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The Interplay between Money Market Development and Changes in Monetary Policy Operations in Small European Countries, 1980–2000

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We study the interplay between money market development and changes in monetary policy operating procedures in 11 European countries from c. 1980 up to the launch of EMU. Aspects of money market development such as the size and structure of different market segments, and institutional and regulatory changes, are addressed. We recount and empirically examine the extent of reorientation of monetary policy instruments away from quantitative direct control instruments toward indirect market-based instruments. The process of financial deregulation is uniform across the countries. The path of money market development varies substantially, whereas changes in central bank instruments show both similarities and differences. We hypothesise a relationship between the two processes and provide tentative evidence.

The implementation, as well as the underlying 'philosophy', of monetary policy has undergone radical changes in most industrial countries during the last few decades. These changes have been paralleled by a similarly radical development of financial markets − including money markets (short-term debt markets), which are the main 'forum' for the implementation of monetary policy. The instruments available to a central bank usually fall into one of three categories: direct regulations (e.g., interest-rate regulations and credit ceilings), standing facilities (deposits and loans at the central bank available to banks at their own initiative), or discretionary operations (e.g., repurchase transactions, foreign-exchange swaps, issuance of central-bank securities or outright transactions in short-term markets). In the post-war period, up to the early or mid-1980s, central banks used to rely primarily on the former two categories. The financial deregulation wave of the 1980s and 1990s largely coincided with, or was conditional of, a general reorientation of monetary-policy operating procedures toward the third category. Both the tools used by central banks and the variables on which the tools were designed to operate shifted − essentially from a Keynesian demand-side-oriented monetary policy operating on monetary aggregates, to an inflation-oriented monetary policy operating on interest rates, and playing on market terms.

In this paper, we study the parallel processes of financial market deregulation and development on the one hand, and reform of the operative frameworks of monetary policy on the other, and the extent and nature of the association between the two processes, in 11 small, European countries from the beginning of the 1980s and up to the launch of EMU. We focus on the development of domestic money markets, and address aspects of this development such as the size and structure of various market segments, and institutional and regulatory changes, besides empirically examining the extent of reorientation of monetary policy instruments. We hypothesise that the parallel processes are intertwined and that developments

in any one particular country is best described as a continuous interplay of market outcomes and policy choices.[1] We also provide tentative empirical evidence to that effect.

The 11 countries in our study are basically just a complete list of the developed European countries that *unambiguously* fitted the 'small, open economy' criterion (and had their own currencies) during the 1980s and 1990s. The countries are: Austria, Belgium, Denmark, Finland, Greece, Ireland, the Netherlands, Norway, Portugal, Sweden and Switzerland. The diversity of these countries in terms of monetary policy regimes pursued (from hard-currency countries like Austria, to countries with near-emerging-market status, such as Greece) and level of institutional integration (from core EMU countries like the Netherlands to *sonderweg*, non-EU countries like Norway), also make them an excellent laboratory as regards the link between money market development and the conduct of monetary policy. The choice of study period is based on previous research on the financial-market 'transformation' process (see Oxelheim, 1996).

The paper is structured in the following way. In Section 1, main developments in domestic money markets are reviewed. These are largely comprised of two interlinked processes: that of deregulation and liberalisation on the part of authorities, and that of innovation and growth on the part of 'markets'. These two processes are treated in separate sub-sections. Section 2 mirrors Section 1 in that it analyzes the changing operative procedures of central banks along two lines: the decreasing role of direct controls (closely related to the general deregulation of financial markets), and the increasing role of market operations. In

[1] The cross-country comparisons of central bank operating procedures that exist − e.g., Kneeshaw and Van den Bergh (1989), Batten *et al*. (1990), Bernanke and Mishkin (1992), Kasman (1992), Goodhart and Viñals (1994), Hooyman (1994), Bisignano (1996), Borio (1997), BIS (1986; 2001), Kopcke (2002) − consistently indicate that changes in the operative frameworks of central banks have been both effects and drivers of broader changes in financial markets. This is the link we focus on here. For more general considerations of the political economy of financial market development, see, e.g., Pagano and Volpin (2001), and Rajan and Zingales (2003).

Section 3, we identify the main drivers of the changes in central-bank operations. Thereafter, we empirically examine the sources and effects of fluctuations in money-market liquidity in the case countries and tentative evidence of a determinant of the intensity of open market operations. Section 5 concludes.

1. General developments in domestic money markets

The countries covered in this paper all followed the general trend among industrial countries of broad-based financial-sector deregulation in the 1980s and 1990s. Below, we make a brief summary of that process. We go on to recounting main developments in money market innovation, differentiation, and growth, in each of the case countries.

1.1. Financial deregulation

The regulations in force in a majority of European countries until the 1970s or, in most cases, the 1980s were of four major types: interest-rate controls, quantitative credit and investment regulations, restrictions on the issuance of financial instruments, and market-entry/branching or ownership restrictions. These 'repressive' regulations typically served multiple purposes, but the major ones were to achieve monetary control and to achieve broader social/economic policy objectives.

As can be seen from Table 1, which summarises the situation around 1980 in terms of regulation in the sample countries, several countries applied all major types of regulations. Portugal, for instance, was in 1980 very much still marked by the effects of the nationalisation of financial sector in 1974 and a system whereby the Banco de Portugal was equipped with almost limitless authority to intervene in all aspects of financial intermediation. All or most regulation types were also used, for instance, in Austria, Greece, Norway and Sweden.

[Table 1 about here]

a) Interest-rate regulations were in force in all countries in the sample except the Netherlands at the start of the study period (see Table 1). Administrative control over interest rates − in particular, keeping interest rates at low levels − was used as a general monetary-policy instrument, as a way to boost demand, and as a means of providing cheap financing for the government.

Interest-rate controls began to be dismantled in the late 1970s in Austria, Denmark, Ireland, Norway and Sweden. By the mid-1980s, interest rates in Denmark, Ireland, Norway and Sweden (beside the Netherlands) were essentially liberalised. In most of the continental-European countries, the main steps were taken in the second half of the 1980s.

By 1990, also Austria, Finland and Switzerland had completely liberalised interest rates; Belgium had, in principle, also deregulated interest rates, but retained some minor controls on specific categories or types of credit. The last among the survey countries to abolish interest-rate regulations, Greece and Portugal, completed the process a few years into the 1990s, in accordance with their gradual implementation of European-Community directives (see Rautava, 1994; Edey and Hviding, 1995).

The typical sequencing pattern was that the liberalisation of wholesale interest rates occurred first, followed by lending rates and deposit rates.[2] The process was mostly gradual, and sometimes hesitant on the part of the authorities. An illustration of this is that formal rules and restrictions (a ceiling, a quota, etc.) were often initially followed by *implicit* regulations in

[2] The usual argument given for this sequence of events is that agents in wholesale markets are assumed to be more professional, thus better qualified to handle market-determined rates; see, for example, Mehran *et al*. (1997).

the form of recommendations or various types of agreements before being *de facto* liberalised. Such was the case in Austria, Belgium, Denmark, Greece, Ireland, Norway, Portugal, and Sweden. These implicit regulations were enforced through the understanding that the central bank could, and would, enforce its goals by means of the reinstatement of formal regulations if deemed necessary (see, e.g., Grønvik, 1994).[3]

b) Quantitative credit and investment restrictions, in one form or another, were employed in a majority of the countries (again, see table 1). The low interest rate policies pursued by several of the countries a low-interest-rate policy which, in combination with high inflation rates, led to very low (or even negative) real-interest-rate levels. This, in turn, led to high credit demand, indicating that credit had to be rationed and the market as a whole had to be regulated in detail, both as regards prices and quantities.

As an effect of the co-dependence of various types of regulations, credit controls to some extent became obsolete or irrelevant as interest rates were being liberalised.[4] Hence, most of these regulations were abolished in Austria, Denmark, Finland, Ireland, Netherlands, and Sweden in the first half of the 1980s. Belgium had initiated the deregulation of credit in 1979, but the process took more or less the entire 1980s to be completed. Of the other countries, Switzerland had not applied quantitative controls since the 1970s. Norway abolished credit regulations in 1988, Portugal around 1990, and Greece a few years into the 1990s.

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[3] The 'empirical' relevance of implicit interest rate regulations is illustrated by Pech's (1994) estimation that in the early 1990s almost half of all credit extended to industry in Austria, though formally free from regulations, was in fact subsidised.

[4] Temporary regulations have been resorted to in extreme cases even in recent years. The latest example is the imposition by the Bank of Greece of a 12-percent credit-expansion ceiling on commercial banks in 1999 after consumer credit had expanded more than 30 percent *p.a.* in 1998 and 1999 (Bank of Greece, *Monetary Interim Report, 1999*).

c) Issuing restrictions on securities were used to control the extension of credit through direct channels (i.e., through issues in the open market). Usually, rules and regulations on minimum maturities, etc., were combined with various authorisation requirements.

The initial emergence of short-term securities markets in several countries was directly conditional on the abolition of one or several restrictions on the issuance of debt securities. Conversely, where such deregulations did not occur, or occurred late, an important condition for the emergence and growth of markets was lacking. Controls on (debt) securities issuance were mostly in place for slightly longer than interest rate and credit controls. Exceptions are Denmark (which had a relatively free and internationally oriented bond market based on private debt already in the 1970s), and Netherlands, where regulation was comparatively limited. Switzerland was low on formal regulation, but the growth of the domestic market segments was hampered by business practice, as well as by tax policy and other factors. Finland, Ireland, Sweden and Switzerland lifted issuing controls in the first half of the 1980s. In some countries important liberalisation measures were implemented in the mid-1980s (for instance in Norway – see Norges Bank, *Penger & Kreditt,* 26:1, 1997). Netherlands, although comparatively liberal in several respects, applied rules on minimum maturities which constrained the development of short-term markets, and were fully abolished only in 1990.

In other countries, important steps toward the opening-up of securities markets occurred in the context of a reform of government-financing systems. Such is the case, for example, in Austria and Belgium (around 1990; see De Broeck *et al*, 1998), and Greece (early/mid-1990s; see Soumelis, 1995). Generally, however, the liberalisation of markets for private debt was slower than other categories. For instance, the Portuguese fixed-income market was not formally opened to all domestic issuers until 1994 and to foreign issuers 1995 (see de Pinho, 2000). Also, as previously mentioned, market development was in some cases stifled by the existence of various types of more or less informal authorisation requirements. For instance,

Switzerland abolished numerous cartel-like conventions and permanent securities-issuance syndicates of banks in 1990.

d) Market-entry rules or *line-of-business regulations*—the separation of banking and securities businesses, the separation of commercial banking from investment or savings banking, and other branching restrictions—limited the segmental integration within the financial system. A similar effect is implied by regulations limiting *ownership* linkages between different types of financial institutions, between financial institutions and other industry sectors, and between domestic and foreign institutions. In addition, a sort of 'ownership restriction' was the indirect control by the government of the financial sector through the dominance of state-owned banks in combination with market-entry restrictions. This applies primarily to the countries with previously entirely nationalised financial sectors (Greece and Portugal), but also, to some extent and during some periods, in other countries. In Norway, for instance, through ownership of major banks was one consequence of the banking crisis around 1990.

Regulations within this category were partly or wholly lifted in the 1980s and early 1990s in some countries, including Austria, Belgium, Denmark (where de-compartmentalisation of the banking sector occurred already in 1975), Finland, Norway and Sweden. Moreover, a 'spontaneous' functional market integration (taking place, for instance, through banks establishing subsidiaries within the securities-trading business, or purchasing finance companies) is often considered a major feature of the financial-market transformation process undergone by the industrial countries in the 1980s (see, e.g., the survey in OECD, 1989). To some extent, this implies a diminishing practical importance of remaining regulations.

To this category may also be counted restrictions on foreign-bank entry. In the sample, Finland, Norway, Portugal and Sweden were among those countries that opened their

domestic markets for foreign banks during the 1980s. In some other countries, including the Netherlands and Switzerland, rules on foreign-bank access to the domestic market were already relatively liberal at the start of the 1980s, whereas in much of the rest of the continental-European countries, significant steps were taken only with the implementation of the EU's 2nd Banking Directive (effective in 1993).

In the area of ownership control, the deregulation wave made a comparatively modest impression in the 1980s and 1990s, and several such regulations remained in the mid-1990s (see, e.g. Herring and Litan, 1995). State-ownership of a large proportion of domestic financial institutions also outlived financial integration in some countries. The Greek banking sector, for instance, was still completely dominated by state-owned banks when ownership regulations were abolished. In terms of assets, the government's ownership share was about 75 percent (see Hope, 1993). In other countries, state-ownership of banks became an effect of banking crises in the early 1990s: after the crises, the governments of Norway and Finland ended up with ownership shares of 52 and 35 percent, respectively (see the *Banker*, 1993; also see the *Economist*, 1992, and Warner, 1993, for short background articles on the deregulation and privatisation of Portuguese banks).

The deregulation process in the 11 focus countries is summarised in Table 2.

[Table 2 about here]

1.2. Money market growth and development

The money market is usually defined as a market for short-term debt (generally with original maturities of up to one year; see, e.g., Stigum, 1983). One main segment of money markets is the interbank market. The other segments are primary and secondary markets for various short-term securities, and a derivatives market. The foreign-exchange (FX) markets and

domestic money markets are also closely interlinked through the existence of markets for forward-exchange contracts and swaps, which make certain types of FX transactions equivalent to single-currency transactions.

Because the interbank segment is defined *in terms of participants* and the 'open-market' segments usually *in terms of instrument* there is a considerable overlap between these segments. The interbank market is sometimes taken to mean the market for very short-term, that is, overnight up to a few weeks, deposits and loans. Central-bank facilities for such deposits and loans are included. Virtually all types of instruments − including derivatives − are traded interbank. The segmental structure is therefore not wholly clear, and tends to vary from country to country.

[Table 3 about here]

Table 3 summarises the starting years for the main segments in all 11 countries. It indicates a progressive convergence during the 1980s and 1990s in terms of the *presence* of different types of money-market instruments.

The most traditional money-market segment is the interbank deposit market. It includes the central bank's deposit and loan facilities and its structure and function are, as a consequence, to a high degree determined by the incentives regarding banks' liquidity management implied by the central bank's choice of operative framework. Deposit markets turned up in most countries as monetary policy instruments changed during the 1980s and 1990s. The segment largely retained its importance throughout the 1990s in spite of the emergence of alternative instruments (such as repurchase agreements in particular). For instance, transactions in the uncollateralised segment were estimated at about twice the size of collateralised transactions in the euro area in 1999 (see Santillán *et al.*, 2000).

In the short-term securities markets, considerable dissimilarities can be seen between the focus countries, in terms both of the relative total size of the market as well as in terms of the relative importance of specific segments of the market, as evidenced in Figure 1 and Table 4.

[Figure 1 about here]

[Table 4 about here]

In the short-term securities segment, treasury bills or equivalent short-term government securities are typically the most important sub-market. In several countries (for example, Austria, Belgium, Ireland, Sweden), short-term government securities have existed for a long time, but were traditionally non-marketable, and sold directly to final holders at regulated rates until a decade or two ago. True markets for t-bills mostly emerged in connection with relaxations or complete abolition of issuing restrictions (years in Table 3).

Two other main cash-instrument types—commercial paper (generally issued by non-bank entities) and certificates of deposit (a securitised bank liability)—were introduced in several countries in the mid-1980s, but as revealed by Table 4 their importance varies greatly. In some cases (for example Finland and Sweden), the introduction of CDs preceded the introduction of tradable government securities. In other cases, diversification of the market to other than government issues occurred several years after a t-bill market had been established (Ireland, the Netherlands, Portugal).

Commercial-paper markets gained importance in some (but far from all) countries toward the late 1980s (Norway, Sweden) or further into the 1990s (Belgium, Ireland). There seems to be some indication that where commercial-paper markets could be benchmarked

against a liquid government-bill market (or other instrument with a market-supporting role), their development came earlier and was more extensive (see Alworth and Borio, 1993).

Beyond the above reported cash instruments, various derivative instruments play an important role, as do repurchase agreements (repos), which − according to BIS estimates − was the fastest growing instrument/transaction type internationally during the 1990s. Data, however, are scarce. Reporting in different countries is also such that available historical data are not readily comparable (BIS, 1999). Existing data indicate considerable variations in derivatives as well as repo markets. For example, in Belgium, repos became the main financing tool for domestic banks in the 1990s, and largely replaced more traditional interbank transaction types (see Commission of the European Communities, 1999). Similar trends were visible in other countries (particularly those with ample stocks of collateral). Others were partly stifled due to thin debt markets (Netherlands, Norway), ambiguities with regard to regulatory policies, legal status and tax treatment (Ireland, Portugal, Switzerland), or excessive concentration of market participants.

2. Changes in central-bank operations 1980–2000[5]

Until the mid-1980s central banks relied largely on traditional deposit and loan facilities (standing facilities), supported by various direct controls, for the conduct of monetary policy. The ordinary credit facilities were mostly supplemented by some sort of tranche-division system (for example, Denmark, Finland), penalty-rate system (Austria, Sweden), or a combination of both (Belgium, the Netherlands) in order to allow central-bank control of the

[5] General references for this sub-section not cited elsewhere include BIS (1986; 1997a), and Aspetsberger (1996).

marginal cost of banks' borrowing under the facilities, and thereby of the supply of liquidity to the banking system.

All our focus countries reformed their operative frameworks for monetary policy substantially during the 20 years we study. In some countries, the revision of the monetary-policy operating framework took the form of comprehensive reforms (for example, Denmark 1992, Switzerland 2000); in others, developments proceeded more piecemeal (see Table 5). In several countries (Belgium, Finland, the Netherlands) the trend toward a gradually increased diversification of liquidity-supply instruments became visible toward the mid-to-late 1980s. Others followed suit during the 1990s (Denmark, Portugal, Austria).

[Table 5 about here]

2.1. The diminishing role of quantitative controls

The diversification of instruments used by central banks as well as by other money-market participants during the 1980s and 1990s was paralleled with the lifting of most direct regulations. This sub-section therefore focuses on one direct control that remained in use by many central banks—the minimum reserve requirement.

During the 1990s, practically all our case countries followed an international trend among industrial countries toward lowering or completely abolishing reserve requirements (see Table 6). The major arguments behind these reforms were to reduce the tax effect of reserve requirements and to neutralise the competitive disadvantage of subjected depository institutions vis-à-vis other financial institutions—domestic or foreign (see, e.g., Bank of Japan, 1995).

The original objectives of the reserve-requirement instrument were to maintain banks' liquidity even in case of large deposit withdrawals, and to influence liquidity for monetary-

policy purposes. The function of reserve requirements as a mechanism to control monetary-aggregate quantities on an ongoing basis was largely abandoned during the late 1980s or early 1990s. Nowadays, reserve requirements serve three main purposes. One is as a means of providing for banks' ongoing liquidity needs (having banks in a position of reliance on the central bank facilitates the conduct of monetary policy). A second purpose is to improve the flexibility of banks' liquidity management (reserves can be used to settle interbank payments). Finally, reserve requirements (particularly if unremunerated) can provide seigniorage income for the central bank, thereby contributing to its profitability and (economic) independence (see, e.g. Grønvik, 1994; Bank of Finland Bulletin 12, 1996; BIS, 2003).

Countries that abandoned the use of reserve requirements more or less entirely relatively early on include Belgium (mid-1970s), Norway (1987) and Sweden (1990). In Norway, for example, both primary reserves (that is, cash-reserve requirements) and secondary reserves (compulsory bond holdings by banks and insurance companies) had been used since the 1960s. From 1971 only the primary reserve requirements were used in Norway, but they were altered often and by much.

Minimum reserve requirements were in use as liquidity-management instrument until the late 1990s in the Netherlands, Austria, Finland, and Ireland; but the only country where they played a significant role for active liquidity management until the late 1990s was Greece (until its entry into the EMU), where the instrument was deemed necessary to retain control over the liquidity supply in the face of large capital inflows (this parallels earlier experiences in, for instance, Portugal).

[Table 6 about here]

2.2. The increasing role of market instruments in central-bank operations

Three main types of discretionary instruments predominate: short-term (cash) securities, repurchase operations, and swaps. Effective open-market operations to some extent presuppose an existing market to operate in. Thus, central banks have typically, at some point or other, come to favour the creation of markets, and have often stimulated and supported their development. This holds for interbank deposit markets as well as for short-term securities markets.

The absence of an efficient interbank market is bad news because banks may then rely on central-bank facilities to gain access to liquidity even when other banks are very liquid, creating a situation of excess liquidity in the banking system and poorer monetary transmission.[6] For monetary policy to bite, banks' *marginal* liquidity needs must be settled with the central bank. Hence, when − as a consequence of financial deregulation − direct controls (such as specific credit quotas to individual banks) can no longer be used to deal with excess-liquidity problems, there appears an incentive for central banks to create adequate instruments to drain liquidity and to stimulate the formation of markets for alternative short-term assets. Examples are the establishment of efficient day-to-day interbank markets in Belgium and Sweden (1985–88), both of which were anticipated effects of changes in the layout of monetary-policy operating procedures (BNB, 1985; Kneeshaw and Van den Bergh, 1989). More generally, the initial emergence of a markka money market was stimulated by the Bank of Finland's decision to withdraw its presence from the forward exchange market (around 1980). Parallels exist in, for example, Denmark and Portugal (see Danmarks Nationalbank *Monetary Review*, August 1996; and Pinto, 1996).

[6] In Switzerland, for instance, the underdeveloped domestic money market, the unaccommodative attitude of the National Bank with regard to reserve imbalances (resulting from its long-standing reserves target—now

The emergence of short-term securities markets adds a dimension to liquidity management for central banks. In practice, cash operations in short-term securities by central banks are relatively rare, even where the size of these markets is sufficiently large to make such operations feasible (see Borio, 1997). One reason is that other types of operations are more flexible. Other reasons which have carried some weight in several countries are the wish to avoid potential conflict with other public-policy objectives – notably public-debt management (for example in Denmark and Portugal) and tax policy, and the wish to avoid circumvention of limits on central-bank lending to the government. These problems are particularly relevant in emerging stages of money-market development (see, e.g., Mehran *et al*., 1996; Kneeshaw and Van den Bergh, 1989).

To avoid conflicts of interest and to increase the effectiveness of monetary policy, it has been relatively common for central banks in small countries to issue their own securities (central-bank CDs) in the primary market in order to absorb liquidity from the banking system. In some cases, this was one of the main strategies of the central bank. Countries where the issue of central-bank paper played an important role during shorter or longer periods include Finland (from 1987 onward, but particularly during the 1990s), the Netherlands (1994−99), and to some extent Ireland and Portugal among the EMU countries; and Denmark (1992 onward) and Sweden (1992−96) among the non-EMU countries.

Even in the absence of outright transactions in securities, the existence of a liquid securities segment in the money market is often argued to facilitate the central bank's operations by providing collateral for repurchase agreements and similar collateralised transactions. To the extent that it does so, the varying degrees to which short-term securities markets have emerged in the focus countries imply correspondingly varying possibilities for

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abolished—) and the comparatively high cost of Lombard (overdraft) facilities led Swiss banks to hold reserves substantially in excess of those required under reserve requirements (Kasman, 1992).

the respective central banks to exploit the flexibility and other advantages of repurchase agreements and similar instruments.[7] During the course of the 1990s this type of instrument was adopted as a main liquidity-management instrument in Austria (1995), Finland (mid-1990s), Denmark (as from 1992), the Netherlands (refers to 'special loans'), Sweden (1994), Switzerland (1998), and then, from the time of its inception in 1999, in the whole Eurosystem (see Table 7).

[Table 7 about here]

In principle, of course, any type of security—not just short-term securities—may be used to underpin collateralised transactions. The common argument that efficient short-term securities markets are needed for the conduct of open-market operations by central banks is therefore not necessarily particularly strong (see, however, Section 4). Recent developments, in which the ECB has gradually expanded its palette of security types eligible for collateral in repurchase operations, is also an illustration of this. In the US (BIS, 2001) and the UK (Bank of England, 2002), where that palette is somewhat narrower, the debate in recent years has been more concerned with the 'quality' (rather than the original maturity) of the collateral: more specifically, the concern has been with the feasibility of open market operations and the

[7] Several advantages are perceived with repos as an instrument for monetary policy relative to more orthodox cash instruments (see, e.g., Turner and van 't dack, 1996; BIS, 1999). One advantage is that they do not directly influence the underlying asset prices. A second is their flexibility: they break the link between the maturity of the asset and the transaction, and can essentially be tailored to suit prevailing liquidity conditions. Thirdly, because repo transactions are backed by (high-quality) collateral, the risk involved is typically very low. This also means that they convey relatively accurate information on the market's interest-rate expectations over the short term. Finally, repos are seen as appropriate for signaling the central bank's monetary-policy stance.

eligibility of private securities for central bank operations in an environment of declining government issues (see, e.g., McCauley, 2001, and Wojnilower, 2000).

Nonetheless, the introduction of the common monetary-policy framework in the euro area in 1999 altered the use of *short-term* paper as collateral for central-bank operations quite substantially. In most EMU countries, the use of short-term paper (particularly t-bills) as collateral for the ECB's refinancing operations increased as compared to the pre-EMU collateralised transactions of the respective national central banks. In Belgium, Ireland and the Netherlands, the proportion remained largely unchanged, whereas in Portugal and Finland, it decreased.[8]

Some countries without liquid short-term markets relied on foreign-exchange operations (particularly swaps) for liquidity management. The pre-eminence of swaps over spot or regular forward-exchange operations simply reflects the greater importance of swaps in the interbank market. Swaps are the major instrument by which banks cover their forward foreign-exchange commitments to customers (See Hooyman, 1994). Countries where FX swaps played a significant role for liquidity management by the central bank and/or by the banking system as a whole include Austria, the Netherlands and Denmark. In Switzerland, USD-CHF swaps were the principal market operation of the National Bank during the period between the early 1980s and the late 1990s.[9]

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[8] In Portugal, the decline in short-term paper as collateral refers primarily to t-bills, which decreased from initially very low levels (3 percent). In Finland, however, collateral paper mostly consisted of bank CDs, the use of which dropped from about 30 to 20 percent after the adoption of the common monetary-policy framework in the euro area. See Santillán *et al*. (2000).

[9] By 1987, the National Bank's holdings of currency swap contracts amounted to approximately half of its foreign-currency assets, which in turn amounted (together with gold) to almost 90% of its total assets. Roughly that situation remained until 1998, when the Nationalbank began to broaden its arsenal of instruments (Banque Nationale Suisse, *Bulletin Trimestriel* 4, December, 1999). Also see Zurlinden (1996).

There was a clear trend from the mid-1990s onward in the EMU group of countries toward a 'non-spontaneous' convergence in the arsenal of instruments used by the central banks, in the explicit anticipation of adopting a unified operational framework. This becomes clear from studying which instruments were adopted by the central banks, but also from the motivations given for the specific reforms made to the national, pre-EMU operational frameworks by the monetary authorities themselves in annual accounts and other official documents. However, there is also a case for arguing that the choice of instruments for the Eurosystem to some extent reflected broader international trends in central-bank operations: an argument which is somewhat strengthened by the observation that the non-EMU countries in our sample have largely undergone similar changes in this respect (often prior to corresponding changes in the EMU countries, as in the case with the adoption of repos in Denmark and Sweden).

3. Changes of central-bank operating procedures: main drivers

Because financial market regulations were partly designed as monetary policy instruments, the deregulation process is in itself sufficient reason for reformation of the operational framework of central banks: as some policy instruments are taken away, others must replace them. Therefore, the main drivers of changes in central bank operating procedures largely coincide with those of financial deregulation in general. Beyond this somewhat trivial explanation, the literature and the central banks' own accounts offer five main reasons.

First, monetary-policy instruments were changed in several countries in order to adapt the operational frameworks of the respective monetary authorities to new regimes and/or new targets for monetary (and exchange-rate) policy. The examples are manifold: the Austrian central bank, on embarking on its new 'hard-currency' policy in the late 1970s, put weight

behind the new policy formulation by entering (and keeping a permanent presence in) the foreign-exchange market (Glück, 1994); the Bank of Finland's 1994 revision of intervention procedures and clearer focus on interest rates were motivated by the new inflation target for monetary policy (Kuosmanen,1996; Finland at this time adopted an inflation target); the same goes for the new interest-rate management system adopted by the Swedish Riksbank the same year (Hörngren, 1994) and that of the Swiss National Bank which is in force since January, 2000.

Second, structural factors outside the central banks' control made some of the traditional instruments outdated and the adoption of new ones necessary. Such structural factors may be quite varied. One of the primary reasons, for instance, given by the Norwegian central bank for the revisions of its operational framework in the 1990s was the need to adapt to the change in the underlying structural liquidity position of banks (from a deficit throughout the 1980s and up to 1992–93 to a surplus in the years around 1995), which, in turn, was attributed primarily to the weakening government budget (see Norges Bank, 1995, and various issues of the *Economic Bulletin* of the Bank of Norway). More important, however, were the structural changes resulting from the general transformation of the financial system—a trend affecting all countries. The expansion of the financial overhang in the economy occurred more or less entirely outside the central banks' balance sheets, and therefore reduced the share of the financial system over which monetary authorities could exert direct control. The result was an increasing need for indirect ways to exercise control over the non-monetary components of the money supply. In other words, the development produced (among other things) alternative liquid assets which continually challenged the precision and purpose of a policy relying heavily on, for example, regulating the growth rate of such or such a monetary aggregate. One consequence was that *interest rates* emerged as a more relevant operating variable (prominent exceptions to the rule were, importantly, countries with largely bank-based financial systems

such as Germany and Switzerland). To that extent, this second reason for central banks to change their instruments is related to the first one: structural changes outside the central banks' control indirectly called for new instruments by requiring that policy operate on different variables.

A *third* factor relates both to the expansion and diversification of financial markets domestically and to the increasing international integration of financial markets. Greater interest rate flexibility and narrowing differentials between rates of return in different currencies gave rise to the need for instruments whereby liquidity (and thereby interest rates) could be managed more *flexibly* in time and in magnitude, and with a greater measure of *accuracy* than that offered by, say, discounting, interest-rate controls, and lending ceilings.[10]

Fourthly, the increasing importance of *expectations* in a world of free financial markets favoured the adoption of instruments better suited for *signalling* the central bank's monetary policy stance. By this token, among the reasons mentioned for the change of operational targets in Sweden in 1994 were the need for possibilities of more flexibly adjusting short-term interest rates and the need for tools appropriate and effective for signalling medium- to long-term policy intentions (see BIS, 1997b; Sveriges Riksbank, 1994). Similarly, on introducing repurchase transactions as one of its key operations and the lending rate for secured transactions as the new main policy interest rate, the Danish Nationalbank gave the motive that changes of the discount rate had become too 'powerful' (in other words, too blunt) to be a useful tool (Danmarks Nationalbank, *Monetary Review* 2, 1999).[11]

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[10] As financial integration between countries increase, the narrowing interest-rate differentials vis-à-vis other countries imply that even very small interest-rate movements can generate considerable cross-border capital flows, making exchange-rate or money-supply targets increasingly difficult to meet. Hence the increasing need for instruments which would enable the central bank to influence domestic short-term rates with greater flexibility and accuracy.

[11] One additional motive for the Nationalbank to increasingly use secured transactions in its operations to extend

A *fifth* broad category of reasons relates to the wish more generally on the part of central banks to stimulate money-market activity and improve monetary-policy transmission, and to achieve a clearer separation of monetary policy implementation from government-debt management, and from other social-policy goals (favouring certain sectors in the economy by granting access to cheap credit, etc.) which were auxiliary reasons for the imposition of financial-market regulations. Because financial regulations were often of a multiple-purpose variety, and because the central bank was typically responsible for the implementation of the regulation policy, the distinction between monetary policy and other 'types' of policy had previously not always been very clear-cut. For instance, the experience of the Portuguese central bank was that the controls used to attain monetary-policy goals up to around 1990 increasingly conflicted with other public-policy objectives and with the ambition to achieve effective policy transmission. The consequence was an increased uncertainty and frequent unexpected changes of variables used to calculate credit ceilings and quotas, rendering credit control less and less useful or relevant (Pinto, 1996). In Norway, the sentiment at the central bank around 1980 was that direct controls were no longer effective, but, in fact, only made the credit market more difficult to control and the interpretation of information more problematic (see Vale, 1995).

4. Sources and effects of fluctuations in money-market liquidity and the scope for open market operations

liquidity to the banks was to lower the risk involved in these operations. A reason for wanting to do so may have been concern with the solvency of the banking system (Finland, Norway and Sweden experienced rather severe banking crises at the time).

In order to analyze broad changes in monetary-policy stances and instruments over the 20-year period from around 1980 up to the launch of EMU, we extracted the principal sources and uses of money-market liquidity as well as the main instruments used to influence liquidity from the central banks' balance sheets over three shorter time periods: one in the early 1980s, one in the late 1980s (or early 1990s), and one period in the late 1990s. The general methodology closely follows that suggested by Borio (1997; Annex I). The frequency is weekly where available, otherwise monthly (see the notes to Table 8). This somewhat impedes comparability between periods and/or across countries. Still, we considered it better to use the weekly-frequency data where such were available. The lower-frequency (monthly) data may to an extent over-/understate some items because operations of central banks often have shorter maturities than one month.[12]

[Table 8 about here]

Table 8 shows the principal sources of liquidity in our survey countries over the three different time periods. To begin with, it can be noted that the variability of the autonomous position was consistently much higher than the average position. This indicates that autonomous factors did not generally have permanent 'structural' effects. More generally, it implies that we cannot make statistically significant conclusions about the average size of the positions.

Policy can be assumed to work against the autonomous position (to have the opposite sign), so as to offset its net effect on liquidity supply (banks' reserves at the central bank).

[12] The average size of the positions as well as their variability tend to increase with the total length of the period covered, and therefore tend to be higher for those countries for which *monthly* rather than *weekly* data are used: an indication that the data should be interpreted with caution.

This assumption is supported by the data, but as with the autonomous position, the *variability* of the policy position far exceeded its size, leaving little or no room for conclusions about the average stance of policy. Generally, policy appears to have offset autonomous influences imperfectly—that is, the average size as well as the standard deviation (variability) of autonomous factors are mostly higher than that of policy.

The resulting effect varies. Overall, fluctuations in net liquidity changes were comparatively low in Belgium and the Netherlands. Per contrast, average net liquidity changes were more variable in Denmark and Norway. Comparing data within countries but across periods, there also appears to have been an upward trend in liquidity fluctuation in these two latter countries, possibly along with Ireland. The opposite trend seems to apply to Sweden. In Finland, liquidity fluctuation dropped between periods one and two, then rose again. For Portugal, this pattern is inversed. These differences with regard to the variability of net liquidity changes reflect differences in the variability of the autonomous position fairly well. That can be taken as another indication that policy smoothed out liquidity fluctuations though only imperfectly.

Finally, the reasonable expectation of seeing more activist policy in latter years is not invariably heeded by the data; rather, the standard deviation of the policy position (which can be used as an indicator of policy activism) seems to have covaried strongly with that of the autonomous position. Taken together, this reinforces the indication that the job of the central banks in the sample was primarily to forecast and offset factors outside its direct control that influence the domestic market.[13]

[13] One potentially complicating factor here is that if we believe that the central bank's policy measures can in and of themselves give rise to 'innovations', we have an endogeneity problem of the 'autonomous' factors: the central bank influences these factors *indirectly* through its own actions.

The variability of the main autonomous factors is shown in Table 9. Note that Tables 9 and 10 contain only variability (standard deviations), not the average positions (again, these are generally statistically insignificant). Seen over all countries and periods, the two most important autonomous sources of fluctuation in money-market liquidity (and thus the major factors that the central banks have had to counter in their policies) were net foreign assets and net lending to the government. Of these, the latter in many cases almost seized to be a source of fluctuation in the last period, since central-bank lending to the government became prohibited for members of the European Union. For these countries, this item continued to influence liquidity only through marginal holdings of government securities and through the government's deposits at the central bank.

[Table 9 about here]

The net-foreign-assets portion of the autonomous position should—all else equal—be more variable in countries with far-reaching exchange-rate commitments, where the central bank was active in the foreign-exchange market or in other ways made more extensive use of foreign-exchange reserves to uphold that commitment (such as Austria and the Netherlands). Conversely, it should be less variable in countries where exchange-rate commitments were absent, or secondary to monetary policy (such as Switzerland, or Sweden in Period 3). However, no clear such pattern can be discerned, although Denmark fits well into the picture. For the other countries in the study there was a tendency that net foreign assets are a more important source of liquidity fluctuation in 'weak-currency' countries – regardless of exchange-rate regime –, and a less important one in 'hard-currency' countries. (This tendency, however, must be considered very tentative, given the imprecision of any categorisation of

hard- and weak-currency countries; for evidence of the influence of exchange rate regimes on short-term interest rates, see Forssbæck and Oxelheim, forthcoming.)

In some countries (Denmark, Norway, and to some extent also Ireland, Portugal and Sweden), foreign influences along with net lending to the government were consistently and by far and away the most important source of liquidity fluctuation (and thereby domestic short-term interest-rate fluctuations). The historical development of the foreign-assets position is varied: its contribution to liquidity fluctuations increased between the early 1980s and the late 1990s in Denmark, Finland (though at a lower level), Ireland, Portugal, and (slightly) in Sweden; it decreased in Belgium and the Netherlands. Similarly, it decreased between the late 1980s/early 1990s in Austria and Norway. Net lending to the government was particularly variable for the Scandinavian non-EMU countries (Denmark, Norway and Sweden). This might well be interpreted as an illustration to what has been said about the unclear separation of various forms of public policy; notably the unclear separation of the central bank function from other public-policy issues, such as financing of the government. It would, in that case, indicate that the Scandinavian central banks were among the least economically independent among those covered here. This corresponds rather well to the indicators of central-bank independence reported elsewhere (see, e.g., Grilli *et al.* for one of the original contributions in this field).

[Table 10 about here]

Table 10 shows the respective contributions of standing facilities and market operations to the central banks' liquidity-policy positions. The data largely confirms the indications given earlier in this study, and results of earlier cross-country studies, of an increased market-orientation of monetary policy operating procedures. The variability of that portion of the

policy position which is made up of standing facilities has decreased across the line, and in most cases this decrease finds a corresponding increase in the variability of the position stemming from market operations.

The results from Table 10 provided us with a measure of the extent, or intensity, of open market operations in the different countries at different periods in time. In order to test the hypothesis of a relationship between choice of instrument type and the degree of market development, we performed a series of tests, the results of which are reported in Table 11 and Figure 2. The dependent variable is given by the 22 observations of the variability of the market operations component of the policy position in Table 10; the independent variable is the relative size of the short-term securities market (as shown in Figure 1) at the periods corresponding to the observations of the dependent variable. In order to atone as much as possible for the problem of a limited number of observations, we performed both least squares and non-parametric regressions. Caveats are still warranted, both because of the imprecision and comparability problems of the data generated from the central banks' balance sheets, and because of the questionability of using the size of short-term securities markets as a yardstick for the feasibility of open market operations (*cf.* the discussion in Section 2.2); finally because the limited number of observations still provide limited degrees of freedom for elaborating the model tested.

[Table 11 about here]

[Figure 2 about here]

As seen in Table 11, a simple linear regression does not indicate any significant correlation between the two variables, but a quadratic specification provides some support for the notion

of a positive, but marginally decreasing association between the intensity of open market operations and market development. Given the limitations mentioned above, however, and some difficulty with the intuition of a quadratic specification to the right of the optimum (see Figure 2), the results must be considered tentative.

5. Conclusion

Up to the late 1970s and early 1980s, money markets (as well as the financial sectors in general) in our case countries were typically underdeveloped and highly regulated (possibly with a couple of exceptions). Since then, politics, primarily through the effect of a general deregulation of the financial sectors, has been one of the main determinants of money-market development. However, beyond motives and reasons for *financial deregulation* that are valid for the financial sector as a whole (such as technological advances, increasing internationalisation of business activities and financial innovation – the combination of which factors led to ever increasing opportunities to evade or circumvent existing national financial regulations and restrictions –, an increasing realisation on the part of policy makers of the incompatibility of highly repressed financial systems with efficient resource allocation, and international 'peer pressure' in the context of international organisations and institutions for international economic cooperation), we would argue that there are also additional 'political' motives for promoting the formation of efficient *money markets*, specifically. In particular, we found motives in terms of the need of the central banks for an arena in which to conduct open-market operations and in other ways to control the supply of liquidity to the banking system, as regulations, controls and restrictions became increasingly ineffectual or unavailable as instruments for monetary-policy implementation.

Such generalisations, however, cannot explain the significant differences between the countries we study in the path of money market development. These differences – in terms of the size of the market in total, as well as the structure and relative importance of the main market segments – instead seemed largely to persist during the entire period studied. A rough division, for instance, can be made between countries with and countries without a significant short-term securities segment. However, in those countries that do have such segments, these segments still vary substantially with regard to size, liquidity and the relative importance of different types of securities. For example, the development of Finland's short-term securities market was based on bank CDs, while most other countries' markets were based on government bills; in Greece, the government-bill market, though large, did not give rise to a significant market for other types of short-term paper, and the market long remained very illiquid; Ireland, from a relatively small market, developed, toward the late 1990s, a market for commercial paper which remains unparalleled in relative size in any of the other countries (possibly with the exception of the Swedish CP market).

We therefore conclude that the development over time may best be characterised as a continuous interplay between policy decisions and market outcomes. The development process is thus highly *path dependent*, and largely reflects political *ad-hoc* decisions, which are often, in themselves, responses to market developments. There may also be considerable potential spill-over effects from other policy areas, such as taxation and competition policy, to the extent that such policies may indirectly act restrictively, even in the absence of explicit financial-market regulations and controls, or impose certain – possible unforeseen – incentives upon market participants.

Such country-specific, path-dependent interactions may also apply to the influence that central banks have had on the development of money market in the respective countries. Financial-market innovation in general, and the emergence of increasingly sophisticated

money-market instruments in particular, should, all else equal, weaken monetary policy transmission by the continuous supply of substitutes to central-bank money. In other words, our findings of a development towards more sophisticated and efficient domestic money markets should on balance weaken the effects of monetary policy. However, if there is anything to the story of an interplay between market formation and the operative framework of monetary policy—the simple mechanics that as markets change, central-bank operations change, and *vice versa*—, then the timing and sequencing of financial deregulation/the abolition of direct controls, as well as more subtle aspects of central bank policy may bring home some important lessons.

We found five main reasons, or sets of reasons, why monetary-policy operating procedures changed during the period of study. First, monetary-policy instruments were adapted to changes in the targets or goals of monetary policy (for example, from an exchange-rate target to an inflation target). Second, central banks adapted their operative frameworks to structural changes outside their control (for example, the reliance on the part of central banks on certain types of regulations became outdated as innovation in the money market increased opportunities for market agents to circumvent such controls). Third, the development of money markets domestically as well as a stronger international integration of these markets increased the central banks' need for instruments that allowed them to manage liquidity supply more flexibly, and with a greater degree of accuracy. Fourth, the growing importance of expectations in a deregulated financial system increased the need for instruments which could be used to signal the central bank's policy stance. The fifth set of reasons was a general wish to stimulate money-market activity in order to improve monetary-policy transmission, and to clarify the separation of monetary policy from other types of public policy (such as government financing).

These five broad categories, which account for the often substantial revisions of central-bank policy strategies in the focus countries over the period studied, are clearly not independent of each other, and often overlapping, but they do indicate that central banks had an influence on money-market development that was not insignificant (in some cases it appears to have been decisive). However, the relationship goes the other way too. There seems to be some connection between comparatively radical changes in domestic money-market development (in terms of innovation, market growth and regulatory changes) and greater changes in monetary-policy instruments. In addition, we also found tentative evidence in favour of the hypothesis of a correlation between market development and the intensity of open market operations.

Although the structure of money markets in the countries studied remained highly varied during the study period and the interplay between policies and market outcomes may have carved out different paths of development for the countries, in terms of the instruments which came to be increasingly favoured by central banks during the period, however, there are more signs of convergence from the mid-1990s onward: in the EMU countries as a matter of course (since they have, both *de jure* and *de facto*, adopted a unified operational framework), but also in the non-EMU countries, as well as many other industrialised countries. A salient feature of this particular development is that in recent years, repurchase agreements and variations on collateralised lending/borrowing have become the dominant instrument used by central banks to implement monetary policy. A general explanation for this is that this type of instrument answers well to many of the needs of central banking – for example flexibility and the possibility to effectively signal the policy stance to financial markets. By and by, central banks have also typically broadened their collateral base (that is, the list of securities types that they will accept in a buy/sell-back operation), which diminishes the need for a large short-term securities markets for repo transactions, thus making this type

of operation feasible even in countries where the short-term securities segment is ill-developed.

If there are substantial similarities in the adoption and abandonment, respectively, of monetary-policy instruments, there seems to be larger differences in the sources and effects of fluctuations in money-market liquidity across the different countries. We studied changes in the sources and effects of fluctuations in money-market liquidity over the 1980s and 1990s in our focus countries by analyzing the respective central banks' balance sheets. A general conclusion is that the greatest influence on liquidity fluctuations is factors outside the central banks' control, and that the main effect of monetary policy is to offset these factors (which central banks typically do imperfectly). The overall, as well as the relative, importance of the autonomous factors (primarily the influence of capital flows through net foreign assets and net lending to the government), however, vary considerably between the countries and periods although the net-foreign-assets component is the most important source in almost all our case countries. Based on our results, we argued that these differences could be explained by simple institutional factors, such as the exchange-rate regime. Instead, our data indicate a credibility issue.

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Table 1

Financial repression in 1980

	Interest-rate restrictions	*Specific credit controls*[a]	*Overall credit growth limit*	*Investment obligations*	*Issuing restrictions*	*Branching restrictions*
Austria	•	•	•	•	•	•
Belgium	•	•	–[b]	•	•	•
Finland	•	•[c]	–	–	•	•
Greece	•	•	•	•	•	•
Ireland	•	•	•	n.a.	n.a.	n.a.
Netherlands	–	•	•	–	•	•[d]
Portugal	•	•	•	•	•	•
Denmark	•	•[e]	•[c]	–	•	–
Sweden	•	•	–	•	•	•
Norway	•	•	•	•	•	•
Switzerland	•	–	–	–	•	•

n.a.: Information not available.

Notes: [a] Quotas or ceilings imposed on individual banks or groups of banks/financial institutions, and similar detailed credit controls. [b] Abolished in 1978. [c] Formally guidelines. [d] No real restrictions, but a separation in a legal sense of different types of credit institution was made, and the rules on prudential supervision varied accordingly. [e] Abolished in 1980.

Sources: Edey and Hviding (1995); OECD *Financial Market Trends* (various); Oxelheim (1990, 1996); Vihriälä (1997); Wyplosz (2001); various national sources.

Table 2

Summary of the financial deregulation process

	Deregulation initiated in… (item/s/ first liberalised):	*Financial sector lastly liberalised by… (item/s/ last deregulated):*
Austria	1979 (some interest rates liberalised)	1990s (authorisation requirement for securities issues lifted)
Belgium	1978 (credit ceiling abolished)	1992 (decompartmentalisation / decartellisation of banks)
Finland	1983 (some interest rates liberalised)	1991 (authorisation requirement for securities issues lifted, etc.)
Greece	1987 (some interest rates liberalised)	Mid-1990s (deregulation of banking)
Ireland	1984 (some interest rates liberalised; credit guidelines lifted)	Late 1980s [a]
Netherlands	1981 (credit controls lifted)[b]	C. 1990 (minimum-maturity requirement for securities abolished)
Portugal	1984 (some interest rates liberalised; market-entry rules eased)	1994 (securities markets fully opened for private issuers)
Denmark	1980 (bank lending ceilings lifted)[c]	1989 (issuing controls on securities completely abolished)
Sweden	1978 (some interest rates liberalised)	1985 (ceilings on bank lending lifted)
Norway	C. 1980 (some interest rates deregulated)	1990 (all quantitative controls and most issuing controls abolished by this time)
Switzerland	Early 1980s (interest rates on bonds liberalised)[d]	C. 1990 (issuing restrictions abolished; permanent securities-issuance syndicates dissolved)

Notes: [a] Minor interest-rate 'rigidities' (in the shape of informal agreements) remained until the mid-1990s. [b] Less regulated overall at the start of the 1980s than most other markets here included; interest rates were essentially free already in the 1970s. [c] Less regulated overall at the start of the 1980s than most other markets here included: a decompartmentalisation of banking was carried out already in 1975; some interest rates were free during the 1970s (but partly reregulated in 1979), etc. [d] Most other interest rates already free.
Sources: See Table 1.

Table 3

Money-market innovations, domestic market (year of introduction or year of deregulation of various money market segments)

	Interbank deposit market/ '-IBOR' reference rate	*Treasury bills or treasury notes*	*CDs/ central-bank CDs*	*Commercial paper*	*Single-currency interest-rate futures*	*Single-currency interest-rate swaps and/or options*	*Foreign-exchange or currency swaps*[a]	*Repo market/ repos adopted by central bank*
Austria	n.a. /1989	1987[b]	. . /1995	. .	1993	1994	C. 1990	. . /1995[c]
Belgium	1988/1988	1990[d]	1992/ . .	1990	1988	1991	1980s	n.a./n.a.[e]
Finland	1986/1987	1991	1982/1987	1986	1992	1988	1980s	. . /1991
Greece	n.a./1994	1985	. . / . .	. .	[g]	[g]	[g]	C. 1995/1997
Ireland	1978/ 1993	1960s[h]	n.a./ . .	1989	1989	1989	C. 1990	1997/1997
Netherlands	n.a./1986	1970s	1986/1994	1986	1987	1994[i]	1976	n.a./n.a.
Portugal	1989[l]/1992	1985[m]	1993/1994	1994	1996	1993	1987	n.a./c. 1992
Denmark	1970s[f]/1988	1975	. ./1992	. .	1988	1988	1970s	1993/1992
Sweden	1985/1987	1982	1980/1992	1983	1984	1985	n.a.	1980s/1984
Norway	1993/1993[j]	1985	1985/ . .	1985	1993	n.a.	1970s	1996/. . [k]
Switzerland	n.a./n.a.	1981	. ./. .	. .	1990	1994[i]	1970s[n]	1998/1998

. . Not applicable / a viable market in the instrument does not exist.

n.a.: Data not available.

Notes: [a] Refers to 'interbank swaps': central banks have been using swaplike instruments for considerably longer—the German Bundesbank, e.g., since 1958 (Hooyman, 1994). [b] Refers to the year from which government debt is issued by competitive bidding. [c] The OeNB started to make advances against securities in 1985, but began to make systematic use of repos only in 1995. [d] Refers to the year from which treasury certificates are issued by competitive bidding. [e] The BNB has been conducting advances against collateral for a long time. [f] The market remained inactive until the reform of the monetary-policy operating framework in 1992. [g] A limited derivatives market exists since 1994. [h] Exchequer bills. [i] Options. [j] Refers to the domestic reference rate NIDR; an 'international' reference rate (NIBOR) also exists. [k] Norges Bank conducted 'temporary bond purchases' between 1984 and 1986. [l] Refers to the year of liberalisation of the interbank market. [m] Treasury bills; so-called 'negotiable cash bonds' were introduced in 1983. [n] The SNB has been using swaps for monetary-policy-making purposes for a longer time.

Sources: Alworth and Borio (1993); BIS (1999); Batten *et al*. (1990); De Broeck *et al*. (1998); *Euromoney* country surveys (various); Holbik (1991); Khoury (1990); Kullberg (1991); Lahdenperä (1995); Norges Bank (1995); OECD *Financial Market Trends* (various); Oxelheim (1996); Pinto (1996); and sources to Table 4.

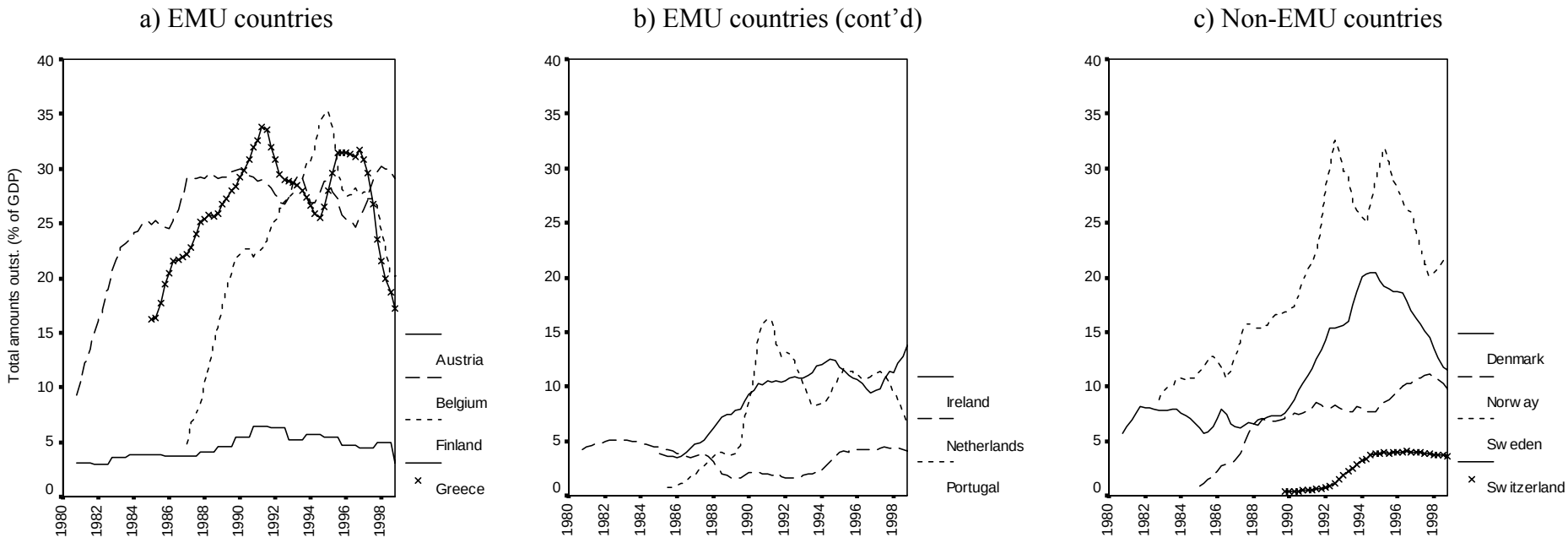

Fig. 1. *Total outstanding amounts of short-term securities* (% of GDP); one-year moving averages of quarterly, end-of-period data (except Austria: annual data).
Notes and sources, see Table 4.

Table 4

Short-term securities markets, outstanding amounts (% of GDP at year-end)

	1985					1992					1998				
	T-bills/ notes	*CDs*	*CB CDs*	*CP / other*	*Total*	*T-bills/ notes*	*CDs*	*CB CDs*	*CP / other*	*Total*	*T-bills/ notes*	*CDs*	*CB CDs*	*CP / other*	*Total*
AT	3.7				*3.7*	5.2				*5.2*	3.2				*3.2*
BE	24.0				*24.0*	24.0	1.8		3.1	*28.8*	16.9	5.9		4.0	*26.8*
FI[a]					*0*	3.1	16.9	1.0	3.8	*24.8*	2.3	16.0	0.8	1.7	*20.7*
GR	24.3				*24.3*	29.8				*29.8*	15.0				*15.0*
IE	1.5	2.1[b]			*3.6*	0.4	4.5[b]		4.8	*9.7*	2.2	4.2[b]		9.5	*16.0*
NL[c]	4.0				*4.0*	0.0	1.3		0.7	*4.0*	2.1	0.8	0.0	0.5	*3.4*
PT[d]	0.8				*0.8*	8.4				*8.4*	2.1	0.2		2.3	*4.5*
DK	4.7	3.9			*8.6*	14.3		0.6		*14.9*	9.2		3.0		*12.3*
SE[e]	11.5	1.2			*12.7*	20.5	0.8		8.2	*29.4*	12.9	1.1		6.6	*20.7*
NO[f]	1.6	0.1		1.1	*2.8*	4.7	0.0		1.9	*6.6*	2.4	3.9		2.8	*9.1*
CH					*0*	2.0				*2.0*	3.7				*3.7*
Mean					*7.7*					*14.9*					*12.3*
(sd)					*(9.0)*					*(11.1)*					*(8.2)*

Notes: [a] 'CP/other' includes industrial paper and local authority paper. [b] Saving certificates. [c] Incomplete data on CDs before 1990; CP: annual data until 1990. [d] T-bills: amounts for 1985 include only t-bills held by banks and other monetary institutions; CDs: includes only certificates held by non-financial corporations. [e] 'CP/other' includes certificates issued by mortgage credit institutions, industrial paper, finance-company promissory notes, and local-government paper. [f] 'CP/other' includes notes of mortgage credit institutions and financial institutions, and other short-term paper.

Sources: Austrian Federal Ministry of Finance (BMF) and Austrian Federal Financing Agency (BFA); Ministère des Finances Belge, Administration de la Trésorerie; Danmarks Nationalbank; Suomen Pankki; Bank of Greece; Central Bank of Ireland; De Nederlandsche Bank; Norges Bank; Banco de Portugal; Sveriges Riksbank; Banque Nationale Suisse; BIS, *Quarterly Review: International Banking and Financial Market Developments* (various); GDP figures from IMF *International Financial Statistics*.

Table 5

Some major changes in central-bank operating procedures between repression and EMU[a]

Country	*Year*	*Change of monetary policy (instruments) / main components of change*
AT[b]	1995	Reform of liquidity-management arrangements: introduction of repurchase transactions for liquidity provision and of central-bank CDs for liquidity absorption; reduction of reserve ratios.
BE[b]	Mid-1970s	Abolition of reserve requirements.
	1985	Introduction of a more flexible discount-setting system, and revision of the central bank's credit and deposit facilities (resulting ultimately in the emergence of an efficient day-to-day interbank market).
	1991	Tender procedures introduced for the issuance of government paper, leading to more market-oriented procedures for monetary policy, including the gradual adoption of repurchase transactions as the main liquidity-management instrument.
FI[b]	1983	Quotas for central-bank credit abolished; banks asked to manage liquidity through call-money market.
	1987	Open-market operations in CDs initiated.
	1991	Repurchase transactions introduced by the central bank.
	1992–95	Several adjustments in the technical design of the central bank's credit and deposit facilities, as well as that of the minimum-reserve system.
GR[b]	C. 1990	The central bank switches its operational regime from direct regulation to indirect instruments.
	1997	Repurchase transactions initiated by the central bank.
IE[b]	Mid-1980s	The exchequer-account overdraft facility is abolished; collateralised operations introduced.
	Mid-1990s	The central bank stops discounting exchequer bills, and adopts repurchase transactions as its keynote operation; minimum reserve ratios substantially reduced.
NL[b]	1994	Reform of liquidity-policy framework; central-bank CDs introduced.
	1998	Reform of liquidity-policy framework.
PT[b]	1985	The central bank starts to issue treasury bills on behalf of the government.
	1986	The central bank is formally authorised to issue short-term securities and to pay interest on the government's and the credit institutions' deposits.
	1992	Repurchase transactions initiated by the central bank.
	1994	Revision of liquidity-policy framework: central-bank CDs introduced; the central bank's credit facilities still relatively complex, with some facilities subject to quotas, some available at penalty rates.
DK	1992	Comprehensive reform of monetary-policy instruments: revision of the central bank's credit and deposit facilities (so as to stimulate money-market activity); introduction of central-bank CDs for liquidity absorption and of repurchase transactions for liquidity provision; no reserve requirements.
	1999	Extension of collateral basis for the central bank's repos and some other minor changes of technical nature.
SE	1985	Reform of the central-bank's credit and deposit facilities: the fixed-quota-and-penalty-rate system was abolished, and an 'interest-rate ladder' was introduced.
	1988	Changes in operating procedures: liquidity may be supplied to banks by lending on market terms.
	1990	Reserve requirements lifted (formally set to zero).
	1993–97	The central bank issues its own CDs to soak up liquidity.
	1994	New interest-rate-management system introduced (motivated largely on the new monetary-policy regime—the inflation target), based on *Bundesbank*-type repos, with the fixed repo rate serving as target for the overnight interbank rate.
NO	1984–1987	The central bank conducts 'temporary bond purchases'—effectively a form of repurchase transactions.
	1985	The certificates market was launched, expressly for the purpose of involving the public more directly in the money market, increase the control of the central bank over the supply of liquidity and enhance the efficiency of monetary-policy transmission.
	1987	Reserve requirements abolished.
	Mid-1990s	Simplification of the central bank's credit and deposit facilities; (re)introduction of repurchase transactions for liquidity provision.
CH	1998	Repurchase transactions initiated by the central bank.
	2000	Reform of monetary-policy framework: interest-rate targeting strategy replaces the traditional monetary-targeting strategy; repurchase transactions become the central bank's keynote operation.

Notes: [a] All EMU countries' central banks together with the ECB make up the ESCB (European System of Central Banks) and share a common policy framework since 1999 (Greece since 2001); the main refinancing operations of the ESCB are executed by the national central banks.

Selected sources: BIS (1997b); Banque Nationale Suisse, Bulletin Trimestriel 4 (1999); Borio (1997); Danmarks Nationalbank (1992, 1999); Hasko (1996); Hasko and Kuisma (1995); Hörngren (1994); Kasman (1992); Kneeshaw and van den Bergh (1989); Kuosmanen (1996); Mehlbye and Topp (1996); Norges Bank (1995); Oxelheim (1996); Pinto (1996); Sveriges Riksbank (1994).

Table 6

Reserve requirements

	1970s		*Late 1980s*[a]			*Late 1990s*[b]		
	RRIF	*Max.*	*RRIF*	*Max.*	*Diff.*	*RRIF*	*Max.*	*Diff.*
Austria	•	10.5[c]	•	9.0[d]	•	•	5.0	•
Belgium	•	6.2[e]	–	–	–	–	–	–
Finland	•	3.2[f]	•	7.8	–	•	2.0	•
Greece	•	n.a.	•	n.a.	n.a.	•	12.0	–
Ireland	•	13.0[f]	•	10.0[g]	–	•	3.0	–
Netherlands	•	7.0[h]	•	var.	•	•	var.	•
Portugal	•	15.0[e]	•	17.0[i]	–	•	2.0	–
Denmark	•[j]	3.0	–	–	–	–	–	–
Sweden	•	5.0[e]	•	4.0	–	–[k]	–	–
Norway	•	5.5[l]	–	–	–	–	–	–
Switzerland	•	n.a.	•	2.5	•	•	2.5	–
Memo:								
Eurosystem[m]	. .	. .	. .	. .	. .	•	2.0	–

RRIF: Reserve requirements in force

• Yes

– No

Max.: Maximum reserve ratio applied

Diff.: Different ratios for different types of liabilities/deposits (this information was unavailable for a majority of countries for the 1970s; therefore the column has been left out for that decade).

. . Not applicable

N.a. Not available

Notes: [a] 1988 unless otherwise indicated; [b] Individual country ratios of EMU countries refer to ratios applied before the launch of the Eurosystem; [c] 1972; [d] 1990; [e] 1974; [f] 1979; [g] 1986; [h] 1973; [i] 1989; [j] Temporarily in force 1975–76; [k] The required reserve ratio was set to zero in April 1994, and has not been used as a policy instrument since; [l] 1976; [m] since 1999.

Sources: Bank of Japan (1995); BIS (1997b); Borio (1997); Central-bank bulletins (various); ECB (1998); Holbik (1973); Kneeshaw and Van den Bergh (1989); OECD Financial Market Trends (various); Pinto (1996).

Table 7

Targets and main open-market operations before the launch of EMU

Country	*Orientation / main target*	*Main operating variable*	*Key instrument*	*Collateral for repurchase transactions*	*Other open-market operations*
Austria	Exchange rate	Overnight rate	Repurchase agreements	Government and private securities	Foreign-exchange swaps
Belgium	Exchange rate	1–3-month rate	Repurchase agreements	Trade bills; government securities	Interbank operations; foreign-exchange swaps; etc.
Finland	Inflation (formally) / exchange rate	1–3-month rate	Repurchase agreements	T-bills; government bonds; central-bank and bank CDs; AMCA notes[a]	Outright money-market operations; sales of central-bank CDs; foreign-exchange operations
Greece	Inflation / exchange rate	M3/M4N growth rate and total credit expansion are 'tentative' targets	Deposit tender operations	Government securities	Reverse repos; foreign-exchange swaps
Ireland	Inflation / exchange rate	1-month rate	Repurchase agreements	Government securities	Foreign-exchange swaps
Netherlands	Exchange rate	1-month rate	'Special loans' (repo-equiv.)	Government and private securities	Sales of short-term paper; foreign-exchange swaps; etc.
Portugal	Inflation / exchange rate	Overnight rate	Repurchase agreements	Government securities[b]	Central-bank CDs; TIM[c]
Denmark	Exchange rate	1–14-day rate	Secured loans (repo-equiv.); central-bank CDs	Government securities; mortgage bonds	Foreign-exchange operations
Sweden	Inflation	Overnight rate	Repos/reverse repos	Government and mortgage securities	Interbank operations
Norway	Exchange rate	1-week rate	Deposits and loans	T-bills and government bonds	Foreign-exchange operations; repos; T-bill issues
Switzerland	Reserves ('M0')	Giro deposits	Foreign-exchange swaps	Treasury bills	Repurchase agreements; transfer of government deposits

Notes: [a] Notes issued by the Asset Management Company Arsenal. [b] Private securities introduced in May, 1998, as a step in preparation for stage 3 of EMU. [c] Títulos de Invervenção Monetária (Monetary Intervention Bills). *Sources*: Banco de Portugal, *Economic Bulletin* 1 and 2 1998, and *Annual Report* 1998; *Bank of Finland Bulletin* 9/1998; Bank of Greece, *Monetary Policy Interim Report* November 1998 and March 1999, and *Annual Report* 1998; Borio (1997); Central Bank of Ireland, *Annual Report* 1998; Danmarks Nationalbank, *Monetary Review* 2, 1999; Norges Bank, *Penger & Kreditt* 1998/4, and *Annual Reports* 1997 and 1998.

Table 8

Principal sources of liquidity

	Autonomous sources of liquidity			*Policy position*			*Net liquidity*		
	P1	*P2*	*P3*	*P1*	*P2*	*P3*	*P1*	*P2*	*P3*
AT	n.a.	.32	.56	n.a.	-.30	-.30	n.a.	.02	.26
		3.67	**2.44**		**2.45**	**3.21**		**4.87**	**3.28**
BE	.39	-.69	.19	-.36	.51	-.17	.03	-.17	.01
	2.90	**2.26**	**2.24**	**2.83**	**2.45**	**2.25**	**.29**	**.70**	**.16**
FI	-.35	-.14	-.50	.12	.74	-.08	-.24	.59	-.59
	4.96	**3.51**	**6.54**	**9.99**	**3.36**	**10.25**	**9.05**	**1.72**	**12.28**
GR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
IE	2.83	.63	1.57	-1.90	.01	.23	.93	.63	1.80
	5.81	**15.25**	**10.53**	**6.21**	**13.05**	**6.67**	**3.78**	**4.79**	**7.75**
NL	-.57	-.31	-.25	.56	.40	.18	-.01	.10	-.07
	5.22	**8.99**	**1.21**	**5.20**	**8.19**	**1.61**	**.10**	**3.72**	**1.18**
PT	2.31	2.08	-.82	-.47	1.44	1.09	1.85	3.52	.27
	5.90	**6.78**	**15.51**	**5.75**	**13.83**	**17.68**	**4.07**	**12.07**	**5.39**
DK	.88	-.83	-8.62	-.97	1.92	6.77	-.10	1.09	-1.85
	24.77	**20.48**	**32.04**	**23.41**	**12.55**	**44.71**	**3.40**	**15.41**	**23.39**
SE	-1.54	-.70	.04	.35	1.26	-.10	-1.19	.56	-.05
	21.18	**8.57**	**5.30**	**17.47**	**8.13**	**5.24**	**9.67**	**2.96**	**1.89**
NO[b]	n.a.	3.49	-2.77	n.a.	-3.11	1.76	n.a.	.39	-1.01
		40.40	**19.22**		**38.40**	**11.90**		**7.66**	**14.64**
CH	n.a.	n.a.	.54	n.a.	n.a.	-.91	n.a.	n.a.	-.36
			7.38			**11.41**			**6.43**

The table shows average weekly (monthly)[a] changes/positions as % of the average level of base money, and variability of positions (standard deviations) in boldface.

Positive positions ⇒ liquidity injection; negative positions ⇒ liquidity absorption.

Definitions:

In the central bank's balance sheet, the column headings in the table comprise of the following summary items:

- Autonomous sources of liquidity (or autonomous position) = changes in net foreign assets + changes in net lending to the government + changes in other net assets – changes in outstanding currency (i.e., notes and coin);
- Policy position = changes in the central bank's net lending to the banking system;
- Net liquidity = changes in the amount of liquidity in the banking system (= autonomous position + policy position).

'Net lending to banks' comprises the net of claims on and liabilities to banks over which the central bank exerts control (except liabilities due to reserve requirements); the amount of liquidity in the banking system can be understood as any remaining liabilities to the banks (i.e., the banks' reserve holdings with the central bank, including deposits due to reserve requirements).

n.a.: data not available.

Notes:

[a] Weekly data were available for the following countries and periods: Austria P2 and P3; Belgium P1, P2, and P3; Finland P1, P2, and P3; Netherlands P1, P2, and P3; Sweden P3; and Switzerland P3.

The periods used are the following:

Austria P2: Oct. 31, 1989–Jan. 31, 1990; P3: Jan. 7, 1998–May 31, 1998.

Belgium P1: Jan. 7, 1980–June 30, 1980; P2: Jan. 2, 1989–June 26, 1989; P3: Jan. 5, 1998–May 29, 1998.

Finland P1: Jan. 8, 1980–May 30, 1980; P2: Jan. 6, 1989–May 31, 1989; P3: Dec. 31, 1997–May 29, 1998.

Ireland P1: 1979:12–1981:02; P2: 1988:12–1990:06; P3: 1997:12–1998:12.

Netherlands P1: Jan. 5, 1981–May 25, 1981; P2: Oct. 2, 1989–Feb. 26, 1990; P3: week 1, 1998–week 25, 1998.

Portugal P1: 1980:01–1981:12; P2: 1988:01–1989:12; P3: 1996:07–1998:06.

Denmark P1: 1979:01–1980:12; P2: 1988:01–1989:12; P3: 1997:12–1998:11.

Sweden P1: 1980:01–1981:10; P2: 1987:01–1988:10; P3:Dec. 31, 1998–May 31, 1999.

Norway P2: 1991:12–1992:12; P3: 1997:12–1998:12.

Switzerland P3: Sept. 30, 1999–Apr. 10, 1999.

[b] Balance sheets on a monthly or shorter frequency are only consistently available since 1992.

Sources: The figures are calculated on the basis of data from the respective central banks' balance sheets, mostly taken from annual and/or interim reports; in some cases obtained as spreadsheet documents directly from the central bank.

Table 9

Autonomous sources of liquidity—contribution of different components

	Net foreign assets			*Net lending to government*			*Other net assets*			*Currency*		
	P1	*P2*	*P3*	*P1*	*P2*	*P3*	*P1*	*P2*	*P3*	*P1*	*P2*	*P3*
AT	n.a.	3.28	2.71	n.a.	.08	.19	n.a.	.36	2.07	n.a.	2.19	1.29
BE	1.90	2.82	.33	2.87	2.70	.07	1.09	2.83	.42	1.41	.84	2.28
FI	3.92	3.51	6.45	1.43	.72	.01	1.30	.96	1.00	1.63	.35	1.16
GR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
IE	7.00	10.45	10.77	6.30	12.05	8.38	2.89	1.27	5.05	2.48	3.21	3.11
NL	3.12	.83	.63	3.91	8.97	.05	3.65	.57	.80	.88	.89	.80
PT	5.00	6.11	7.64	6.75	5.88	12.28	3.21	3.34	3.57	2.38	1.69	2.69
DK	14.26	19.28	28.89	20.59	17.77	26.89	9.54	6.88	3.30	2.89	2.77	1.86
SE	3.93	5.12	4.64	20.75	13.57	.85	2.74	6.21	1.16	2.82	3.11	1.76
NO	n.a.	30.89	13.09	n.a.	19.43	16.59	n.a.	4.28	6.44	n.a.	4.13	2.52
CH	n.a.	n.a.	4.38	n.a.	n.a.	6.31	n.a.	n.a.	.95	n.a.	n.a.	3.48

The table shows the variability (standard deviations) of average weekly (monthly) changes as % of the average level of base money. Definitions, notes and sources, see Table 8.

Table 10

Policy position—contribution of different components[a]

	Standing facilities			*Market operations*		
	P1	*P2*	*P3*	*P1*	*P2*	*P3*
AT[b]	n.a.	.64	.18	n.a.	2.79	3.21
BE	2.83	2.45	1.09	.00	.00	2.56
FI	10.13	2.96	.02	3.78	3.09	10.25
GR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
IE	6.21	8.53	1.42	.00	11.77	6.40
NL	5.90	3.00	1.47	2.43	6.88	.75
PT[c]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
DK	23.41	12.55	.00	.01	.00	44.71
SE[d]	17.47	5.98	5.58	.00	8.59	7.61
NO[c]	n.a.	30.52	n.a.	n.a.	19.79	n.a.
CH	n.a.	n.a.	.33	n.a.	n.a.	11.39

The table shows the variability (standard deviations) of average weekly (monthly) changes as % of the average level of base money. Definitions and sources, see Table 8.

Notes: [a] The precision of the designation of the various instruments used by the central banks to inject/withdraw liquidity into the categories of 'standing facilities' and 'market operations', respectively, is constrained by the limits of the information contained in the regularly published balance sheets of the respective central banks; no in-depth analysis of the de-facto nature of the various instruments used has been possible.

[b] The 'Market operations' component includes certain types of foreign-exchange operations; operations in the domestic market were negligible until 1995.

[c] Lack of data due to the fact that the Central Bank's balance sheet does not discriminate among different policy instruments (NO, P3), or makes only a functional categorisation (liquidity-absorbing/-injecting assets/liabilities: PT, P1–P3).

[d] The series for Period 2 are not completely consistent due to changes in operating procedures in August, 1988; figures are estimates.

Table 11

Results of regression of the intensity of market operations[a] *on relative market size* (p-values in parentheses)

	Least squares estimation		*Wilcoxon non-parametric estimation*	
	I	II	I	II
Intercept	5.644	-0.361	4.334**	0.276
	(0.102)	(0.930)	(0.032)	(0.912)
Market size	0.094	1.725**	0.038	1.046**
	(0.707)	(0.040)	(0.789)	(0.040)
(Market size)^2		-0.058**		-0.033*
		(0.041)		(0.054)
Adjusted R^2	-0.042	0.123		
Wilcoxon robust R^2			0.004	0.208
F-statistic	0.146	2.470	0.080	2.489
	(0.707)	(0.111)	(0.781)	(0.110)
No. of obs.	22	22	22	22

Note: [a] As measured by the variability in the policy position due to discretionary operations, see Table 10.

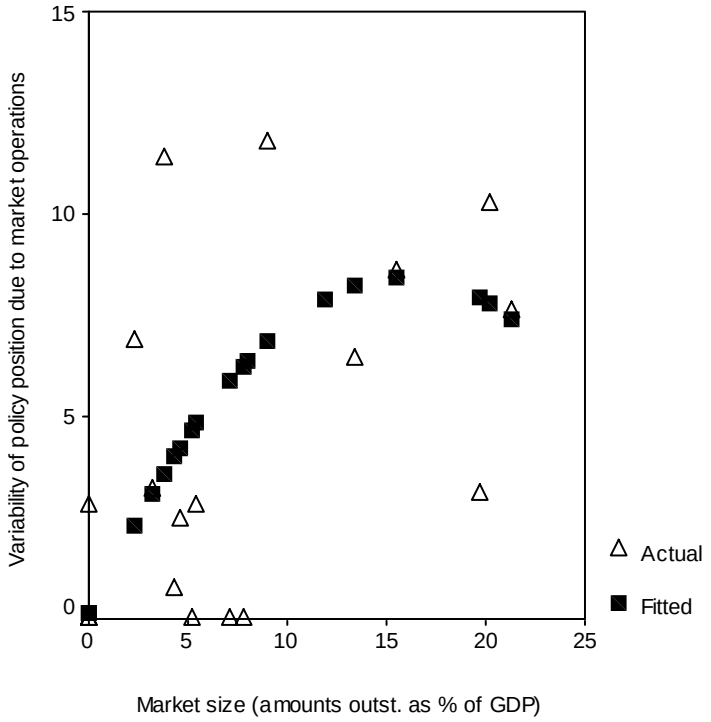

Fig. 2. *Estimated relationship between the intensity of open market operations and the relative size of short-term securities markets* (Wilcoxon non-parametric estimates as in Table 11).