows that this has not always been the case.

C. Instruments of the Money Market

Many types of instruments have developed to facilitate unsecured and secured lending between market participants. Usually the first to develop and one of the basic and most well-known money market instrument is the **bank deposit**. A deposit can be a current account, usually non-interest bearing⁸⁶ and used for making payments. A term deposit is a simple⁸⁷ one period obligation of a commercial bank to repay the principle and interest promised at the maturity of the deposit. Some longer term deposits might pay interest at set intervals during the life of the deposit. A bank deposit is totally illiquid and non-transferable.⁸⁸ In terms of credit risk, deposits are the highest ranked obligation of the bank and are lower risk than other bank liabilities. Due to their central role in the system, deposits up to a set maximum, often benefit from a limited government guarantee ("deposit insurance") making them essentially credit risk-free. Bank deposits play a number of important roles; they are a basic component of the money supply; they play a central role in the payment system, and the interest rates paid on them frequently serves as a reference rate for other instruments (Especially interbank deposits: see Section F in Chapter 5:).

Certificates of Deposit (CDs) are commercial bank liabilities ranking equally with deposits (*"pari-passu"*) but issued as securities, so that they attain a degree of liquidity, as opposed to regular deposits. They can be in denominations suitable for retail investors as well as large denominations for the institutional market. Since they have some liquidity, often in the form of an informal commitment by the issuing bank to buy them back, they can be issued for relatively long tenors up to 5 years. They can have either fixed or floating rates of interest and are generally issued on a tap basis. CD's are "tiered"; that is they are priced and traded in the secondary market in categories based on the issuing bank's credit rating: AAA, AA etc.

Bankers Acceptances (BAs) are short term debt instruments issued by non-financial firms, which are then endorsed or guaranteed by a commercial bank. Once they have the guarantee of a bank they have the same credit standing as the bank, and can become easily negotiable. They were one of the first money market instruments, developed many centuries ago, and have played an important role in facilitating international trade.

Treasury Bills are another important component of the money market. They are short term obligations of the central government, usually in tenors of up to one year, and are considered risk free investments. They became more important as debt financing by the government increased. They are generally the most liquid short term security in a given market, and given their low risk and high liquidity they will have very low yields, which will form the short term yield curve. They are issued by the Treasury as part of its debt management process; they can be issued either on a regular schedule (which contributes to market development) or on an ad hoc basis, usually by some form of auction. Their low risk and liquidity make them extremely useful as collateral and for central

⁸⁶ Financial innovation, de-regulation and competition with non- bank financial intermediaries have resulted in a blurring of the once clear distinction between different financial instruments, for example, MMDA (money market Deposit Accounts) in the US which are essentially interest bearing current accounts. MMMF (Money Market mutual funds are close substitutes to current accounts or deposits but issued by non- bank intermediaries.

⁸⁷ Banks can embellish deposits in various ways, usually for marketing purposes aimed at retail clients.

⁸⁸ In certain cases and jurisdictions, deposits can be "broken" or withdrawn before the original maturity, but this usually involves a substantial penalty and is quite rare.

bank OMOs. They are traditionally issued in discount form. Although they are obligations of the treasury, they are sometimes issued by the central bank acting as fiscal agent for the government.

Central Bank Bills are sometimes issued by central banks when there is an insufficient stock of government securities for efficient monetary operations. The central government might not see a need for short term debt operations or they might not be part of its debt management policy. The central bank might then issue its own bills for liquidity absorption purposes (sterilization). In this case, the interest costs are borne directly by the central bank, and this can be a serious issue. The decision to issue CB Bills needs to consider, in addition to the availability of other instruments and the costs involved, the impact on monetary policy transmission channels, the operational independence of the CB; the development of financial markets; and coordination with government debt management offices.

Commercial Papers (CP) are unsecured short term debt instruments which can be issued either by financial or non-financial firms and carry the credit risk of the issuer.⁸⁹ They are typically issued to fund short term receivables such as working capital. The CP market is tiered by type of issuer and credit rating. CP are usually issued in large denominations and not aimed at retail investors; they are frequently purchased by MMMFs and similar schemes. Issuance is on a tap basis, sometimes under the framework of a "CP program" where the desired amount of outstanding funding is achieved by issuing CP at various tenors. A CP market can be an important step in diversifying the credit market away from total reliance on bank funding.

Asset-Backed Commercial Paper (ABCP) is CP which is collateralized, generally by financial assets such as accounts receivable, mortgages, or commercial loans. They are issued by a Special Investment Vehicle (SIV) or "conduit" which is an entity which holds the assets and issues the CP against the collateral. Issuance is usually part of a program; the conduits are often related to a financial firm which uses it to access funding at a lower rate or with fewer regulatory issues. Although they are collateralized, they can have varying degrees of credit risk depending on the collateral and the structure of the SIV.

Repurchase agreements and Reverse Repurchase agreements (Repo, Reverse Repos) have assumed major roles in money markets in recent years, as well as becoming important in monetary operations. The Repo Market is one of the most traded and largest money markets, with volume in The US measuring in the trillions of dollars. A repo is a contractual arrangement between two parties, whereby one party agrees to sell securities to another party at a specified price with a commitment to buy the securities back at a later date for another specified price. This makes a repurchase agreement economically identical to a short-term interest-bearing loan against specific collateral. The seller (economically, a cash borrower and collateral provider) and buyer (economically, the cash lender), are able to meet their investment goals of secured funding and liquidity. A reverse repo is exactly the same transaction, but from the point of view of the buyer, who is lending cash.

A repo is first and foremost a short-term credit transaction to borrow or lend funds with low risk due to the collateralized nature of the transaction. As a result, it provides safety to the lender and a low

⁸⁹ CPs issued by banks do not have equal right of payments and seniority ("pari passu") as deposits and are therefore of higher risk.

cost to the borrower. It has become the primary means of funding intermediaries' inventories of securities, and an important tool of cash management and investment. It has also played an important role in the development of markets, as it provides a convenient way of obtaining a specific security (by the cash lender), for example to maintain a short position. It has also become an essential tool of monetary operations, as an efficient and flexible means of temporarily injecting or absorbing liquidity by the central bank. It is the main tool used by the Federal Reserve in its open market operations, and is used by many other central banks as well.

The bulk of the repo market is very short term, typically for one day ("overnight"), but there can also be "term repos" for specified maturities as well as "open repo" which is an overnight repo renewed by the parties until closed by agreement. The interest rate on the transaction can either be explicit (expressed as a percent of the face value) or implicit: the difference between the sale and repurchase price.⁹⁰

Arrangements regarding collateral are an integral part of the agreement: the security can be delivered to the other party; held by a third party as in a "tri-party repo"⁹¹; or infrequently held in custody by one of the parties themselves⁹². In addition, the collateral is usually "marked-down" – the loan is over-collateralized by applying a "haircut" to the collateral to ensure that it still covers the amount of cash lent, even if the price of the security's price falls.

The classic repo uses government securities as collateral; but a range of additional classes of securities has been used. The lower the perceived credit quality and liquidity of the collateral, the higher the cost (interest rate) on the loan and the higher the "haircut". The repo rate will be lowest for government securities. When no specific security is requested, the repo is known as general collateral or GC. Sometimes the motivation is to obtain a specific security, in order to cover a short securities position or for other purposes. This is known as a "special", and the interest rate will be more attractive to the lender of the securities the greater the demand for the special security. Interest rates on specials are lower than for GC, and can be zero or negative, even before the post 2008 period of low interest rates. The development of the repo and special markets contributed to the development of the government bond markets, as it enables market-makers in the relevant securities to provide liquidity to the market with greater certainty.

Before the formalization of repo transactions, the same economic transaction was achieved through a "buy and sell back" or "sell and buy back" transaction, where a security is simultaneously sold and bought for different settlement dates, with the difference in price constituting the interest payment. However, a formalized and standardized repo transaction is more convenient, safer and can receive preferable accounting and tax treatment.

Contractual, legal, accounting and tax arrangements play an important role in the repo market. The International Capital Markets Association (ICMA) Global Master Repo Agreement (GRMA) is widely

⁹⁰ Agreements cover technical details, such as the treatment of interest payments on the collateral paid during the repo period, use of gross ("dirty") or net ("clean") price, etc.

⁹¹ This arrangement has become very common, with the third party providing other services as well such as arranging deals, managing margin etc.

⁹² This somewhat increases the risk to the other party, should the holder of the collateral default. This type of arrangement has been abused in the past.

used. Many jurisdictions have to implement legislation regarding the repo market so as to remove ambiguity regarding the status of repo agreements regarding taxation or in the event of a default.

In many EM economies, the lack of a repo framework including Master agreements, impairs secured lending in the interbank market, especially in an environment where banks do not trust each other nor have credit limits for each other. Standardised documentation and clearly defined obligations under a contract, help to promote more efficient trading. Local Master Repo Agreements should be agreed between the central bank and local financial institutions and between local financial institutions to help develop the interbank market.

In developed financial markets there will be a variety of **Short Remaining Maturity** instruments, which become part of or close substitutes to the money market. These are debt instruments, originally issued for longer maturities, which have aged until they have a remaining maturity of one year or less. From an economic point of view they should be identical to any other money market instrument with the same characteristics (credit quality, etc.). However, in practice they are usually less desirable and will generally have a higher yield than original money market instruments. They are also less liquid, infrequently traded, and might have non-current coupon rates or other disadvantages. For instance, if a capital gain is taxed more than interest income, low coupon bonds are less desirable. In addition, in some markets longer maturity debt instruments are "stripped" – the remaining coupons and principle are traded separately. In this case the payments to be made in the next 12 months are effectively discount securities and close money market substitutes, as are the stripped coupons themselves.

Foreign Exchange Market instruments are often used in conjunction with domestic currency instruments, and sometimes as a substitute. They are almost universally conducted in the OTC market. A *spot* foreign exchange transaction is a conversion of one currency to another for immediate value, depending on the market standard but usually 2 business days. A *forward* or *outright* transaction is a conversion agreed today, including the exchange rate, but for settlement in the future. A *swap* is the simultaneous transaction of a spot and forward conversion to the original currency, at rates agreed upon today. This eliminates any exchange rate risk, so the economic impact is of a funding transaction. It is essentially a deposit/loan collateralized with foreign currency.

Many **Derivative Instruments** have developed in recent decades⁹³ and assumed important roles in financial markets, including money markets. Various interest rate derivatives are very widely used for cash management, investment, asset and liability management, and hedging. The notional⁹⁴ value of outstanding interest rate derivatives is in the hundreds of trillions of dollars. Standardized agreements such as the ISDA Master Agreement contributed significantly to the development of the OTC market in derivatives. In the context of emerging and frontier markets derivative instruments, such as FX forwards, swaps and cross-currency interest rate swaps have become an important source of LCY funding for foreign investors (Box 25:). Some well-known derivatives include:

⁹³ Some derivative instruments have very long histories: rice futures have been traded in Osaka Japan for centuries.

However, the development of modern option pricing models in the 1970s, along with increased volatility and sophisticated technology led to a vast increase in the range and volume of derivatives.

⁹⁴ The notional value refers to the face value of the underlying assets of the derivative contract; the actual market value of the derivative contract itself is usually substantially less than the notional value.

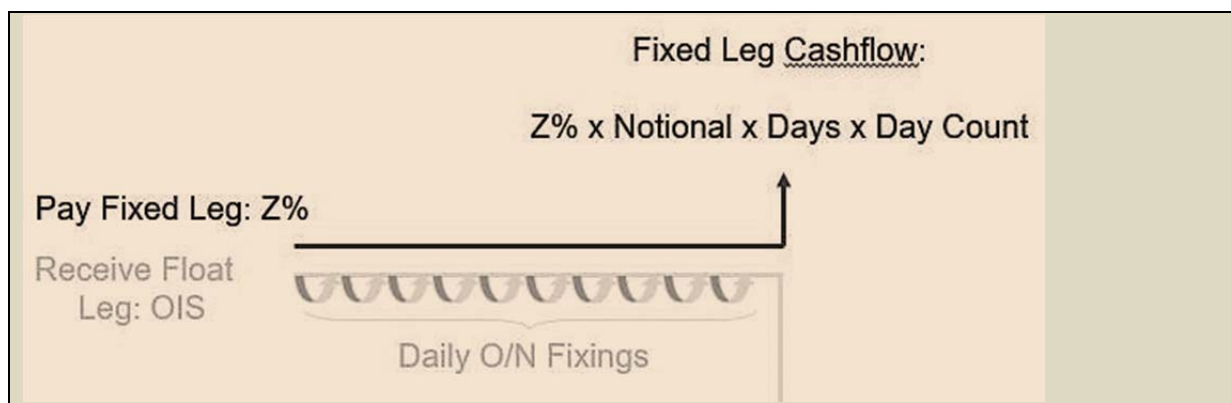
- Interest Rate Futures are futures contracts (traded and valued similarly to other futures contracts) where the underlying instrument is an interest bearing instrument. They are traded on exchanges in very high volumes. Examples include T-Bill futures, Eurodollar futures and Fed Fund futures in US Dollars; EURIBOR and Sterling LIBOR in Europe and Euroyen in Japan.
- Forward Rate Agreements (FRAs) are OTC contracts which determine an interest rate to be paid (or received) at a future date by the parties, based on an agreed notional amount. A reference rate, such as LIBOR determines the rate paid (or received) on the value date. There is usually no actual transfer of principle; at the maturity of the agreement there is one net payment representing the difference between the reference rate and value of the FRA agreement at the settlement value date.
- Interest Rate Swaps (IRS) are an agreement between parties to exchange a series of interest rates (usually the differential between the rates, with no exchange of principle), on an agreed notional amount. They are OTC instruments and widely used for cash management, hedging, liability management and also for speculation. The interest rates being swapped can be fixed for floating; floating against floating, in the same or in different currencies. There is usually no movement of principle but rather a single net "cash settlement" on each payment date. An Overnight Index Rate Swap (OIS) is an interest rate swap of special importance for the money market activity and development (See Box 24:, Box 27: and Box 28:).

Box 24: The Overnight Index Rate Swap

The Overnight Index Rate Swap (OIS) is an interest rate swap of special importance. It is a swap where the floating portion is determined by compounding an overnight one day interest rate for the relevant period. Examples include OIS for O/N Fed Funds, or Eonia for Euro. Since most overnight interest rates are closely related to key policy rates, this can provide important information regarding monetary policy expectations.

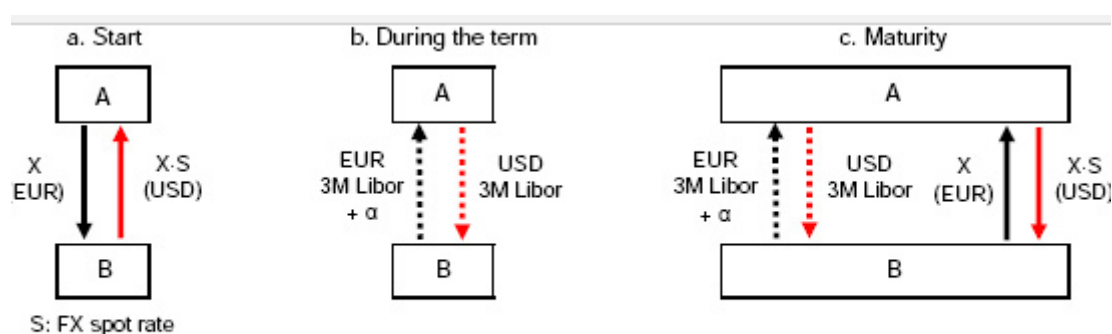
In fact, an OIS is a specific type of an IRS linked to an overnight index. Overnight interbank transactions are much more frequently traded compared to longer dated transactions, which explain why overnight indices are generally deemed more reliable by market participants. In turn, by allowing banks to swap (almost credit risk free) overnight rates for longer fixed rates, OIS are powerful instruments in that they allow banks to manage pure interest rate risk. Unlike IRS indexed to unsecured interbank money market indices, OIS embed no or very little premium for the credit and liquidity risk of interbank unsecured deposits. Being a pure reflection of where market participants expect interest rates to go, OIS can provide a useful tool for central banks in assessing the effectiveness of the transmission of the monetary policy regime (Box 28:). It can also be used to build a reliable longer-term benchmark curve, especially in illiquid markets (Box 27:).

CASH FLOW DIAGRAM OF AN OIS SWAP



- Cross-currency interest rate swaps involve the simultaneous lending of one currency and borrowing of another currency to a counterparty. Over the life of the swap interest rates on the currencies are swapped between the parties; these can be fixed for floating, or floating for floating, or any agreed combination. As opposed to interest rate swaps, there is usually an exchange of principle. They can be for very long term, and are frequently used to access local currency for investments or to change the currency denomination of liabilities. In many EM and FM the cross-currency interest rate swaps are used to hedge the exchange rate risk involved in local currency lending by foreign institutions. For instance, TCX – the Currency Exchange Fund – specializes in providing such instruments to institutional investors in frontier markets.

Figure 6: A cross-currency interest rate swap



Source: BIS-The basic mechanics of FX swaps and cross-currency basis swaps, 2008

- Other Swaps –The swap mechanism can be used to exchange cash flows from any source between parties. The swaps market has grown very quickly. Some of the more common swaps include commodity swaps (gold, oil); equity swaps, and credit default swaps, used to insure against credit risk.
- Interest Rate Options are derivatives whose value is based on an underlying interest rate; as with other options, it gives the purchaser the right, but not the obligation, to exercise the option under defined conditions. Frequently, they are used to set a cap or floor on interest rates.
- Exotic derivatives are special variations, combinations and permutations of the "plain vanilla" derivatives described above. The variety of these exotics is almost unlimited, and includes various structured products, swaptions, barrier options, binary options and many others.

Box 25: Money market instruments intermediating foreign investments

From the perspective of small EM and FM economies, the financial intermediation does not take place only between domestic savers and domestic borrowers, but very often is also about intermediating foreign savings into domestic investments and consumption. Domestic money markets play an important role in this process.

A foreign investor wants to take a risk of investing in the local economy and earn adequate compensation. This risk has many components, which provide a profit opportunity for the foreign investor, and a well-functioning money market helps foreigners to realize this opportunity. The most important examples of the risks involved in investing into FM and EM economies are the exchange rate risk, conversion risk, transfer risk, local counterparty risk and the credit risk of local borrowers, including the government.

The problem is that these different risks are usually bundled together in the instrument, while the investors usually wish to take only some of the risks that they are comfortable in managing. For instance, a simple purchase of domestic government papers in LCY involves both the currency risk as well as the credit risk for a foreign investor. Well-functioning domestic money and FX markets allow this risk to be sliced into different components and sold to investors specializing in that type of risk.

Investors taking only the currency risk usually do it through a FX forward transaction, either with a domestic counterparty or in the international market on a non-delivered basis (NDF). Those who engage in the so called carry trade (see Chapter 6) would usually also buy a short-term government paper through local counterparties.

Other investors only want to take the local credit risk. Their primary balance sheet is in FCY, but to realize the credit risk, they often have to obtain LCY in the process, especially if the regulation of the domestic financial markets discourages lending in FCY. This means that such an investor will need to enter into a FX swap transaction with local money market participant, swapping the FCY into LCY for the duration of the investment and paying a money market price for the LCY, but at the same gaining an extra interest margin from being able to extend a retail LCY loan to a local borrower. There will be no exchange rate risk involved and the profit will be determined as the difference between the retail rate and the money market interest rate.

Money and FX markets provide several ways of achieving the purpose of not assuming currency risk while investing in the credit risk of the local economy. One is that the investor uses a FX swap with a local commercial bank to gain access to LCY liquidity, which it will on-lend to the government papers, mortgages, corporate loans or other investment portfolio. An alternative avenue is to use a conversion of FX into LCY at the local spot FX market and hedge the exposure through a forward transaction, such as in an offshore NDF market (if existent).

Forward markets are therefore an essential source of LCY funding in money economies. Reliable money market base (or benchmark) rates are important for these markets to function fully, enabling effective interest rate arbitrage (see Chapter 6). Many IFIs extending LCY loans often use services of specialized off-shore institutions providing hedging of the currency risk resulting from such transactions. For instance, TCX – the Currency Exchange Fund in Amsterdam specialized in taking the exchange rate risk of many FMs through cross-currency interest rate swaps.

Money Market Mutual Funds (MMMFs) developed as regulatory reform in developed markets allowed commercial banks and non-bank financial institutions greater latitude in offering financial products. MMMFs and similar products are managed by intermediaries, who offer a liquid and low risk asset to the public. The intermediaries purchase other money market assets such as T-Bills, CP and CDs and repackage them in a form suitable for retail investors.

D. Participants in the Money Market

Banks are in many ways the most essential participant in the market. They remain central to financial systems in all countries without exception, and are the dominant financial intermediary in many countries, including most developing and transition economies. They create money and savings- see Box 3:. They are the main channel through which the central bank can add or withdraw liquidity from the system. In addition, they make payments and provide a myriad of other services essential to the market. Commercial banks are usually the major players in the system. Other deposit taking institutions can include savings institutions, credit unions, and cooperative banks. Banks can be "universal banks" providing a wide range of services, commercial banks with more limited functions and regional or money centre banks – all play a vital role in the money market.

Central Banks play many roles in the money market. As the "bank of the banks" they receive deposits from and lend to the banking system, and are the ultimate providers of liquidity; they set many of the parameters of the money market by setting the level and definition of required reserves, as well as the key policy rate and other decisions. Central banks provide a platform for clearing and settlement of payments. The money market is the primary arena for their monetary operations and the transmission channel for their policy. It is also an important source of information for the formation of monetary policy. In addition, Central Banks can also play a regulatory role in the money market and can act as a fiscal agent for the government. They have a key role in exchange rate policy, with important impacts on the money market.

Governments are also key players, particularly Finance Ministries. They affect liquidity through budgetary operations and financing the budget. The form in which governments undertake their operations can have an important impact on the money supply and monetary policy (Box 26:). A Single Treasury Account can make systemic liquidity management much more efficient. As debt managers they issue securities. As the sovereign, the government sets many of the rules for the market and influences it in many ways, especially the legal framework and tax policy. Much of the infrastructure of the market can also be related to government, such as communication networks.

In addition to central governments, local governments, state owned enterprises (SOEs), government agencies (such as GNMA Fannie Mae and Freddie Mac in the US) also participate in the market. Multi-national financial institutions (such as the World Bank and regional development banks) are also active, while micro-lending institutions extend very small scale credit and have limited interaction with the money markets.

Box 26: The government and the money markets

The government is an important player in the money markets, as it can facilitate the development of the money market through the development of the short term government securities market but also because it is one of the largest – and quite often the largest – contributor to volatility in liquidity. The government holds its centralized account with the central bank. In the very short term the money flowing into the government's account, held with the CB, is "lost" to other sectors including the banks. Households and firms run down their deposits at the commercial banks to pay taxes therefore an increase in the government's account decreases liquidity and vice versa. Government transactions are typically large (e.g. local debt issues, tax collection, spending on large projects but also paying out public sector salaries, etc.) and thus their liquidity effect is large. As it happens, their forecasts can also be the least reliable. This problem may be mitigated by moving the

government's account into the banking sector or introducing a system where the surpluses above a threshold are lent out and the shortages below it are withdrawn automatically but institutional factors and the lack of the government's willingness may hinder these initiatives.

The government is often the largest debtor in the economy and to finance its deficit and debt it regularly sells government securities. By shifting the issuance toward market-based solutions, such as auctions, the government can create the first roots of a money market. The T-bill market is usually the starting point for building an operational money market and then later a yield curve. The provision of regular, fungible T-bill and T-bond issues with sufficient regularity and magnitudes will enhance liquidity and the securities can be used as collateral in interbank and other money market transactions. Also, the rate on T-bills will provide the first hints about the market clearing interest rate.

Deep and liquid money markets foster the reduction of the long term risk premium, so it will become easier and cheaper for the government to borrow both in local currency and for longer terms. As maturities lengthen and yields come down, the benefits of a lower risk premium will become evident in lower interest rate expenditures and the government will also be motivated to support policies directed at reducing risk premium and maintaining it at a stable and low level. Also, a long term fixed income government securities market makes debt management less sensitive to liquidity shocks or temporary (global) market turmoil through lower rollover risk thus fostering fiscal sustainability and financial stability. Finally, the existence of a long mortgage market has a stabilizing effect on fiscal policy by dampening the propensity of boom and bust spending cycles, because mortgage rates affect large scores of the electorate and thus can become an important variable in the political debate of a democratic political system.

Non-Bank Financial Institutions (NBFIs) are financial institutions that do not have a full banking license but function in ways that complement or substitute for banks. They are active in money markets as both borrowers and lenders, and include securities companies, asset managers, insurance companies, finance companies and a variety of firms that primarily serve the retail sector (See Box 21: on Shadow Banking). Many of other institutions listed in this section fall into this category.

Dealers and Brokers play an import role in the functioning of the money markets. Dealers provide liquidity, either in a formal or informal market-making role, in distribution and sales or as underwriters. Brokers do not participate in the market themselves as principals but facilitate transactions by bringing together buyers and sellers.

Non-Financial institutions usually do not act as intermediaries but on their own behalf, when they need credit or need to invest surplus funds, or in managing cash flows in general. For working capital and other short term needs they will access the commercial loan market, issue CPs or BAs, or seek to discount assets such as accounts receivable. When they have excess funds they can access an array of money market instruments. Financing of international trade (Import-export financing) uses a specialized set of transactions, including letters of credit and documentary credits. Many non-financial corporations undertake financial intermediation through subsidiaries, originally to support their main line of business with the automobile industry as a prominent example.

Households and private individuals play a prominent role, as net suppliers of funds to the money market by making bank deposits and investing in securities and contractual arrangements such as MMMFs.

Asset Managers use the money market to manage cash flows, maintain liquidity and control financial exposures, frequently through the use of interest rate derivatives such as futures, FRAs and derivatives. They also access the repo market for various purposes.

Regulators/supervisors have a direct and considerable impact on market development and behaviour, since they literally "set the rules" by which the markets operate. The regulators are public institutions, and belong either to the central bank or the general government, but due to their crucial role they merit a distinct discussion. If the regulator belongs to the CB the supervisory and monetary policy functions and organization should be carefully separated. Banks are strictly regulated, often by the central bank, sometimes by a separate bank regulator, and their behaviour will be strongly impacted by regulatory decisions regarding capital adequacy, minimum liquidity requirements, leverage ratios etc.⁹⁵

Regulatory goals include both prudential supervision and conduct of business, which do not always coincide. Prudential supervision aims at ensuring the stability of both institutions and the system as a whole. Conduct of business regulation seeks to protect the consumer, through preventing unfair business practices, preventing conflicts of interest, and promoting transparency, full disclosure and fair competition. Institutional setups vary from country to country, but in addition to the bank regulator there is usually a regulator (or more than one) with responsibility for capital markets; securities exchanges, insurance, and other non-bank financial intermediaries (NBFIs). Where there is deposit insurance there will also be an agency responsible for that.

Recently many countries have formed Financial Stability Committees or Boards (FSCs or FSBs), again with a variety of structures and mandates, to provide overall monitoring of systemic stability. The appropriate structure of regulatory institutions is a matter of rigorous debate, and no widely accepted conclusions have been reached. Since they developed over time and responded to a dynamic situation, the structures are often complex with overlapping or unclear jurisdictions, and responsibilities.

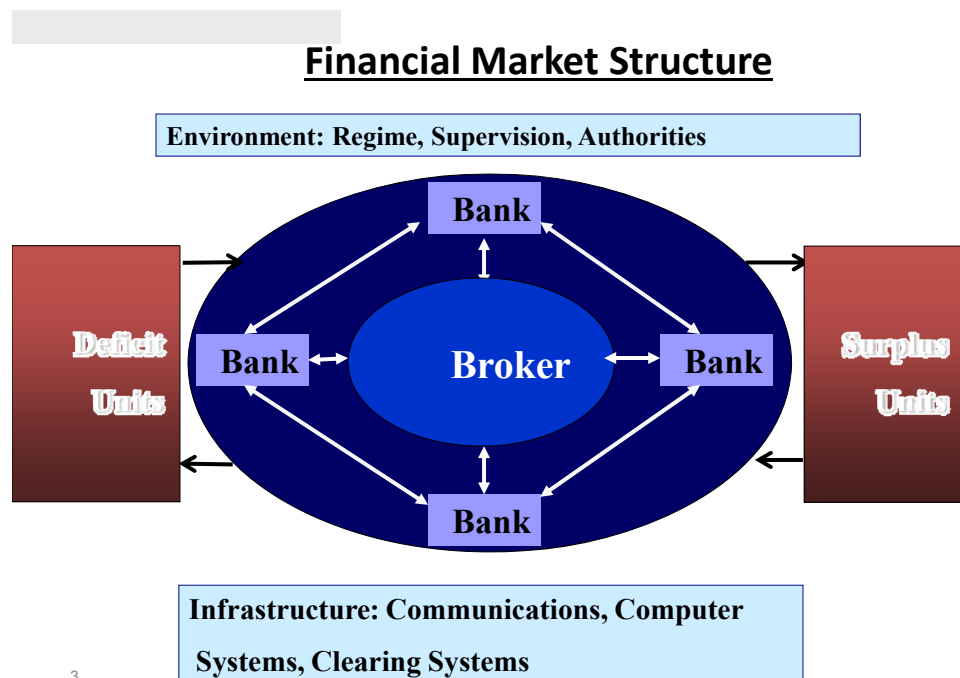
Industry groupings such as the International Capital Markets Association and the International Swaps and Derivatives Association play an important role in financial education, promoting standards and best practices. In smaller jurisdictions, particularly in emerging markets, industry associations such as the local chapters of the Association of Banks International (ABI) play the role of the industry interface. Many groupings are sponsored by regulators, for example the Investor Advisory Committee on Financial Markets and The Foreign Exchange Committee by the New York Federal Reserve, or the London Foreign Exchange Joint Standing Committee by the Bank of England. While they may have no formal regulatory or policy making roles they play an important role in the market, as do other "self-regulatory" groups.

The institutions operating the infrastructure which supports the money market are essential but overlooked participants of the market. They include institutions that support trading (such as those operating exchanges); settlement clearing and safekeeping (such as the Depository Trust and Clearing Corporation, DTCC in New York, the London Clearing House, LCH, Euroclear and Clearstream

⁹⁵ There is also an increasing role for multinational regulation in response to the increasing globalization and integration of financial markets. Examples include the Basel regulations on minimum capital adequacy, and Basel III proposals for LCRs and SFRs.

as well as their local equivalents), payment systems and other crucial infrastructure such as SWIFT that transmits financial messages.

Figure 7: Financial Market Structure



3

E. Transactions and Functions

Money and Credit are created in the money market (see Box 19:). It therefore lies at the heart of the entire financial system. Liquidity is managed, traded and priced in the money market. This provides the basis and platform for all the vital functions of the market.

Monetary policy is implemented by means of central bank operations. Indirect instruments such as reserve requirements, open market operations and standing facilities work through the money market.

The Payment System operates in the money market. The central bank must ensure efficient operation of the payments system, an essential part of a modern economy. Adequate liquidity, both systemic and per participant in the payments system is an important concern.

Government financial flows take part, to a large degree, in the money market. This includes both fiscal operations- expenditures and collection of revenues- as well as debt management, including the issuance of T-Bills as part of overall government debt management.

Short term credit and savings are created, intermediated, transformed, allocated, priced and distributed in the money markets. Banks play the key role as the initial providers of credit, along with a significant (and in many cases growing) role for other financial institutions.

Cash Management is conducted in the money market. Both financial and non-financial institutions use the wide array of money market instruments and markets to manage working capital, bridge

financing gaps, and manage their liquidity needs. International trade is also financed and conducted largely in the money market.

Investment needs are also met in the money market. "Cash" or cash equivalents are a part of most investment portfolios, both to supply actual or potential liquidity needs, and also as part of a diversified mix of assets. Money market instruments can be the primary tool for those portfolios managed with a short time horizon. Bank deposits, CDs, Treasury bills CP and derivatives, amongst others, are important tools in portfolio management. Money market investments may be "buy and hold" (i.e. held to maturity), rolled over (renewed) or actively managed according to needs and developments. In addition, many long-term portfolio (or liability) managers use money market instruments to manage important parameters such as duration, through the use of FRAs, IRSs and futures.

Risk management of all types makes frequent use of the money markets. Many financial exposures can and are managed by money market instruments. Cash flows can be met ("immunized"), liabilities matched, and financial exposures hedged through the use of interest rate derivatives, as well as other tools. Many other risk management tools, although not actual money market instruments themselves, are traded in money market settings and closely integrated with the money market. Examples include Credit Default Swaps (CDSs), commodity futures and derivative equity instruments.

F. Interbank reference (benchmark) rates

Information and reference rates are important for statistical, valuation and accounting purposes as well as serving as benchmarks for financial and other contracts. They add transparency to the market, improve governance and compliance, assist in hedging and risk management, and can therefore help reduce systemic risk. Provided they reflect pure domestic interest rates and are not polluted by FX considerations (which is the case for indices based on implied interest rates derived from FX swaps), they can be very helpful to central banks in monitoring the effectiveness of the monetary transmission mechanism. They are an important element in the development of capital markets, particularly derivative instruments and hedging techniques

Reference rates are different from the central bank rates, which are usually somewhat limited, and may not always reflect market conditions in a timely fashion. Several private sector reference rates have emerged, usually displayed on financial information services such as Reuters or Bloomberg. Policy makers and market participants follow developments closely, including all aspects of the market function, i.e. not just prices and rates, but also volumes, volatility, trends and other parameters.

The determination of reference rates for a wide variety of instruments and contracts is an especially important role of the money market. Most variable rate debt instruments reset periodically and are repriced according to short-term rates. Many derivatives such as FRAs and IRSs are based on an agreed reference rate. This role was assumed by LIBOR (the London Interbank Offer Rate) for various tenors and a variety of currencies. LIBOR is calculated from quotes provided by large banks, so is not based on actual trades. The London interbank market was large, liquid and fairly homogenous, so it lent itself to establishing reference rates. The daily settings soon became the benchmark for trillions

of dollars of variable rate deposits, loans, mortgages, securities, derivatives and other contractual arrangements. Other financial centres developed their own benchmarks, such as HIBOR in Hong Kong, SIBOR in Singapore, EURIBOR for the Euro market, PIBOR in Paris and many others.

Since the evidence was found of manipulation and collusion in the setting of LIBOR rates by the participating banks in the aftermath of the GFC, there have been several proposals to create an alternative reference rate, but until now no feasible and practical alternative has emerged.⁹⁶

EM and FM economies may not have sufficient market liquidity nor price transparency to develop term reference rates. One of the new published guidelines by IOSCO that were part of the ‘principles for financial benchmarks’ state that reference rates ideally should be related to a tradeable market. In emerging markets (‘EM’) this has historically been difficult to implement, as there were rarely any active longer term unsecured interbank market in existence. In EM and FM economies, there have been many failed attempts at establishing reference rates for money markets, which could form the base for the development of a longer term interest rate swap market. There are a number of reasons why such innovations have not succeeded and these include:

- the reference rate not relating to the most actively traded part of the interbank market,
- the reference rate not being reflective of actual market rates,
- concern over counterparty credit risk and liquidity risk and
- concern that transparency may lead to decreased bank profitability.

Any attempts at establishing a reference rate have to bear in mind that such indices are only useful, if market participants believe they truly reflect rates at which banks transact between themselves. At a minimum, the reference rates should be based on clear calculation rules including transparent procedures and provisions for periods when markets are volatile or under stress. They should also have a sufficiently high frequency of publication to allow the continual pricing of contracts and be readily available to facilitate contract verification. Market participants need to be able to understand what drives the index, and be able to hedge their exposures to movements in the index. Finally, it is also important that reference rates have proper oversight to prevent abuses and errors. The actual definition and construction of an index will of course be a function of specific country and market conditions.

In many EM and FM economies it was the authority of the central bank, which helped with establishing various benchmark rates, such as XX-BORs. The central bank was in the best position to provide the necessary supervision and logistics to develop such rates. After the benchmark gained wider acceptance, its calculation was often moved to the private sector.

The central bank has also played an important role in establishing reliable O/N indices based on actual trades. It is relatively easy for the central bank to calculate an overnight interbank reference rate by taking the weighted average of all transactions dealt between the banks on any day because all transactions flow across the banks’ deposit accounts with the central bank. The reliability of such

⁹⁶ The Libor fixings were originally conducted by an industry grouping, the British Bankers Association (BBA), but in the wake of a recent scandal the right to run and administer LIBOR was awarded to a private nonbank institution, ICE Benchmark Administration. LIBOR is calculated for 5 major currencies in 7 tenors ranging from overnight to 12 months. Between 11 and 18 banks contribute quotes, depending on the currency and tenor. In 2013 it emerged that there had been collusion and manipulation in the setting of these rates. The investigation is still ongoing, including possible criminal activities, and a number of major banks have suspended or dismissed employees and suffered large fines.

O/N indices is an especially attractive feature over the more traditional quote-based rates. This can be leveraged in construction of a reliable long-term benchmark yield curve (Box 27:).

Box 27: Overnight index swap fixes as a money market reference rate in emerging markets

One of the innovations that the EBRD has promoted for some years is the development of a combination of an Overnight Index Swap ('OIS') market and a fixing of the OIS swap points for different tenors such as one week, one month, three months and six months. If these short-dated fixings are seen as valid and sustainable reflections of the market expectation for the base rate over that tenor, then such a fixing could be utilised as the floating rate leg for longer term interest rate swaps.

The advantage of using this methodology compared to the use of a 'classic' interbank reference rate is manifest in:

1. The overnight rate is actively traded in all EM and non-EM interbank environments.
2. The OIS is a traded instrument that carries little counterparty credit risk.
3. The short term OIS is a transaction that can actually be assembled/disassembled.
4. The fixing can be done with mandatory quoting requirements for all participants, with limited needs for counterparty lines.
5. The fixing is free of the price of liquidity risk
6. The fixing is free of credit risk of the system as a whole.

The overnight rate is an actively traded rate in all interbank environments. In all markets if there is an unsecured market, it is the overnight market. As such it has the largest range of underlying transactions and the average rate for the day, particularly in inflation-targeting regimes, is a relatively stable variable which is closely linked to the policy rate of the central bank.

The OIS is a traded instrument that carries little counterparty risk. Compared to an unsecured deposit, an OIS swap transaction has minimal counterparty exposure, and it has proven (in jurisdictions such as Russia) that it is more straightforward to obtain commitments from market participants to trade with each other and to offer the product to clients facilitating larger amounts of trades amongst market participants. If the legal system is conducive to netting, then the counterparty exposure can be lowered even further. Additionally, an OIS swap is an ideal instrument for central clearing which could lead ultimately to the disappearance of counterparty differentiation in the price forming process as the traded rate itself should be free of credit risk, irrespective of the counterparty.

The short term OIS is a transaction that can actually be assembled/disassembled. Given that most commercial banks are active participants in the overnight market, they can replicate the transaction through the actual transacting of underlying cash flows. As a result, the pricing is done through an efficient arbitrage process which should be influenced purely by views rather than position or size of trade in question. As such, pricing should be able to accommodate relatively small bid-offer spreads irrespective of the traded activity in the OIS market itself.

The fixing can be done with mandatory quoting requirement of all participants, with limited needs for counterparty lines. One of the problems with reference rate maintenance and quoting discipline in emerging markets has been the lack of underlying trade and the lack of counterparty lines to facilitate effective disciplining mechanisms between the reference rate quoting banks. As the OIS is a short-dated derivative instrument, it bears a much smaller exposure profiles compared to a cash instrument. Consequently, this will make mandatory quoting and disciplining mechanisms around the fixing of the term structure much easier to instigate.

The fixing is free of the price of liquidity risk. The price of liquidity in an emerging market can vary considerably. Periods of liquidity short fall or excess are sometimes difficult to forecast making the price of term unsecured money market transactions dependent on more variables than just interest rate expectations. Frequently this can lead to a money market yield curve that is steeper than it should be, if it were just based on rate expectations. In contrast, a derivative instrument has no liquidity implications and is therefore ‘pure’ in its price information.

The fixing is free of credit risk of the system as a whole. One of the things learned in 2008 and 2009 is that reference rates based on unsecured interbank transactions can become an indicator of the health of the system rather than a reflection of pure interest rate expectations. This potential for flagging systemic risk is a cause of concern as it can lead to a self-fulfilling negative spiral. Therefore, a reference rate framework that is free of this such as the OIS, has a major advantage.

The development of an OIS is dependent on the existence of an underlying money market in overnight liquidity with sufficient supply and demand, volume and participation. The development of an OIS fixing would then typically include several stages: (i) ensuring data integrity and producing a reliable overnight index, , (ii) developing the domestic infrastructure necessary to support the development of a derivatives market if not already available (documentation, legal status, tax treatment), and (iii) developing an OIS market with the emergence of supply and demand for OIS, (starting from 1 week, going perhaps to 3 months or longer if feasible), (iv) creating a fixing for the tenors traded by market participants

The EBRD has successfully promoted this methodology in constructing a reliable benchmark curve in the Russian money market during 2013-14. The creation of the ROISfix index allowed the Bank to begin to build a sustainable post financial crisis local currency platform, in which it issued bonds linked to the index. It also allowed for client loans linked to the index and spurred trading in the underlying OIS market. This initiative has been found to be very beneficial for the development of the money markets in Russia.

Chapter 6: Technical Aspects of the Money Market

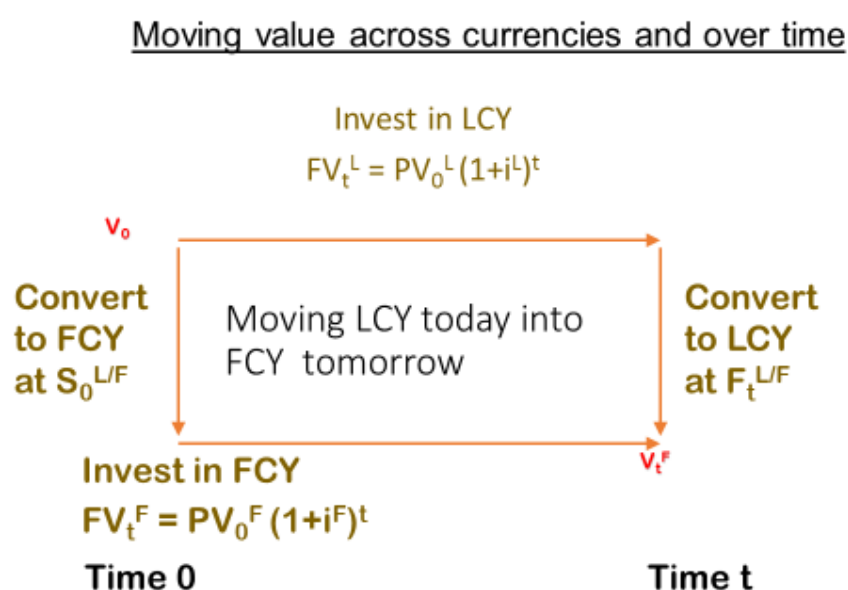
Covered Interest Rate Parity

The relationship between domestic and foreign money market interest rates forms one of the key components of international finance known as covered interest parity. Due to arbitrage opportunities between domestic and foreign interest rates, the FX swap (“forward points”) rate between two currencies will always be determined by the interest rate differential between the currencies for the relevant period expressed in foreign exchange terms.⁹⁷ Arbitrage will keep the money markets in different countries in a strict and easily computable relationship, based on the money market interest rates and conditions in the currencies. Otherwise, a risk free return could be obtained by exploiting any discrepancy. This implies that in the absence of capital controls, there is equivalence between executing short term financial operations via the domestic money market or via the foreign exchange market. A deposit (or loan) can be made either in the domestic currency money market, or synthetically using spot and forward exchange rates and the foreign money market (see Figure 8).

⁹⁷ In actual practice various frictions such as transaction costs, credit differences, taxes etc. must be taken into account.

This important relationship has enabled the foreign exchange market to become well integrated in money markets, and provide additional ways in which markets can develop and become more efficient. Since forward exchange rates express interest rate differentials, they provide information regarding the future. However, this information differs according to the exchange rate regime. In a fixed rate regime the relationship will reflect expectations of future exchange rate developments, as the exchange rate policy will dominate the markets. In a floating rate regime, on the other hand, they reflect expectations of future interest rates movements. This provides a forward yield curve, which can then support the development of “forward-forward “rates and forward rate agreements (FRAs).

Figure 8: Stylized example of moving value across currencies and over time



Box 28: Money market as a source of information

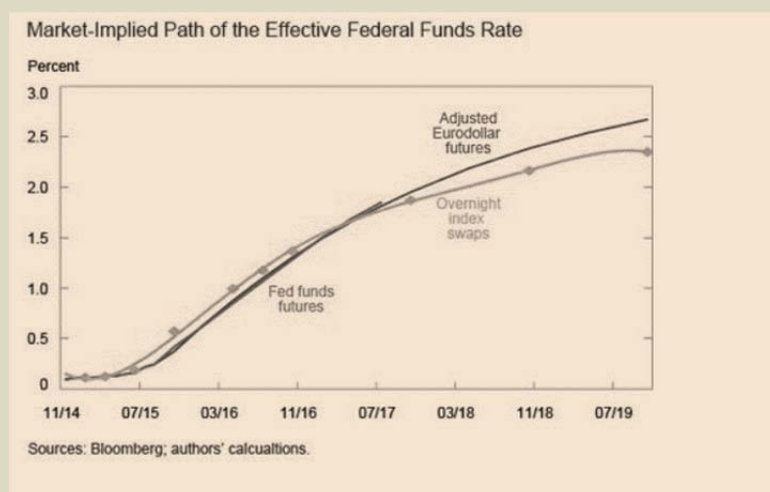
Efficient money markets can be used as a source of important information about the markets' expectations regarding inflation, future path of short-term rates or the degree of market stress.

The nature of the information that can be extracted depends very much on the monetary policy and exchange rate regime. For instance, if the regime is predominantly focused on external price stability, FX fix or FX targeting, then it is likely that all pricing or pricing expectations in the money market will be driven by the developments in the FX market and the money market prices will be driven by the FX swap market. In contrast, if the policy regime is focused on internal price stability such as in an Inflation Targeting regime, then the pricing in the money market (and OIS markets) is more likely to be driven by inflation expectations and the associated changes to monetary policy. The key therefore lies in the complementarity between a monetary policy regime, and the signalling function of money markets for longer term expectations.

Central banks operating in a flexible exchange rate regime with a money market interest rate as the main instrument are usually most interested in extracting information about the implied or expected path of future short-term interest rates from the yield curve (Figure 9). For this purpose they mostly use the prices of various interest rate derivatives. Fed Fund futures, FRAs, OISs and Eurodollar futures are all based on market assessments regarding the future path of short term rates, which are linked to the central bank policy rates.

Changes in future policy rates will be reflected in the price of these derivatives. Adjustments need to be made to account for risk premia, liquidity, term premiums etc.

Figure 9: Market-Implied Path of the Effective Federal Funds Rate



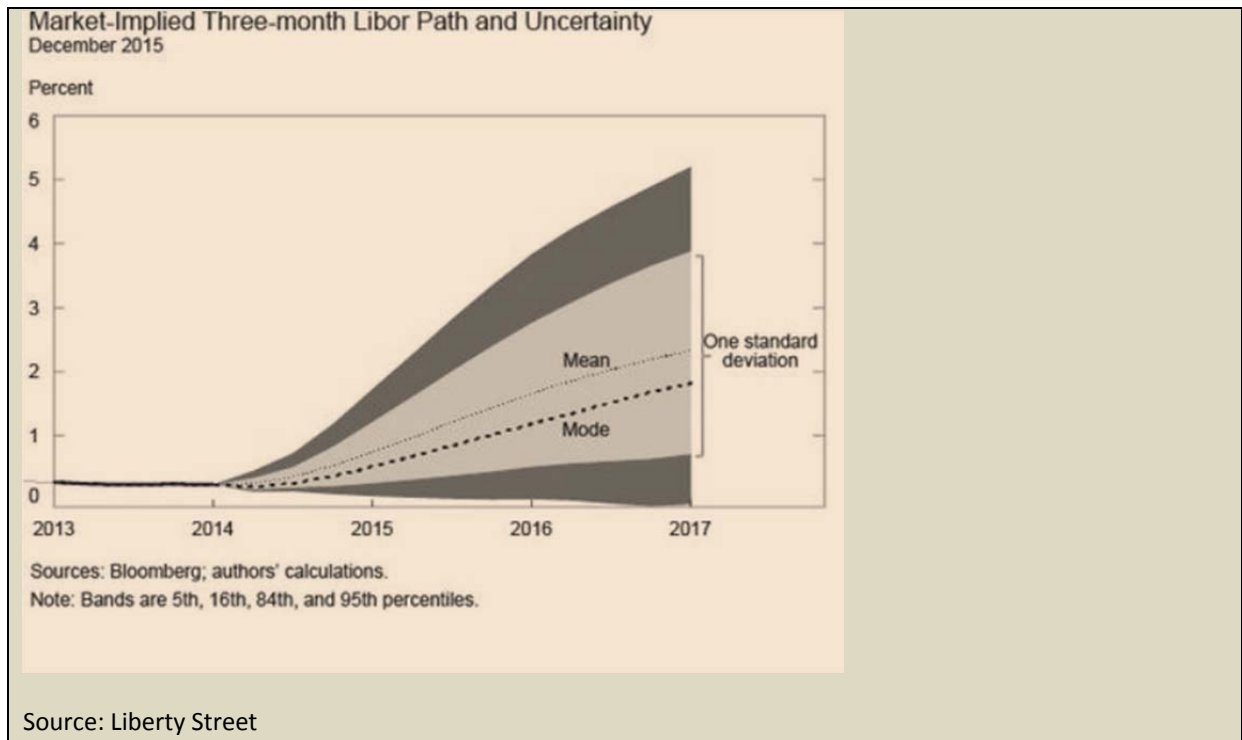
Source: Liberty Street

To get an unbiased estimate central banks need to estimate term premiums embedded in the yield curve. However, the fluctuation of the risk premium over time is not yet sufficiently understood. Nevertheless, the expectations hypothesis still appears to be a reasonable starting point for gauging interest rate expectations from the yield curve. Notably for shorter horizons in the money market, term premia tend to be relatively low and stable.

The term premium covers different types of risks the investor should be compensated for: the default or credit risk (like the one described above), the maturity or duration risk and the liquidity risk. There are many more risk premiums mentioned in the financial press but these can be thought of as part of the above 3 types. For instance, country risk or exchange rate risk is part of default risk. Duration risk is related to the fact that longer term bonds are more sensitive to interest rate movements. Liquidity risk is related to the potential loss if an investor would like to sell its investment quickly to use the cash for other purposes.

In addition to the mean of short-term interest rate expectations, money markets can also reveal information about the distribution of the expectations. For instance, Figure 10 shows how using options can reveal not just the mean expectation, but some information on the distribution of expectations as well.

Figure 10: Market-Implied Three-month Libor Path and Uncertainty



Another piece of information, which central banks regularly extract from the money market yield curve are inflation expectations. According to the Fisher-equation, the nominal interest rate can be decomposed into a real interest rate or expected real return and an expected inflation component. For IT central banks, it is a crucial relationship as it offers the opportunity that the yield curve can be used to extract information about market participants' inflation expectations. To do that the central banks need a proper estimate for the *ex ante* real interest rate expectations. This is usually obtained from inflation-linked bonds on issue (if available), whose yield can be seen as a good proxy for expected real interest rate. Using these real rates along with nominal bond yields makes it possible to derive the so called break-even inflation rate.⁹⁸

Finally, as noted earlier, the OIS-LIBOR spread is not only an important source of information regarding monetary policy expectations, but also of the credit risk in the banking system. Since an OIS has little to no credit risk, the spread between the OIS and an interbank interest rate such as LIBOR is a useful indicator of the credit risk associated with banks and of liquidity conditions in the market (Figure 11).

Figure 11 The Use of the OIS-LIBOR spread to measure Money Market Stress



Source: <http://thismatter.com/money/derivatives/overnight-index-swaps.htm>

The Carry Trade

Covered Interest Rate Parity ensures that returns will be equal across currencies when the exchange risk is hedged. The “carry trade” seeks to increase returns by doing away with the hedge and bearing uncovered exchange rate risk. The technique is simple: borrowing in a low interest rate currency and investing in a high interest rate currency, without hedging the risk that the exchange rate will move against the investor. This has been and can be a profitable tactic, but at the cost of considerable risk. While the investor earns the differential between the low interest rate currency and the high interest rate currency, any adverse move in the respective exchange rates can cause sizable losses. Nevertheless, the carry trade is a popular tactic, particularly amongst Japanese investors, and often accounts for significant capital flows to and from the emerging and frontier markets.

⁹⁸ However, empirical tests rejected the notion that these are unbiased estimates of inflation expectations due to the presence of time varying inflation risk premium. Nevertheless, the Fisher equation can still be used to assess inflation expectations, which is a measure of credibility for an IT central bank. It is also true that central banks care about not just the expected level of inflation but also about its expected volatility, which is directly related to the inflation risk premium.

Computing Yields

A number of different systems are used for quoting and calculating yields. Amongst the most important ways in which short term yield calculations differ are interest accrual (discount, coupon, etc.); day count methods (360, 365, actual, etc.) and compounding assumptions (both inter and intra period methods). For a number of reasons, the most logical candidate for a common denominator for short term yields is the money market, or CD equivalent yield, given by:

$$\left(\frac{RP+C}{PP+A} - 1 \right) * \frac{360}{I.P.}$$

PP = purchase price

C = interest due

A = accrued interest

IP = investment period in actual days

Aside from its already being the most commonly used calculation for 1 year and under investments, it is intuitively understandable and relatively free of encumbering assumptions and limitations.

Day Count Methods

Two day counts are needed in any yield calculation: the number of days for which interest accrues (or for which a discount instrument is held); and the number of days by which the quoted notional interest rate is divided (for the usually quoted annual nominal interest rate, the assumed number of days in a year.) In different methods a year is assumed to have 360 days (i.e. the quoted rate is divided by 360), 365 days or occasionally "actual" (i.e. 366 days in a leap year). For example, if the method is assuming a 360 day year (sometimes called a money market assumption or a Euro day count), an investor who holds the asset for a 365 day calendar year will actually earn slightly more than the quoted rate: 365/360 or 1.01388 times the quoted interest rate.

Money market instruments are usually issued or negotiated so that payments and/or principle payments fall on a valid business day ("value date") However, original longer maturity payment dates occasionally fall on a weekend or holiday; moreover, unexpected holidays can be declared. Actual payment is made according to the relevant market convention, usually deferred until the next valid working day.

Deposits and CD's

Deposits and CD's are by definition presented in money market terms and no further corrections are necessary, except for the case of domestic deposits and CD's of over 6 months maturity, where interest is paid semi- annually. In this case, adjustment must be made to an annual yield.

Discount denominated instruments (T. bills, BA's, CP's)

Although the market convention is to quote these instruments in terms of discount, it cannot be too strongly stressed that this is a pricing mechanism only, with virtually no usefulness as an indicator of true yield or return. Fortunately, the market long ago realized this, and the widely used method for quoting "bond equivalent" or "semi-annual" yields for these investments provides an adequate measure of true yield on a semi-annual 365- day year basis. The bond equivalent (B/E) yield can be used without adjustment when comparing yields to U.S. government bonds and similar instruments, including its foremost use, that of building the treasury yield curve. To translate the T bill B/E to a

M/M yield, the only transformation necessary is a simple $\frac{360}{365}$ adjustment for day count basis, and for instruments over six months, adjusting from a semi-annual yield (comparable to coupons) to an annual yield (as in the non-domestic money markets). It should be noted that since discount instruments never mature on a non-business day, no adjustment is necessary for possible "bad end days". Furthermore, and somewhat surprisingly, the compounding assumption used in arriving at B/E yields of bills is that of the M/M yield, so that no adjustment is necessary, as in the case for coupon issues. In this sense, B/E yield of T bills is a better measure of true yield than the bond yield it was meant to replicate.

(1) Money Market Yield (annual or euro)

$$\left(\frac{RP+C}{PP+A} - 1 \right) * \frac{360}{I.P.}$$

Where:

RP = redemption price

PP = purchase price

C = interest due

A = accrued interest

IP = investment period in actual days

The attraction of this calculation lies in its simplicity and wide applicability. This is the most common yield calculation used in money markets. From the formula it is apparent that this yield is simply a holding period rate of return, annualized on a simple interest basis on a 360- day year, the standard of the money markets. It takes no account of compounding opportunities. Instruments quoted in another convention can be adjusted to money market terms for easy comparison. See Figure 11.

(2) Compounding

$$A. \quad Y_a = \left(1 + \frac{Y_c(n)}{n} \right)^n - 1$$

Where:

Y_a = Simple annual yield (decimal form)

Y_c = Compound yield (decimal form)

n = Number of compounding periods of period year.

The most common case, of converting from a semi-annual to an annual yield, therefore becomes

$$B. \quad Y_a = \left(1 + \frac{Y_{semi}}{2} \right)^2 - 1$$

(3) Year Basis

Converting a yield on one day count basis to another is a simple linear transformation. The most common need is to convert 365- day yield to a 360 -day year by multiplying by

$$\frac{360}{365} \text{ or } .9683$$

(4) Discount Securities

Many money market instruments, such as T-Bills, banker's acceptances, and commercial paper, are traded on a discount to face value. While these instruments are simple to assess, the market convention of quoting them on a discount rate method can give rise to confusion. The discount rate is a price and not a yield. The dollar discount of such an instrument is given by

$$A. \quad D = dF \frac{DTM}{360}$$

D = Dollar Discount

d = Discount rate (decimal)

F = Face value

DTM = Days to maturity

And, therefore, its dollar price by

$$B. \quad P = F - D$$

The M/M yield can then be simply and directly calculated by

$$C. \quad Y_a = \left(\frac{F}{P} - 1 \right) * \frac{360}{DTM}$$

which is simply formula (1) simplified by eliminating coupon and accrued interest. Alternatively, a discount rate can be converted directly to a M/M yield without calculating dollar prices by

$$D. \quad Y_a = \frac{360 d}{360 - d (DTM)}$$

To compare discount rates to longer instruments, the bond equivalent yield must be used. Two cases must be distinguished:

1. Less than 6 months remaining maturity:

$$E. \quad B/E \text{ yield} = \frac{365 d}{360 - d (DTM)}$$

2. For remaining maturities of more than 6 months, the calculation is considerably complicated by the need to understate the yield in the same way that bond yields understate the true effective yield of a semi-annually paying investment. The calculation is given by

$$F. \quad B/E \text{ yield} = \frac{\frac{2 (DTM)}{365} + 2 \sqrt{\left(\frac{DTM}{365} \right)^2 - \left(\frac{2 (DTM)}{365} - 1 \right) - \left(1 - \frac{1}{P} \right)}}{\frac{2 DTM}{365} - 1}$$

Appendix: Basic Risk Management

Interest Rate Risk

Any debt instrument is subject to changes in value due to changes in the relevant prevailing market interest rates. This is usually measured by duration, which is a measure of the sensitivity of the instrument's price⁹⁹ to changes in yields and interest rates. Duration is expressed in units of time: the longer the duration, the higher the price volatility.

Money Market instruments are by definition short duration, less than one year. Their volatility is limited due to the fact that they tend to have no intermediate cash flows such as coupons.¹⁰⁰ Nevertheless, good practice is to measure and manage interest rate risk of money market instruments, since its impact can be substantial in the case of large shifts in the yield curve, long holding periods, and large sums involved. Interest rate risk management is a complex topic, especially when derivative securities are involved. Specialized expertise is called for. Nevertheless, anyone involved in the market should be familiar with basic concepts such as duration, convexity, the relationship between price and yield in discount securities.

Hedging

Hedging is a method of managing or reducing interest rate risk by eliminating interest rate exposure. This can refer to a single instrument or a complex portfolio. The basic method is to ensure that the volatility of an instrument (or portfolio) is exactly offset by an instrument or portfolio with the opposite exposure. This means that the overall volatility of the combined holdings will be low or nil, and the overall value will not change as a result of changes in market rates. This can be done in the asset market, but is frequently done using derivatives. It is a common goal of cash management, and many money market instruments are suitable and widely used for hedging purposes. Without the ability to hedge financial markets would be less stable and intermediation much more difficult. Asset Liability management involves structuring a portfolio so that the duration of a set of liabilities is offset by a suitable set of assets with the appropriate properties. When cash flows are exactly matched, the liabilities are said to be immunized.

Credit Spreads

The primary risk associated with any financial asset is its credit risk, or risk that the debtor will not repay interest and principle as promised. Credit risk is relatively constrained in the money market, due to the short maturities, but also due to the preponderance of very low risk assets (government securities and highly rated bank debt, government or bank guaranteed instruments).¹⁰¹ Nevertheless, it is a crucial concern and needs to be closely monitored and managed.

Government issued or guaranteed debt (in domestic currency) is usually considered default risk free. In financial modeling, a short term government interest rate usually serves as the "risk free rate of

⁹⁹ If the instrument is marketable, and marked to market, the actual price will change in accordance with market interest rates. The price will increase or decrease as the relevant market rates decline or rise, so that the return on the existing instrument is the same as identical assets, which are perfect substitutes. Even if the asset is not traded, or not marked to market (such as a deposit) the economic fluctuation in value is the same.

¹⁰⁰ It is important to note that although the volatility of the instrument is low, that does not necessarily mean that the risk exposure of the lender/borrower is low: that depends on his interest rate exposure. For example, an investor who has a long term horizon but invests in short duration assets has a very large exposure to interest rates. If rates decline he will have a lower return than expected due to reinvestment risk.

¹⁰¹ Despite this, one of the major financial crisis of the last century was the Penn Central Railroad commercial paper crisis of 1970. Equally money market funds as uninsured deposit substitutes also played an important destabilizing role in the GFC in 2007-2009.

return". Rates on treasury bills will usually supply the yield curve for up to one year. The credit risk of all other assets can then be measured as a "spread" or the difference between the return on the risky asset and that of the risk-free asset. The greater the risk of the asset, the higher the spread against the T-bill yields. It should be noted that other factors influence the spread, such as differences in liquidity, eligibility as collateral and tax treatment and these need to be considered and accounted for.

Credit spreads are a key indicator of both the risk associated with a borrower (sometimes an individual security, as they can differ regarding seniority, collateral and guarantee) and the risk of an entire sector, for example the banking sector or commodity producers. As such they warrant close monitoring and consideration. Important credit risk spreads measures include the OIS-LIBOR spread and the TED (Treasury bill-Eurodollar) spread. See Chapter 2: for reference.

Figure 11: Yield calculation Adjustments

