ธนาคารแห่งประเทศไทย

Bank of Thailand

เป้าหมายการดำเนินงานในตลาดการเงินและประสิทธิภาพของนโยบาย

Open Market Operation & Effectiveness of Monetary Policy

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กรกฎาคม 2544

บทคัดย่อ

ข้อคิดเห็นที่ปรากฏในบทความนี้เป็นความเห็นส่วนตัวของผู้เขียนโดยเฉพาะ
ซึ่งไม่จำเป็นต้องสอดคล้องกับนโยบายของธนาคารแห่งประเทศไทย

บทความนี้มีเป้าหมายที่จะศึกษากลไกส่งถ่ายผลกระทบของนโยบายการเงิน (Transmission Mechanism) โดยดูจากประสบการณ์ของประเทศพัฒนาแล้ว 8 ประเทศได้แก่ ออสเตรเลีย แคนาดา นิวซีแลนด์ อังกฤษ ฝรั่งเศส เยอรมนี ญี่ปุ่น และสหรัฐอเมริกา

จากประสบการณ์ส่วนใหญ่ ประเทศเหล่านี้ ได้หันมาให้ความสำคัญกับอัตราดอกเบี้ย ระยะสั้นเป็นเป้าหมาย Operating Target มากขึ้นโดยการใช้ Interest Rate Corridor และ Active Liquidity Management เพื่อช่วยให้ภาคเอกชนสามารถอ่านสัญญาณทางการเงินได้ชัดเจน เห็นแนวโน้ม ของทิศทางอัตราดอกเบี้ยมากขึ้น สามารถปรับอัตราดอกเบี้ยระยะยาวตามได้อย่างเหมาะสม

กลไกเหล่านี้ อาจนำมาพิจารณา ประยุกต์ใช้กับไทยได้พอสมควร โดยเฉพาะเมื่อกลไก ในการบริหารเศรษฐกิจแบบเดิมๆ ถูกยกเลิกไป แต่ทั้งนี้ คงจะต้องมีการปรับแนวทางในการปฏิบัติ (Intervention Mechanism) ทั้งในด้านโครงสร้างตลาด และความยืดหยุ่นของวงเงินที่ใช้ในการแทรกแซง มากขึ้น

CONTENT

1. Introduction

After approximately two years of the implementation of monetary policy framework which utilize interest rate signals rather than the monetary aggregates of the past, a number of questions arise as to how the microeconomic and financial operations of the Bank of Thailand fit into this broader framework, and whether there is a need for adjustments and if so how etc?

At the macro level, over the past two years, this framework has provided a reasonable anchor for financial stability in the context of a post-crisis, "resurrecting" economy in an occasionally wobbly regional environment.

At the money market level, however, the Bank's interaction can probably be best described as yet passive and somewhat constrained by the urgency of the financial crisis management (FIDF's borrowings as an example) than normal monetary operations.

Although rather early to say when, this situation will definitely not last forever. Further, at the first sign of economic recovery, whenever that may be, the monetary authorities would need to stand ready to cope with the return of presumably international capital flows and the accompanying financial volatility, within a new and untested financial environment.

Partly to prepare for such a scenario as well as in an effort to try to improve our own understanding of the macroeconomic and financial markets interaction, an attempt is made in this paper to explore and compare a number of key developments in more advanced economies[1] with Thailand. The choices of these countries are rather arbitrary and partly restricted by availability of documented information although Australia, New Zealand and the UK were specifically chosen due to their experiences with rapid capital inflows and outflows and financial crises in the past similar to Thailand.

With this broad objective in mind, the term "open market operations" is adopted as conventionally defined at the theoretical level as the central bank's act of buying and selling bonds in exchange for money[2]. However, in practice the term encompasses all central bank's mechanisms

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[1] These include Australia, Canada, France, Germany, Japan, New Zealand, the United Kingdom, and the United States.

[2] e.g. Dornbusch and Fischer (1994), p. 124.

for adjusting liquidity in the market, including central bank lending, reversed transactions against domestic currency assets, reversed transactions against foreign currency assets, outright transactions in the secondary market, issue of short-term paper, operations in the interbank market, and transfer of government deposits[3]. These can be executed at the central bank's discretion or more passively in the form of standing facilities; and either regularly or as an occasional "fine-tuning" instrument. Further, the term "open market" may also be used sometimes even when central bank restricts the range of its counterparties and/or transact outside the established private market.

In the context of overall monetary management, moreover, discussions may inevitably be linked to other "non-market" aspects such as reserve requirements as well as other institutional arrangements to properly address this extremely complex issue.

To provide a balanced exposition of the topic, in terms of theory, international experiences and empirical evidences, the present study starts off with (i) a simple model of central banking, followed by (ii) a brief history of developments in monetary policy implementation, both in terms of market structural changes and central banks' reactions to them, closing with brief description of the current status which indicates some kinds of compromise along with an indicator developed to measure the "stance" of monetary policy. Then, (iii) the literature of monetary transmission mechanisms is briefly reviewed to explain the micro-macro links of monetary operations, leading up to the question of (iv) whether Thailand's open market operation mechanisms have been effective. Finally, utilizing both the international experiences as well as a recent report by an IMF mission, an attempt is made to draw some practical solutions on ways to develop and prepare the system for the future.

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[3] From the BIS's central bank instrument taxonomy in Borio (1997), p.23.

2. A Basic Model of Central Banking
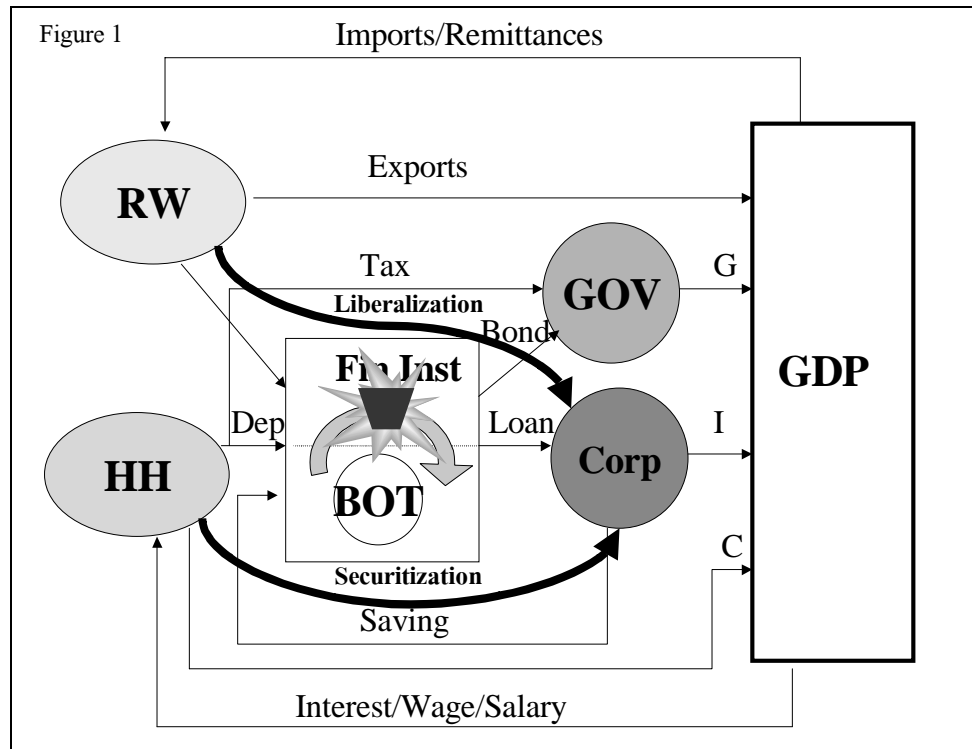
Figure 1

Figure 1. A simple model relating central bank to the rest of the economy.

From Figure 1, an economy is divided into five sectors, namely, households (HH), the government (GOV), corporate sector (Corp), the financial sector (Fin Inst) with the central bank (BOT) at the center, and the rest of the world (RW).

Within this model, the financial system mobilizes funds from households and the rest of the world in the forms of deposits and capital inflows. These funds are then circulated among the financial institutions, the number of rounds per year of which depends on the money multiplier and thus the reserve requirement ratio[4], generating a multiple amount of lending (in the forms of loan and government bond holdings).

The government and the corporate sectors then use these credits to finance their expenditures (G and I), contributing to a significant proportion of the GDP. This GDP by definition of national income, in turn, is remitted to the household sector in return for its supply of capital and labor (Interest/Wages/Salary) a part of which is spent to constitute the consumption expenditure proportion of GDP and the rest saved through the

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[4] In Canada until recently and the US, for example, reserve requirements have been imposed primarily on transaction deposits as a means to target M1 (Kasman 1992, p.18).

financial system. At the same time, this GDP also represents output of the economy a part of which is sold to the rest of the world to generate export revenue. In the opposite direction, what is demanded locally but cannot be produced would then have to be imported from the rest of the world.

Within this relatively simple framework, the central bank (BOT) may be perceived as a piston driving financial liquidity to lubricate the economic activities continuously. Whenever, the economy slows down, the central bank can either pump in more liquidity or, in theory, lower reserve requirement[5] ratios allowing money to circulate more quickly to stimulate activities. Vice versa, when the economy overheats, liquidity has to be withdrawn and/or reserve requirements rose to slow things down.

Based on this conventional money multiplier approach, the roles of a central bank and their impacts on the economy are viewed as somewhat mechanic and probably fairy straightforward. It has served the advanced economies in the sample reasonably well for at least two decades after the second World War. Since then, a number of structural shifts took place that undermined this rather tidy and simple world of central banking. Some of these key developments are captured briefly in the next section.

3. Monetary Policy in Action: A Starting Point

Up to the late 1970s, the conducts of monetary policy within the majority of the sample countries under study, were still characterized by a heavy reliance on administrative controls[6]. Japan and several European central banks, for example, relied substantially on a system of administered interest rates to implement policy. For short-term liquidity management, commercial banks relied heavily on central bank credit facilities, which extended short-term loans at stringently controlled money market rates -- official rates. These rates then served as some kinds of anchors for deposit and lending rates which were themselves subject to regulations while the supply of liquidity through these facilities determine credit availability directly.

On the demand side, many central banks also actively managed liquidity by altering reserve requirements along with other controls mechanisms. In addition to this function, however, reserve requirements also serve four separate but interrelated functions namely, (i) the buffer function as a means to stabilize short term interest rates, (ii) liquidity

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[5] A number of countries have in fact adopted this approach in the past e.g. the US (in 1930s; 1980 and 1990) and Spain.

[6] Borio(1997) opcit.

management function to ensure steady demand for settlement balances by commercial banks, (iii) monetary control function as a means to control money supply, and (iv) income and tax function to levy implicit seigniorage tax from the financial system where the reserve requirements are unremunerated or remunerated at a sub-market rate.

3.1 Key Developments

Since the 1970s, the financial sector among the OECD countries in general began to evolve[7], marked by deregulation and capital market development. Within in the G7 countries, the broad directions of change were highlighted by rapid financial deepening. In particular, the ratios of total financial assets to GDP rose from around four times GDP in 1970 to six times in 1994.

A. Securitization

While the overall degree of financial intermediation rose in most sample countries, the share of banks tended to decline. In term of instruments, the volume securities outstanding as a share of total financial claim has risen, particularly bonds and money market paper, while the share of deposits and loans declined. Institutionally, the share of financial intermediation undertaken by institutional investors has risen sharply, particularly in Anglo-Saxon (UK, Canada, US) countries with the trend towards employing professionals to manage high risk-high return portfolios.

In the United State[8], for example, during the 1980s commercial paper ballooned into a principal source of short-term unsecured credit for large corporations. In particular, high-yield corporate bonds below-investment-grade (or junk bonds), amounted to some 35 billion US dollar of new issue annually. Similarly, securities backed by home mortgages and other assets also expanded dramatically. At end-1987, commercial paper outstanding in the United States grew to exceed 400 billion US dollar, compared to 300 billion US dollar of commercial lending by major money-center banks at the same time. Although banks' balance sheets rebounded rapidly in the 1980s, they leveled off again in the 1990s.

In terms of revenue, in OECD capital markets, the regulations on fees and commissions were abolished, while narrower interest margins

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[7] Edey, Malcom ed. (1996), The Future of the Financial System, Reserve Bank of Australia.
[8] From Smith, R.C. (1989), The Global Bankers, Truman Talley Books, New York, p.355.

and rising bad debts reduced banks' main income streams. As a consequence, financial institutions turned more towards fee based income.

B. Liberalization/ Internationalization[9]

Also starting from the mid-1970s[10], many sample countries particularly those in the Pacific Basin region have undertaken steps to liberalize their domestic financial systems and remove restrictions on international capital flows. In fact, virtually all OECD countries have abolished exchange controls; along with interest-rate controls, as well as the direct controls on credit expansion. Further, the line separating banks and non-bank financial sectors was weakened along with of regulations restricting establishment of foreign institutions.

As a consequence, beginning in early 1980s, international capital flow began to accelerate, particularly from the US and Europe to Latin America and Asia. On the other hand, Japanese capital outflows, more in the forms of FDI, did not pick up until after the Plaza Accord in mid–1980s. By composition, cross-border portfolio investment increased sharply, taking over the previously dominating commercial banking flows, replacing them with securities financing.

Within the national borders, administrative controls came under pressure in the late 1970s largely due to the inability and delays by some central banks in adjusting their interest rates to counter a build up of inflation. This raised concerns about the inflexibility of interest rate determination. Meanwhile, the residual exchange controls in Europe were also eliminated with greater emphasis being placed on exchange rate stability. This, in turn, heightened the roles of interest rate in stabilizing exchange rates as well as in the monetary policy transmission mechanisms to domestic economic and financial conditions.

C. Technological and Financial Innovation

This trend towards liberalization was partly induced by rapid technological and financial innovations which were themselves encouraged by securitization and financial liberalization policies. On liberalization, for example, rapid advances in communication technology also helped break down both domestic and international financial market barriers opening up

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[9] Smith (1989), p. 10.
[10] Sheng, Hang-Sheng and Reuven Glick (1988), Monetary Policy Changes in Pacific Basin Countries, in Kluwer Academic Publishers.

channels for the flux of capital flows, permitted or encouraged by more liberal policies.

On securitization, the rapid growth of derivatives, noted in the 1980s and 1990s, allowed market participants to conclude real economic transactions without or with little changes in commercial banks' balance sheets, thus bypassing traditional monetary controls, and weakening the traditional monetary policy implementation framework significantly. Some of these examples in the context of the US markets were the development of certificates of deposits, Eurodollar borrowing, and repurchase agreements (Sellon and Weiner 1996, p.10).

These structural shifts in terms of both speed and the types of instruments, in turn, had significant impacts on the way in which monetary policy was implemented, in particular in shifting away from direct controls towards market oriented approaches.

D. Competitive Pressures & Financial Reforms

Partly in response to the heightened competitive pressures associated with internationalization and securitization, central banks in most of the sample countries have significantly reduced the reserve requirement ratios, from early 1980s[11] up to complete elimination in the 1990s in some countries e.g. Canada, New Zealand, and effectively non-binding in Australia and the UK (Table 1). This was aimed to reduce the implicit tax distorting competitive structures between different types of domestic financial institutions as well as to cope with cross-institutional and cross-border competition. As a consequence, the estimates of tax associated with these requirements declined to well below 0.05 percent of GDP (See Table 1).

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[11] This does not include the trend that may have started as far back as late 19th century with the development of clearing houses (Sellon and Weiner 1996, p.7).

Table 1

Reserve requirements: size and seigniorage income

	Range of ratios		Size		Seigniorage income	
	1990[3]	**1996[4]**	**1990[3]**	**1996[4]**	**1990[3]**	**1996[4]**
	in percentage points		as a percentage of GDP			
AUSTRALIA	1.0	1.0	0.69	0.79	0.04	0.04
CANADA	…	-	…	-	…	-
NEW ZEALAND	…	-	…	-	…	-
UK	0.45	0.35	0.31	0.24	0.04	0.01
FRANCE	0.5-5.5	0.5-1.0	0.90	0.26	0.09	0.01
GERMANY	4.15-12.1[5]	1.5-2.0	2.58	1.08	0.25[5]	0.04
JAPAN	0.125-2.5	0.05-1.3	1.13	0.68	0.09	0.00
US	3.0-12.0	3.0-10.0	0.55	0.22	0.04	0.01

[1] Vault cash excluded, if possible. [2] Three-month interest rates applied. [3] End of period.
[4] Mid-period. [5] 1991. Source: Borio (1997), p.49; and Sellon and Weiner (1996, p.8).

These developments were directly associated with a reduction in bank deposits at the central bank driven by both policy and market pressures. These deposits are the conventional means by which monetary policy is implemented as discussed in the model in section 2. The new structures thus bypassed and undermined the effectiveness of monetary policy accordingly. More specifically, demand for reserves under reserve requirements will tend to vary one-to-one with public demand for transaction deposit accounts, allowing central bank a direct influence on the economy. As reserve requirements declined and became variable, this relationship was weakened and became unreliable.

As a consequence the implementation procedure had to be modified in a number of ways. These are discussed in four broad categories in the next section. It should be noted that these groups are not meant to be comprehensive but aimed to highlight some possible approaches that less developed countries such as Thailand may follow.

3.2 Some Key Central Banks' Reactions

Partly making uses of these developments and partly in reaction to it, central banks in the sampling advanced economies have developed a number of instruments and tactics to improve implementation of their monetary policy. These tactics are obviously constrained by the choices of monetary instruments available to them, and the central banks in those countries need to adopt both the instruments and the approaches suitable for their specific circumstances. This explains in part the technical differences among the countries studied. The general approaches, nevertheless, may be broadly divided into four groups as follows. (Details of instruments and rules governing actual operations of these countries are summarized in Appendix A).

A. Contrived Scarcity of Liquidity

The first tactic involves a strategy of making liquidity "slightly short" such that banks and financial institutions as a whole will, out of necessity, continue to rely on central banks' supply of liquidity to settle and close their books. The country adopting this strategy is notably the UK through its "over-funding policy", tendering treasury bills up to 600 million pounds a week with unrestricted counterparties. In a similar vein, the Federal Reserves also maintain a certain degree of pressure on reserve (i.e. the proportional amount that the Fed will step in to borrow/lend as money market rates diverge from target specified in the directives of the FOMC). Other central banks, e.g. the Bundesbank and Bank of Japan used the reserve requirements to maintain pressure on financial institutions to hold reserves. In New Zealand, the Reserve Bank similarly sets the "settlement cash" target such that banking system is occasionally short (Sellon and Weiner 1997, p.15).

B. Almost Contemporaneous Reserve Requirements

Another tactic is to allow almost no lag between the reserve accounting and reserve maintenance periods. The major industrial country in the sample adopting this strategy is the US, where the legal reserve accounting and maintenance periods almost overlap (only 2 days between the end of reserve accounting and the end of the maintenance period of 14 days each). Under this requirement, when economic or financial activities, say, pick up (e.g. there is an increase in deposits, presumably matched by increases in lending or associated real economic activities), the financial institutions will almost immediately need to increase their "cash holdings" or their settlement balances, triggering them to 'run' to the central bank.

The central bank's supply of reserve policy would thus have a direct bearing on whether those real transactions are carried through, or at what costs effectively.

The problems with this approach, however, are that it makes the actual amount of reserves required to be held itself uncertain due to data collection lags, prompting the financial institutions to tend to over-provision for these reserve requirements. To alleviate the impacts of this problem, the Fed has, in turn, allowed excess reserves (and later shortfalls) to be carried over into the following maintenance period.

C. Legal Requirements

The third approach from the experiences of some sample countries, either in preparation for or in response to market developments described in the section 3.1, is to stipulate a legal requirement for financial institutions to settle their financial transactions on the books of the central banks. Notable examples of these countries in the sample are Australia and Canada[12].

Nevertheless, it may noted that this requirement may not always be binding in practice since it is already quite natural for financial institutions to tend to prefer to settle on central banks' books. This is because such settlements would also normally (i) entitle the financial institutions to automatically gain access to the ultimate source of the liquidity in the system i.e. the central bank itself, (ii) reduce the credit risk inherent in such a risk free settlement mechanism, and (iii) ensure execution at competitive rates since the central bank is a non-profit neutral counterparty and often a market arbiter as well. In principle, nevertheless, this legal requirement ensures relevance of monetary policy in the daily financial transactions which are, in turn, essential for effectiveness of open market operations.

D. Reserve Accumulation Pattern Management

The fourth approach was found in most central banks, particularly, in France, Germany and Japan where central banks used reserve requirements (with averaging period allowed) to project a guideline for 'normal' reserve accumulation behavior of financial institutions. Then, by gradually supplying the amount of reserves sufficient for these financial institutions to meet these guidelines, the central bank manages to stabilize

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[12] Borio (1997)

demand for bank reserves and thus the short-term interest rates over the maintenance period. Presumably, the underlying economic and financial activities would also be 'smoothed' out over time provided that these reserves can be used for settlement purposes and thus can be used to arbitrage interest rate shocks across time. Via this strategy, the central banks in these countries also ensure that their operations remain relevant and critical to the overall economic and financial activities throughout the maintenance period and thus consistently over time.

Through this strategy, the Bundesbank, for example, has found that the stabilizing (buffer function) role of reserve requirements has also lessened the needs to intervene frequently in the market, either through standing facilities or market operations. This approach has nevertheless been hampered somewhat by the decline in reserve requirements particularly since 1990. Yet, prior to this period, countries which continued to maintain reserve requirements (including US, Germany and Japan) usually compensated the financial institutions indirectly by providing discount windows at below market rates[13]. By its very nature, however, these windows are normally rationed under quotas or with conditionality to discourage frequent utilization (US).

With the recent declines, the functions of these reserve requirements were transformed more to guide commercial banks' liquidity management rather than for monetary control as in the past, and the discretionary adjustments of the reserve requirements ratios were more or less abolished.

E. Other Reactions and Market Fight-backs

The struggle is hardly over between central banks to maintain some degree of monetary control on the one hand, and the financial markets' efforts to cut costs through bypasses on the other. As an example, since 1994, the US financial market, through yet another financial innovation, answered back partly to the developments above in the form of "sweep accounts" where deposits in the chequing or demand deposits are, at the end of each day, transferred with the aid of modern technology into non-reservable money market deposit accounts (MMDAs), leading the absolute amount of required reserves to fall from 50 billion US dollar immediately by about 10 billion US dollar and continuing between 1995-1997 to the lowest level in 30 years of 12 billion US dollar (Sellon and

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[13] Kasman (1992)

Weiner 1996, p. 9). In 1996, only 2000[14] out of 26,000 depository institutions in the US hold reserve accounts at the Fed. The rest have resorted more to vault cash. Since its introduction of sweeping accounts, there also seems to have been less willingness on financial institutions' part to arbitrage interest rates across the maintenance periods. This has led to concerns over potentially more volatile overnight rates by the Federal Reserves.[15]

Moreover, the advent of the ERM crisis in 1992 and more recently the Asian financial crisis in 1997 have perhaps demonstrated the raw market powers that can indeed overwhelm and not just bypass authorities' regulatory powers. These new respects for market forces would probably give rise to serious revisions of monetary intervention strategies in many countries, the best international practices of which are yet to be identified. From the present study's point, however, past experiences of more advanced countries should serve to be a helpful guide for the present given that financial development in Thailand probably lag of some these countries up to some 10-15 years, judging from the processes of securitization and liberalization.

3.3 Current Status: A Market-Oriented Approach

The developments in either the central banks or the markets do not occur in discrete periods, but rather happen on an on-going basis. Because of this, the association of one particular development to another may be somewhat difficult although a significant part of recent developments took place following the ERM turbulence in 1992. Others may have taken place well before that e.g. Germany following the stock market crisis in 1987. Among the various threads of developments, nevertheless, a number of distinct trends could be identified. In particular, central banks in the sample seem to continue to (i) widen their ranges of market instruments in their operations, (ii) shorten maturity of their transactions, (iii) increased frequency of intervention, separating them broadly into "rough-tuning" (e.g. to sterilize FX intervention[16] or seasonality) and "fine-tuning" (to counter unforeseen changes in circumstances). National examples of these are incorporated in the Table shown in Appendix A. In the broad themes of these approaches, one way

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[14] Down by over 500 financial institutions since the introduction of sweeps in 1994.

[15] Borio (1997) p.56

[16] Since FX transactions are usually settled 2 days later, their impacts on daily liquidity would normally be known well ahead of the open market operations for each day. They consequently do not pose very often as a serious source of liquidity shock.

of classification may be to separate them into (i) countries that were moving or already have moved towards zero reserve requirement e.g. Australia, New Zealand, Canada, UK; and (ii) others that still rely on reserve requirements as a means to stabilize demand for reserves e.g. France, Germany, Japan, and US (to a lesser extent). The first group would thus be more affected by development in the payment systems (mostly moving towards real time gross settlement -- RTGS). In response, they have developed 'interest rate corridor' to stabilize rates which also imply paying interest on banks settlement balances at the central banks, in varying degrees.

Besides, in recent years, there has been a widespread trend towards leaving greater room for market forces in determination of interest rates. The reluctance by a number of central banks to conduct outright transactions in securities and leaning more towards Repos probably reflect this trend[17]. Indeed, central bank influence over longer term rates is only indirect and principally determined by market forces. Through arbitrages, longer term rates merely reflect market expectations of future short-term rates. A central bank's leverage over longer term rates is thus obtained through its ability to shift these expectations. By taking steps to communicate credible intentions about the range in which overnight and other short-term interest rates should be actively traded in the future, central bank can transmit their interest rate policies throughout the yield curve.

To this end, most of these central banks have limited themselves to infrequent adjustments in their operating objectives. Targeted interest rates are generally changed in small steps and only after sufficient amount of new information has accumulated to warrant a change in policy stances. By encouraging expectations of interest rate stability over a medium-term horizon, policy makers can enhance the effectiveness of their actions.

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[17] In1996, the Bank of England introduced gilt Repos (fully implemented in March 1997) as an additional instrument to the conventional outright operations. By December 1996, the stock of Repo outstanding stood at around 60 billion pound with daily turn over of at least 15 billion pound sterling (Borio 1997, p.128).

A. Active Liquidity Management

Among the various countries under study, there has been a general trend toward more elastic and flexible[18] supply of reserves during the day, particularly more through market operations than standing facilities[19].

From national experiences, given the somewhat lower reserve requirements imposed in the UK, the Bank of England has traditionally been among the most active central banks in daily reserve management, operating up to four times a day. Nevertheless, the UK has not been a monopoly on this front. In other countries, New Zealand and Japan have also been quite active (up to 3 rounds) in their daily liquidity management as well. Similarly, the Bank of Canada has also permitted access to its loan window freely since the introduction of zero reserve requirement in 1992 while settlement balance deposits are remunerated along the same lines as Australia's and New Zealand's interest rate corridors. Meanwhile, French financial institutions may initiate 5-10 days standing Repo with the Bank of France any time; and Bundesbank does not impose any limit on access to its Lombard loan window although at occasionally penal rates. Finally, somewhat similar to the Australia's, New Zealand's and Canada's interest rate corridors, the US has also started in the late 1990s paying implicit interest on banks' "clearing balances" by exempting these institutions from some of the fees charged in using the Fed's payments system. On lending size, FOMC's directives since the late 1980s have generally provided guidelines for elastic supply of reserves in response to money market rates diverging from the target rate.

These developments, together with the decline in reserve requirements have placed increasing emphasis on short-term interest rates along the trends already discussed. Besides, the uses of indirect money market instruments, particularly Repo, were also found to help to develop the underlying bond markets, and strengthen the transmission mechanisms of monetary policy over the longer term.

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[18] Flexible in the sense that open market operations do not require liquid underlying market (although Repo market has to be reasonably liquid) and the maturity of injection/ withdrawal can be independent of that of the underlying assets; market oriented in the sense that OMO, particularly in a deep secondary market, tends to be cheaper, simpler, and less obtrusive reducing the repercussions of each shift in policy stance on the economy.

[19] This is aimed to reduce the role of central banks as a counter party which could inhibit money market development and enhance flexibility in their discretionary open market operations. This trend, nevertheless, did not start only recently but dates back to early 1980s as well.

Technically on this point, however, active liquidity management will produce stabilizing effects only if there was a reasonably accurate forecast in terms of volume, and frequency of operations required to sustain stable economic and financial developments. In a volatile and uncertain world, this is not an easy task.

To supplement this active liquidity management method, thus, a number of sample central banks have also tended to allow market participants to trade among themselves as much as possible before intervening. Some typical measures among these are the attempt to encourage participants to settle among themselves first in the interbank market, or prior coming to the central bank -- the so called "pre-settlement rounds", with active monitoring of cash position during the day (Japan, UK and Germany do revise their liquidity forecasts a number of times during the day), along with the more common practices of supplying end-of-day liquidity at penal but not too wide rates.

B. Increased Uses of Signaling

Perhaps relating to rising market powers and the authorities' recognition in their limited capability in effecting real liquidity impacts on the market, recent open market operations have placed more emphasis on "signaling" rather than "liquidity management" conventionally designed to shift actual financial institutions' portfolio balances. These developments also coincided with the trend towards greater transparency of central banks in general. The Federal Reserves, for example, conducts outright bond transaction only 5-6 times a year that actually affects the long-term level of liquidity. The rest of their operations (averaged once a day) tend to aim more to stabilize overnight rate around the target - - signaling- - than liquidity management (changing the average level of reserves). Moreover, since the cut in reserve requirements in 1990, many US banks have become less tolerant of excess reserve position during the beginning of the maintenance period. This led to the increase in volatility of the fed funds rate during the whole averaging period. Within each day also, participants became more conservative in holding on to reserves until later in the day, giving rise to somewhat misleading signals read from market conditions in the morning. Under these circumstances, the OMO desk thus paid more attention to fed funds rates than volume of reserves themselves (Kasman 1992, p. 19). Other central banks in the sample, Australia, Canada, New Zealand and the UK, for example, now also announce their operating target interest rates clearly, with Canadian targets in 50 basis points bands.

Among the sample countries most of which have turned towards monetary signaling strategy, the specific interest rates targets used vary from country to country, ranging from overnight (Australia, Canada, NZ, JP, US) to short-term rates (up to 1 month e.g. UK, France, Germany). Presumably, central banks that adopt short term period rates rather than overnight implicitly indicate that they are more willing to tolerate more volatile overnight rates. This perhaps reflects the authorities' attitude / perception as to how much they can "control" the market and how much they can "learn" from the market. The more tolerant attitude of central banks towards volatile overnight rates would tend to indicate a higher weight given towards market opinions.

In actual implementation under a system where central banks manage the reserve accumulation path of the private sector (section 3.2D), the distinction between liquidity management and signaling may not be very clear. With the declining trend in the reserve requirements, however, this distinction becomes much clearer.

C. Interest Rate Corridor

Most notable characteristics in the monetary operations of most central banks surveyed were the recent trend towards limiting interest rate variability via some kinds of interest rate corridor largely to (i) clarify policy signals[20] of the key note intervention, (ii) prevent abuses by participants through penal interest rates, and (iii) instill a degree of discretion to encourage participants to transact among themselves first to ensure market equilibrium.

To achieve these results, the central banks employ two sets of mechanisms. First, they normally rely on some kinds of standing facilities which serve as the bands between which interest rates are allowed to fluctuate. These bands range from two percent in the case of (pre-Euro 99) Germany to 0.5 percent in the case of Australia, New Zealand and Canada. The UK, while not announcing an explicit band, also specifies a clear rule that the Bank of England would charge penalty rate up to 1.5 percent above market rate at the end of the day, and would also occasionally intervene to absorb excess liquidity should interest rates fall significantly below the target rate.

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[20] The shift in corridor itself will at times used to transmit policy signals e.g. in between monetary policy committee's meeting.

Diagrammatically, the interest rate corridor approach may thus be represented as in Figure 2. Under this scheme, supply of reserves become almost perfectly elastic at the boundary of the interest rate band. Within the band, however, supply is highly but less than perfectly elastic.

Figure 2, 10
Interest Rate Corridor

Money market rate

D

Discount Δr Lombard, O/D, Rediscout, Bank Rate

or Remunerated Dep Fed Funds Rate, Tender, SONIA,

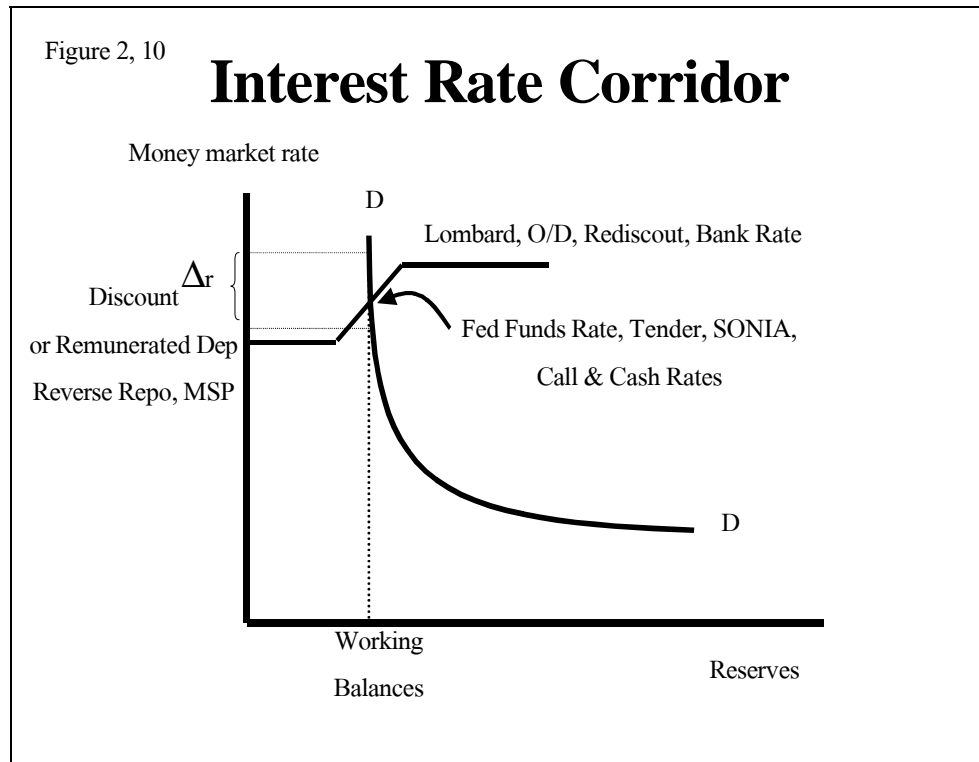Reverse Repo, MSP Call & Cash Rates

D

Working

Balances Reserves

Figure 2. A graphical representation of the interest rate corridor.

In sample countries, usually short term rates fluctuate within only 15 basis points on a day-to-day basis in recent years (Borio 1997, p.34). Since, the actual fluctuations of short-term interest rates on a day-by-day basis are much less than those implied by these standing facilities[21], this implies that open market operations become much more elastic or signaling becoming much more active before market rates hit the boundary rates.

Underlying these responses were the views that standing facilities would only act as "safety valves[22]" and would not be called upon as a source of liquidity on a regular basis[23], e.g. only when there is an error in liquidity forecast conditions, or in case of unforeseen and temporary end-

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[21] Some of the ways of discouraging access to the facilities are: charging accelerating interest rates according to the number of times utilized, or credit granted longer than one day to increase effective costs and encourage 'hard-thinking' before borrowing.

[22] Access to standing facilities in most of the sample countries during 94-95 constituted less than one percent of monetary base (Borio 1997,p.104) except Australia which reached at 3.8 percent.

[23] Except perhaps in the case of Canada.

of-day liquidity shortages, or that market system fails to redistribute reserves efficiently e.g. under financial stress. In Germany, for example, commercial banks resort to Lombard window has traditionally been less than 0.2 percent of central bank's assets except when Bundesbank intentionally let intervention rates drift up close to the Lombard rate usually when close to a shift in policy stance.

3.4 Some Quantitative Measurements

A. Degree of Monetary Accommodation

While most sample central banks implement policy by controlling the aggregate level of reserves available to the banking system, they are not in a position to control movements in all components of their balance sheets, particularly those related to their function as banker to the government and their holdings of foreign currency reserves. These banks nevertheless have sufficient information and operational capabilities to sterilize the effects of these other activities so as to control the aggregate supply of reserves with a reasonable degree of precision.

Based on the calculation method shown in Appendix B, the degrees of monetary accommodation (or sterilization) for the 9 sample countries are calculated for the sample period and shown in Figure 3. From these graphs, it may be noted that most countries seemed to have depicted a downward trend in the degree of accommodation since early 1970s indicating perhaps the trend towards monetary targeting as an ammunition against high inflation following the two oil crises, except perhaps the US.

In the late 1980s and particularly 1990s, the monetary policy stance in most of the sample countries turned more accommodative again except perhaps for the US which started off from the more accommodative position in the earlier period. From monetary policy implementation point, the stances based on this index seem to confirm the observation made earlier that these countries have tended to become more flexible in supplying short term liquidity consistent with the strategy of adopting short-term interest rate as operating target, and placing less emphasis on monetary aggregate.

In the case of Thailand, on the other hands the degree of accommodation had come down sharply in the early 1970s but had since increased gradually. This probably reflects the monetary policy implementation framework that still placed a lot of (perhaps excessive) emphasis on monetary targeting.
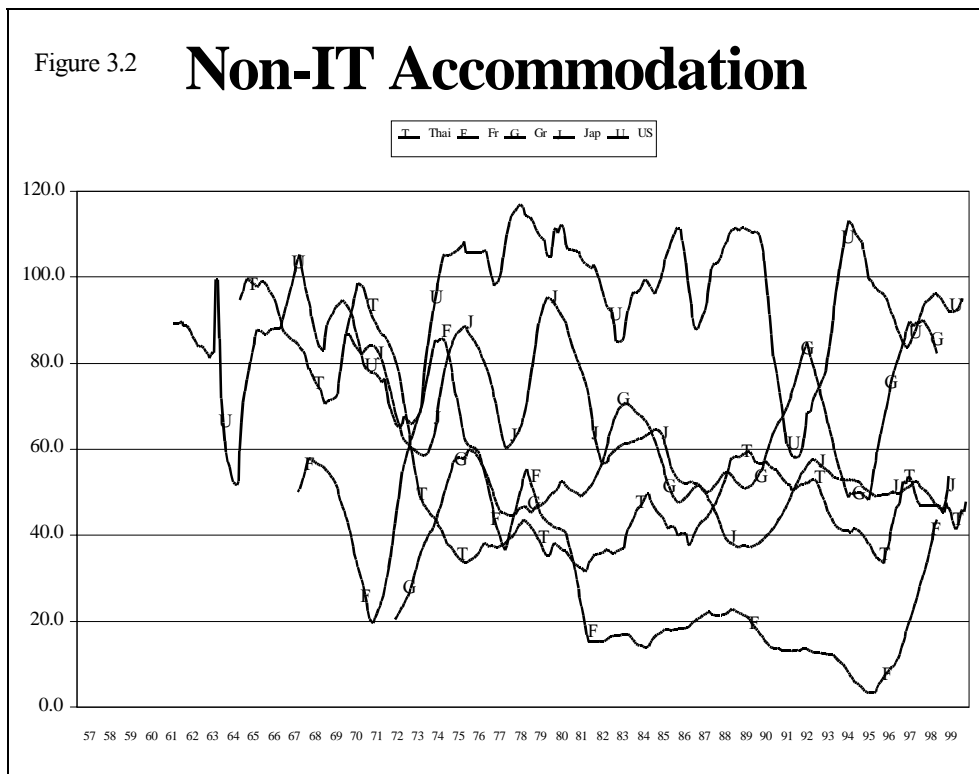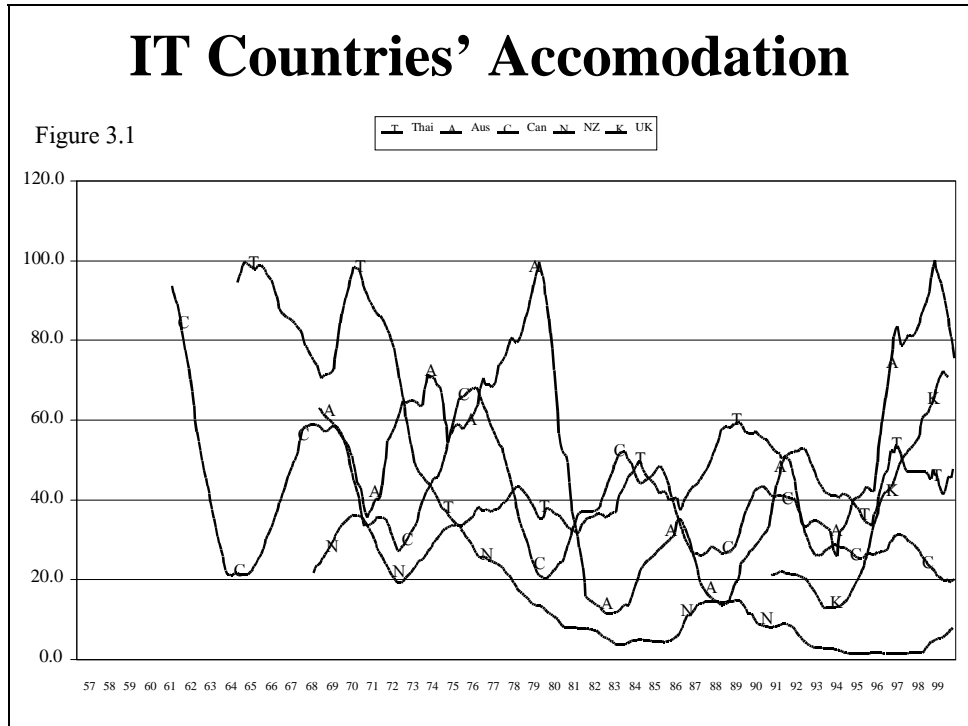
IT Countries' Accomodation

Figure 3.1

Legend: T Thai A Aus C Can N NZ K UK

Non-IT Accommodation

Figure 3.2

Legend: T Thai F Fr G Gr J Jap U US

Figure 3. Comparison of the degree of monetary accommodation.

B. Variability of Interest rates, Monetary Bases and Exchange Rates.

Alternatively, the "stances" and priorities of monetary policy in the sample countries may also be discerned by comparing monthly volatility[24] of short-term interest rates, monetary bases and exchange rates. In general, the data confirm the trend towards interest rate targeting with due consideration to exchange rate stability. Volatility of monetary bases growth of Thailand, however, is somewhat lower than other countries. This again reflects the probably more stringent attitude towards monetary targeting compared with other countries.

From Figure 4, it may be seen that over the past 4 decades, the degrees of volatility of monetary base of the recently-adopting inflation targeting (IT) countries[25] have concentrated more in the narrow range of 2-6% (except for New Zealand of over 10%, IT averaging 5%) compared with 1.5-8% (also average around 5%) of the non-IT countries. Furthermore, these volatilities for IT countries have also tended to be rising overtime (except perhaps for New Zealand with down-turns in the early 1990s) while non-IT countries' volatilities have tended to be more stable or declining only slightly over time (except for (pre-Euro 99) France which has risen in a similar way to IT countries). Comparing Thailand (2-3%) with sample countries average of 5% implies that there may be room for perhaps more active liquidity management in Thailand up to 2-3%. This room for flexibility could be used to improve the clarity of policy signals and manage short-term volatility in the post-crisis recovery period.

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[24] Calculated from 36 months' moving average of 12 months' backward moving standard deviation of the respective variables. In the cases of monetary bases and exchange rates, the series are first transformed into a month-on-month growth rate both to ensure stationary and for policy interpretation. The 36-month moving averages are designed to remove short-term movements to reveal long-term trends. Prior to this report, various lengths of moving average were tested and found that 36 months were the minimum that could ensure reasonably smooth graphs.

[25] For simplicity, these countries will be referred to loosely heretofore as IT countries as against Non-IT countries. Since Inflation Targeting is only a recent phenomenon, this classification will be related to the analysis of the recent past only. Prior to this, the dichotomy does not have any significant analytical implications.

Figure 4.1

IT Mb Volatility

| N | 36 per. Mov. Avg. (NZ) | T | 36 per. Mov. Avg. (Thai) | K | 36 per. Mov. Avg. (UK) | C | 36 per. Mov. Avg. (Can) | A | 36 per. Mov. Avg. (Aus) |

Figure 4.2

Non-IT Mb Volatility

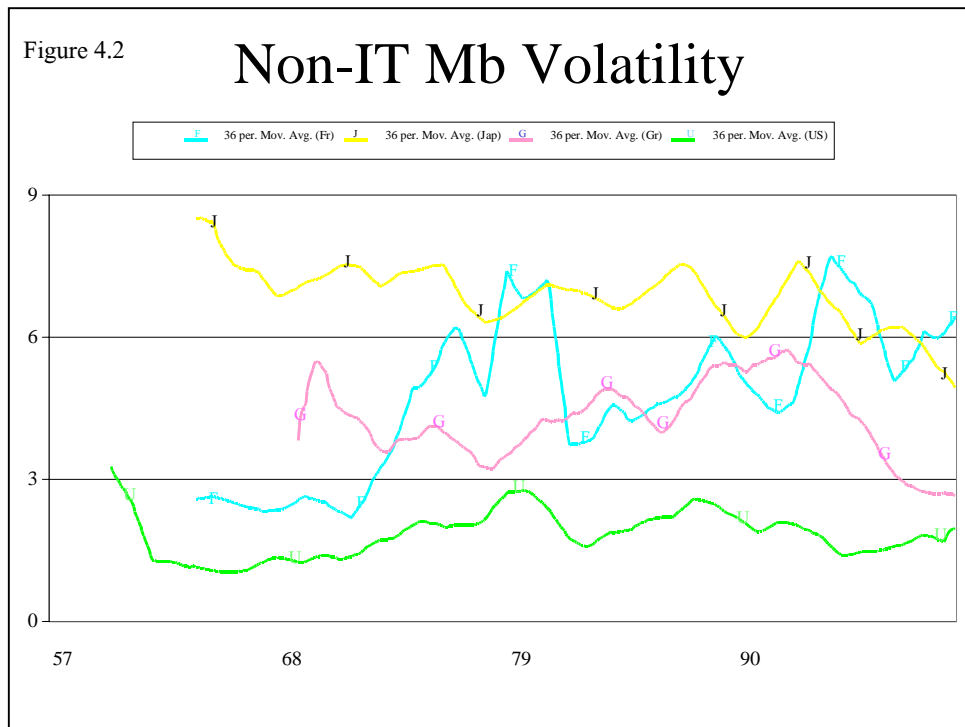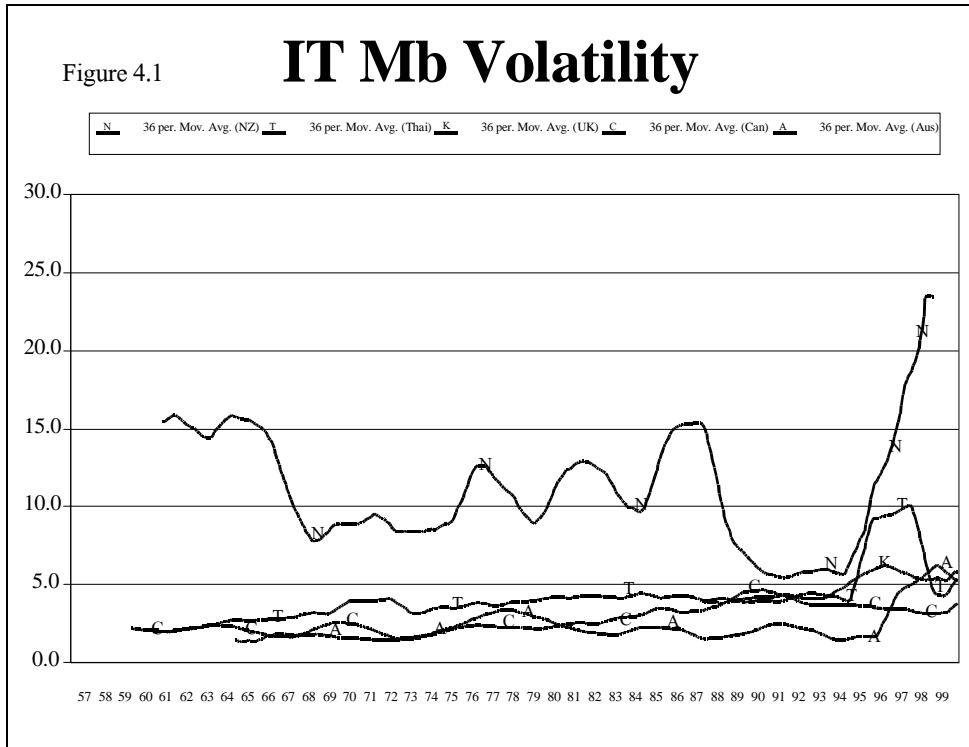| F | 36 per. Mov. Avg. (Fr) | J | 36 per. Mov. Avg. (Jap) | G | 36 per. Mov. Avg. (Gr) | U | 36 per. Mov. Avg. (US) |

Figure 4. Monetary Base Volatility

Interest rate volatility of both IT and Non-IT countries, on the other hand, tended to decline over time, corresponding to the fact that the majority of the sample countries have adopted short term interest rates as signaling instruments (operating targets) in the past decade and a half. With a sharp contrast to this trend, however, the volatility of Thailand's short-term interest rates have been rising during the same period. In terms of magnitude, Thai's rose consistently from 1 to 4 percent (including crisis period) while the other IT countries' fell below 1 percent while Non-IT's declined to close to zero.

It should be noted that this time series analysis is based on monthly data only. Based on a cross-section analysis on a higher frequency data (daily) between 1988-1991 of Switzerland, UK, Canada, US, Germany, and Japan, Kasman (1992) found that a strong (negative) correlation between reserve requirements and interest rate volatility. UK and Switzerland, for example, tended to have higher volatility in the O/N rates due to the low or non-binding reserve requirements.

Based on experiences of Canada, New Zealand, UK, nevertheless, Sellon and Weiner (1997, p.17) noted that interest rate volatility may, in fact, be related more to the mechanism for providing liquidity to the settlement system than on the level of required reserves. Nevertheless, Bennet and Hilton (1997) observed that as sweep accounts led to further fall in reserve balances, intra-day volatility in the fed funds market appears to have risen moderately.

Figure 5.1
IT r Volatility

Figure 5.2
Non-IT r Volatility
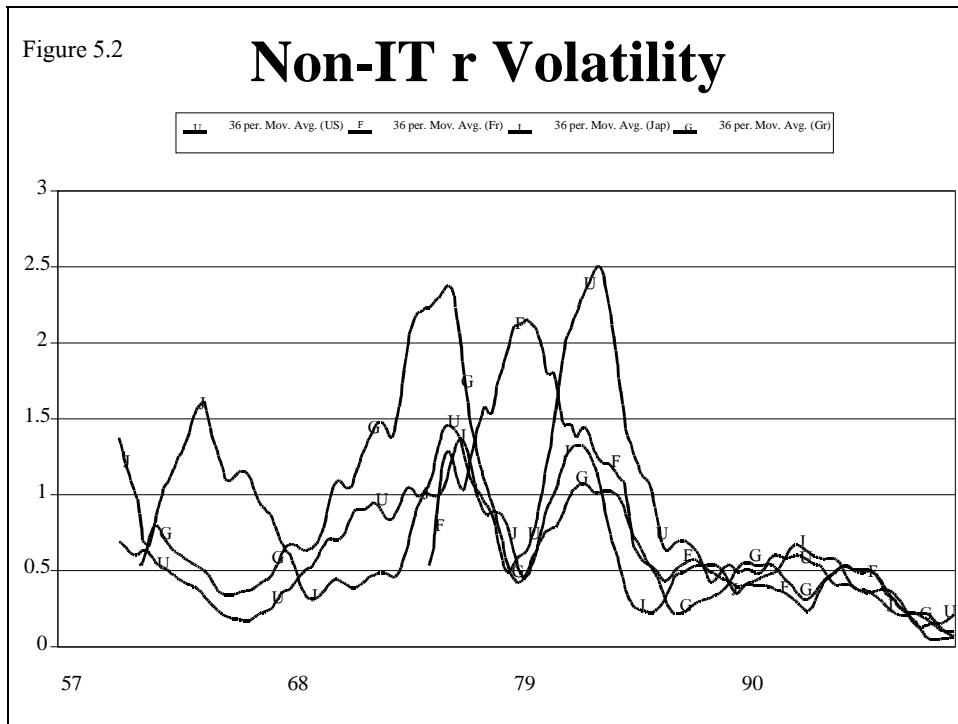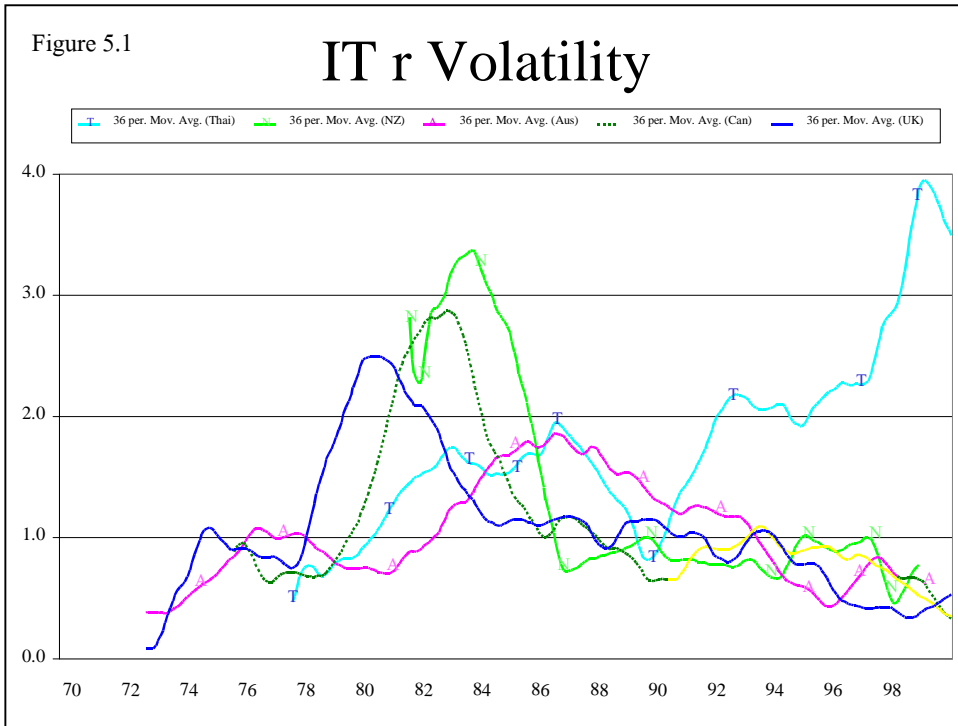
Figure 5. Interest rate volatility

Over the longer term, however, irrespective of inflation targeting or not, exchange rate volatility tends to vary according to the respective nation's relations to a particular trading block. For example, France and Germany, which have been the core members of EMU, tended to maintain the exchange rate stability (volatility less than 0.5% per month) against ECU (Euro since 1999) (Figure 7) while allowing a certain degree of volatility against the US dollar (up to 3%) shown in Figure 6. Among the ITs, on the other hand, the currencies of Thailand and UK had been among the most stable (approximately 2% volatility per month) against ECU while the Baht and Canadian dollar were among the currencies closely related to the US dollar (1 percent or less per month).

Based on these international experiences, Thai exchange rate volatility may be expected to be somewhat higher than in the past (1 percent). The degree of volatility rising out of control, nevertheless, will be inhibited by closer monitoring measures against speculation as well as increased regional cooperation.

Figure 6.1 **IT ER Volatility vs US$**

Figure 6.2 **Non-IT ER Volatility vs US$**
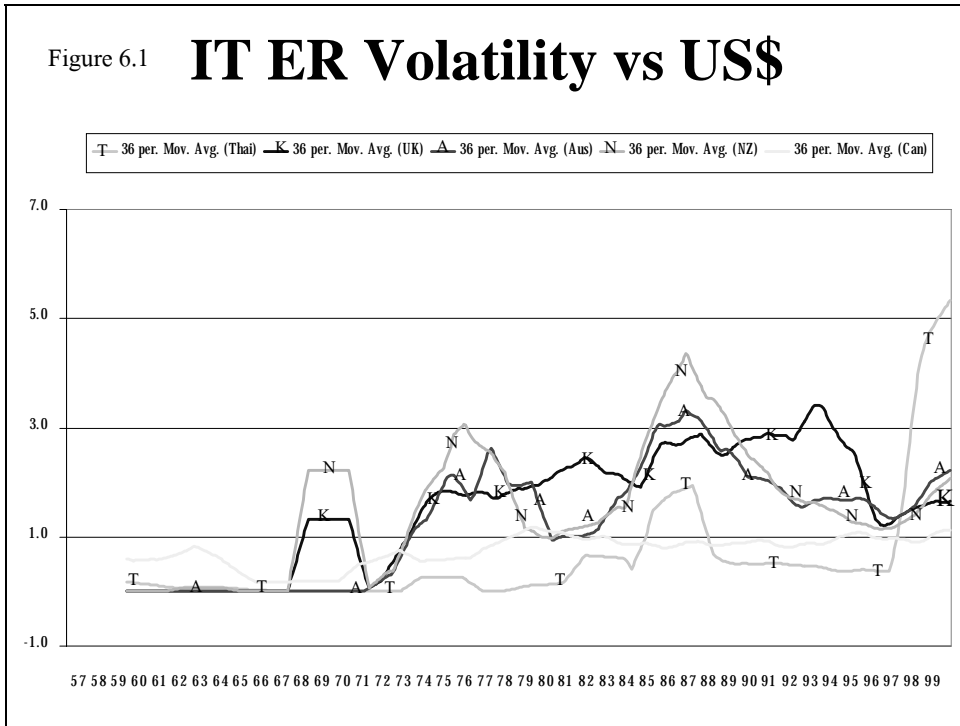
Figure 6. ER volatility US$

Figure 7.1

IT ER Volatility vs ECU

T 36 per. Mov. Avg. (Thai) A 36 per. Mov. Avg. (Aus) C 36 per. Mov. Avg. (Can) N 36 per. Mov. Avg. (NZ) K 36 per. Mov. Avg. (UK)

Figure 7.2

Non-IT ER Volatility vs ECU
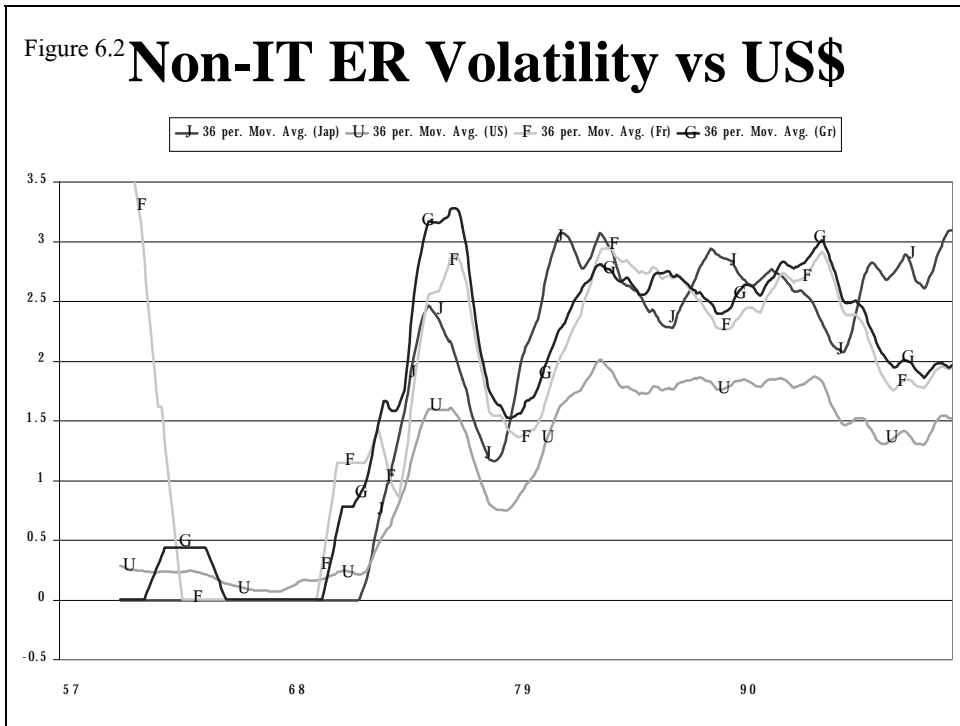
U 36 per. Mov. Avg. (US) J 36 per. Mov. Avg. (Jap) F 36 per. Mov. Avg. (Fr) G 36 per. Mov. Avg. (Gr)
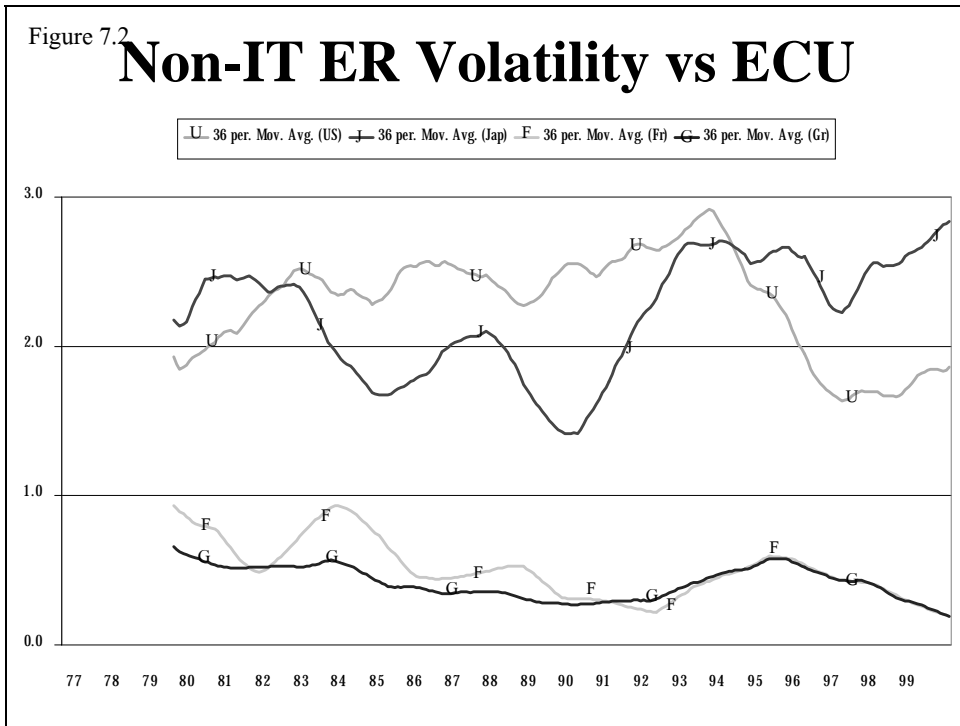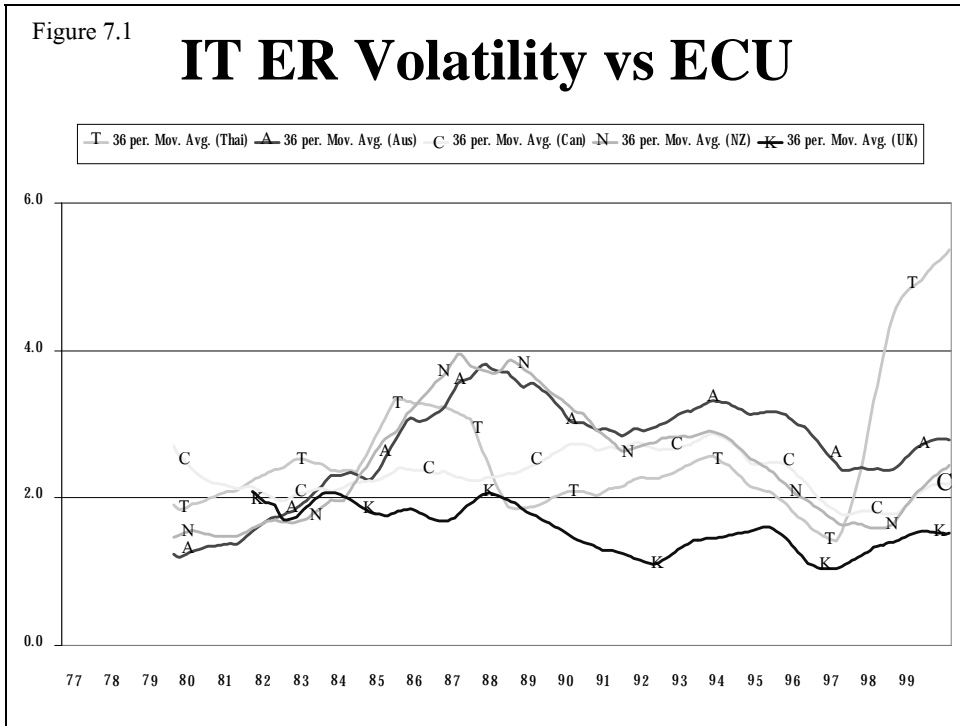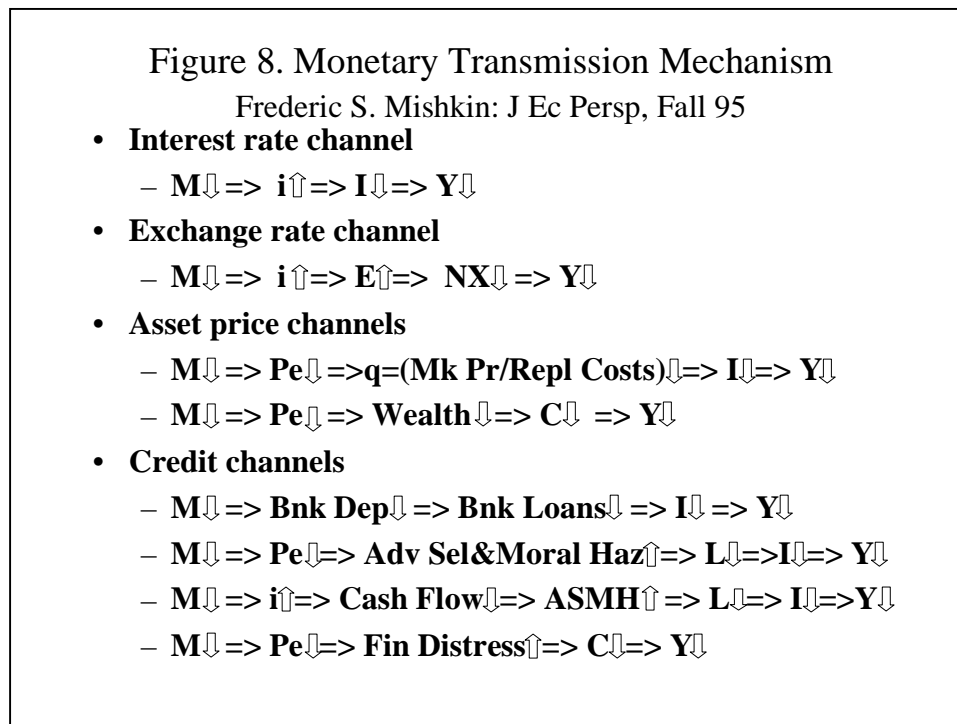
Figure7. ER volatility against Euro.

4. MP Transmission Mechanisms

While do these monetary authorities placed so much emphasis on short-term interest rate stability? This is because, via signaling, this channel is probably one of the most important transmission mechanisms, linking central banks' action to the real sector. In order to gain a better understanding of this link, the literature of monetary transmission mechanisms is briefly reviewed in the next sub-section.

4.1 A Brief Literature Review

Based on Mishkin (1995) and Blinder (1998), the monetary transmission mechanisms in broadest terms may be represented as shown in Figure 8.

Figure 8. Monetary Transmission Mechanism

Frederic S. Mishkin: J Ec Persp, Fall 95

- **Interest rate channel**
  - M⇩ => i⇧ => I⇩ => Y⇩
- **Exchange rate channel**
  - M⇩ => i⇧ => E⇧ => NX⇩ => Y⇩
- **Asset price channels**
  - M⇩ => Pe⇩ =>q=(Mk Pr/Repl Costs)⇩=> I⇩=> Y⇩
  - M⇩ => Pe⇩ => Wealth⇩=> C⇩ => Y⇩
- **Credit channels**
  - M⇩ => Bnk Dep⇩ => Bnk Loans⇩ => I⇩ => Y⇩
  - M⇩ => Pe⇩=> Adv Sel&Moral Haz⇧=> L⇩=>I⇩=> Y⇩
  - M⇩ => i⇧=> Cash Flow⇩=> ASMH⇧ => L⇩=> I⇩=>Y⇩
  - M⇩ => Pe⇩=> Fin Distress⇧=> C⇩=> Y⇩

From this figure, the mechanisms may be divided into 4 main channels. First, via interest rate channel, a restriction[26] in money supply tends to raise interest rate, increasing the cost of and effectively slowing down private investment and thus income. Secondly, a tighter monetary policy, in a flexible exchange rate regime, would also tend to lead exchange rate to appreciate, lowering net exports and again national income or output. Thirdly, the restrictive monetary policy would also tend to lower

---

[26] The transmission mechanisms , in theory , work in symmetric fashions such that either tighter or looser monetary policy will follow exactly the same flow of logics except in opposite signs. Here, only a tight monetary policy stance is used for simplicity of exposition.

price of equity. This bearish sentiment then delivers two simultaneous impacts on the real economy i.e. (i) via expected capital losses (q = market price of firms or factory relative to its replacement cost or equivalent to the par value) to lower private investment and income; and (ii) through the loss of wealth effect to lower private consumption and thus national income.

Finally, monetary policy may also affect the real sector of the economy directly via the credit channels, which may be sub-divided further into four categories. (i) As monetary authorities tighten their stance, commercial banks' deposits would tend to dry up restricting banks' loans, private investment and thus income. (ii) Tighter monetary policy induces lower equity prices rendering a weaker corporate balance sheet, encouraging them to engage more in risky businesses (adverse selection and moral hazard), triggering commercial banks to become more cautious, cutting back loans, and thus private investment and national income. (iii) Alternatively, restricted cash flow from tighter monetary policy may induce banks to become suspicious of corporates' ability to service debts, and hence cut back their loans which again lower investment and national income. (iv) Finally, tighter monetary policy inducing bearish capital market may undermine consumers' confidence, leading them to spend less resulting in lower economic activity as a whole.

From the transmission mechanisms described above, it may be seen that a large part of the channels went through long term interest rate variable, presumably loan and deposit rates. Meanwhile, central banks, in reality, intervene mostly only on the short-end of the yield curve, the transmission mechanisms above thus assume that there is an automatic link between short rates and these longer term rates.

It is thus of great importance that these links be supported by empirical evidence. Further, it would also be interesting to test whether there would be any difference across time or between inflation targeting and non-inflation targeting countries. This is done in the next two sub-sections.

4.2 OMO and Transmission Mechanisms

Since interest rate operating objectives are transmitted to economic activity largely through their linkage to longer term interest rates and other financial prices, central bank intervention strategies are designed to communicate information about current and future policy that strengthens this transmission. In most cases, interest rate objective are changed in small steps to stabilize expectations across the term structure.

In some countries, central banks intervene in assets of varying maturities to influence the money market term structure directly. This may be shown as in Figure 9.
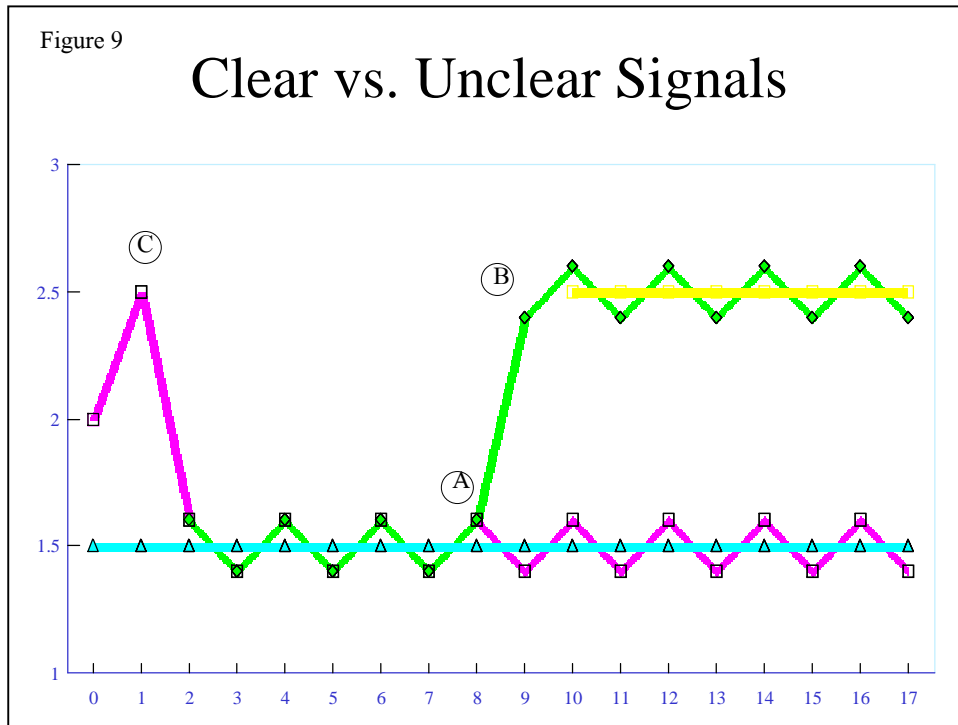
Figure 9. **Theoretical relationships between short and long rates.**

At the origin of a shift in the stance of policy (B), usually accompanied by a statement, market participants may have a reasonable idea (implicit policy credibility) where short-term interest rates are heading. They can then adjust their longer term rates, particularly the deposit and loan rates accordingly (assuming perfect arbitrage). If, on the other hand, the central banks do not stabilize short term rates on a regular basis such as point C, the signal may become unclear as participants will be unable to distinguish between B and C, as a consequence they may choose to keep long-term rates as before at A, rendering monetary policy ineffective.

A. Liquidity vs. Signaling Effects

As already mentioned earlier in theory, as the reserve requirements became lower such that working balances became binding, the demand for reserves on the margin would also become insensitive to

interest rate changes[27](Figure 10). In particular, in countries where there is restrictive policy on daily overdrafts, a fall in reserve balances also reduces the benefits of averaging and thus the interest sensitivity of reserve demand -- i.e. less room to maneuver (Sellon and Weiner 1997, p.23).

In addition, this demand curve may, in practice, also shift around reflecting the "instability of demand for money" following deregulation and liberalization. In this case, the ability of central bank to stabilize rates will depend on its ability to forecast liquidity although interest rate corridor will continue to provide support.

Figure 2, 10

Interest Rate Corridor

Money market rate

D

Lombard, O/D, Rediscout, Bank Rate

Δr

Discount

or Remunerated Dep

Fed Funds Rate, Tender, SONIA,

Call & Cash Rates

Reverse Repo, MSP

D

Working
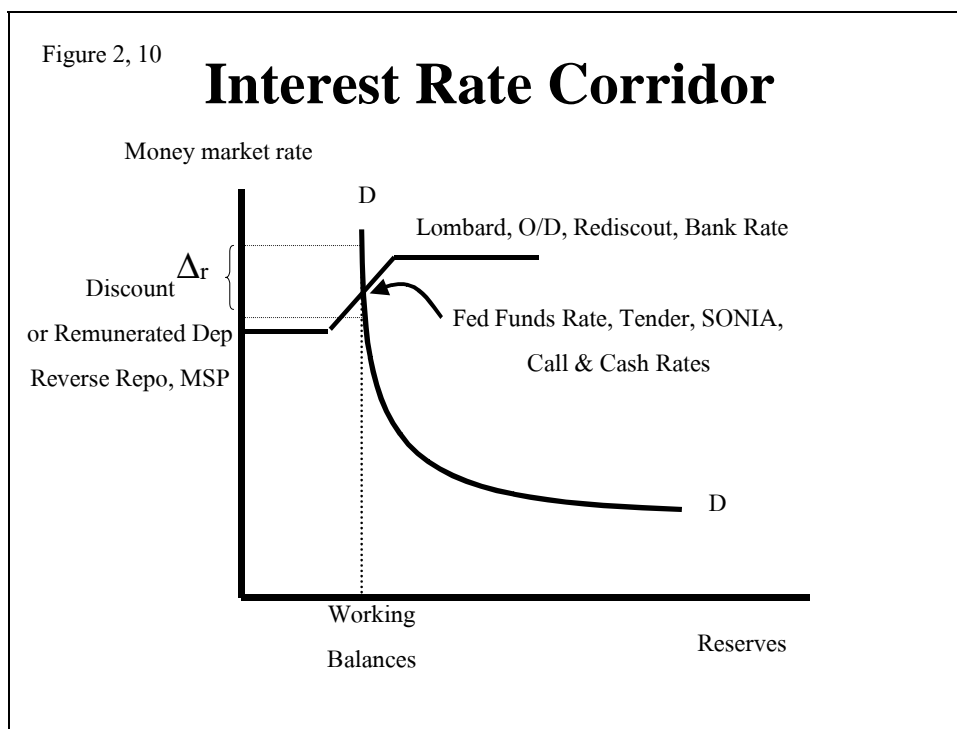
Balances

Reserves

Figure 10. **Theoretical demand and supply for reserves.**

In practice, this is because working balances are more or less the minimum amount of liquidity commercial banks need for their settlement purposes (the opportunity cost is simply becoming default which is extremely high). At the time of the settlement, e.g. at the end of the maintenance period, financial institutions would thus normally be willing to pay "any rates" to meet liquidity requirements, implying very low interest elasticity as shown in the graph. This behavior has been confirmed in most sample countries during the end of maintenance period.

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[27] Also theoretically, at somewhat higher rates of interest, the non-bank public may have incentives to switch into fixed term deposits from transaction deposit accounts, lowering demand for reserves. Further, financial institutions may also wish to hold less excess reserves at high interest rates, lowering interest-elasticity marginally.

At this point, any intervention by the central bank to change even the smallest amount of reserves would result in significant increases in short-term rate volatility without matching effects on equilibrium amount of cash holding by commercial banks. In addition, demand for reserves under modern payment systems will largely depend on the security measures imposed on these systems. Real time gross settlement system, for example, will likely require more settlement balances than the net system. Under such a circumstance, thus, liquidity management becomes almost virtually ineffective. Accordingly, signaling through gradual changes in short-term interest rates (without the needs to intervene very much at all) become more effective. Further, as reserve requirements were lowered , this strategy becomes even more critical.

From section 3.3.C. on interest rate corridor, it may be seen that central banks have tended to supply liquidity more elastically within a band of interest rates—designated as discount and Lombard rates[28] here. With rapid shifts in demand, the amount of reserves in ex post will tend to swing around while interest rates remaining stable. This is consistent with the stylized facts discussed earlier.

Yet, in reality it may also be difficult sometimes to distinguish whether the outcome reflects the authorities tolerance of minor fluctuations around a desired level, a shift in monetary policy stance, or difficulties on the part of the central bank in reconciling the interest rate bids with its liquidity management objectives.

Greater flexibility in liquidity management has thus been accompanied by increased transparency in policy signals regarding desired interest rate levels -- another common trend recently. This has essentially taken two forms: explicit announcements of targets for operating objectives, be their point targets (e.g. Australia, UK, and the US) or ranges (e.g. Canada), and a revealed preference for tender techniques where the central bank's decision regarding interest rates is made more transparent (e.g. fixed rate as opposed to variable rate tenders). Further, this communication strategy may be augmented by avoiding unintentional highlights of non-keynote operations, and confirming policy stances by acting frequently as a price taker in the markets at rates consistent with announced policy target rates.

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[28] Specific countries' responses may somewhat depending on the cultural and institutional environment, in particular the trade off between the desire to maintain short term rate stability, the penalty rates to discourage abuses, and the degree of uncertainty of official liquidity supply aimed to make private sector self-sufficient. For details see Borio (1997).

Alternatively, central banks may also use open market operation to "test the wind", that is, to explore whether the market reaction to a policy change will be consistent with the central bank's objectives. This tactic is particularly critical for countries with exchange rate commitments, since interest rate differentials can have significant implication on exchange rate stability.

Besides, central banks may also differ widely with respect to the variety of policy signals employed. Some central banks, such as the Federal Reserve or the Reserve Bank of Australia, prefer to rely on a single signal, viz. the target announcement. Others, including those in several European countries, utilize broader spectrum. Such supplementary signals can perform a number of functions: distinguishing the medium-term domestic policy stance from the need to resist unwelcome short-term exchange rate pressures (such as through rates on standing facilities versus those on market operations); communicating sudden changes in policy when the main signals can only be set at regular intervals (e.g. through fixed schedule tenders); testing the market reaction to possible modifications in the policy stance; bringing about a change in stance in less visible ways; and resisting or encouraging market-induced movements in interest rates.

B. The Tail that can wag the dog

On this "testing the wind" issue, Hardy (1997) has compiled the experiences of more developed countries in monetary policy implementation in the form of a theoretical model. From the model, the key characteristics may be summarized as follows. First, central banks do not always have a precise, optimal operating target set in advance. In fact, both central banks and market participants are equipped with rather incomplete and asymmetric (costly) information.

Second, by limiting the degree of intervention, central banks can induce market players to acquire information, reflected in market prices which can then be observed and utilized by central banks. Here, the clarity of signals from central banks will also depend on information acquisition efforts by participants which, in turn, depends on the frequency of intervention itself. All these arguments thus imply the existence of some levels of the 'optimal frequency' of intervention .

The point is particularly relevant for emerging market such that large sunk cost of information gathering in some cases may imply that no intervention at all may be optimal in promoting market efficiencies. From the more developed countries' point, analogously, the more 'Fed watchers'

i.e. the more efforts by private sectors in gathering and analyzing information, the less will be the need for frequent intervention. This is because market efficiency will already be enhanced by information gathered, analyzed and disseminated by those ' Fed watchers'.

Thus, the optimal rule of intervention will need to balance between the needs to keep market price in the proximity of policy target and the incentive for market participants to acquire and reveal information—to ensure that central banks set proper targets in subsequent periods. This analytical framework, therefore, does not view open market operations in a "top-down" policy directive fashion. On the contrary, markets as in reality can play a significant part in setting a proper stance of monetary policy. Hardouvelis (1994), for example, used this approach to test whether market interest rates (long bond yield) contain information regarding future banks' policy stance. In the context of the present study, the fact that most central banks in the sample allow short-term rates to vary and diverge marginally from the target rates probably reflect this attitude/ strategy.

4.3 What is the Effectiveness of Monetary Policy? : Some Empirical Evidences

The analysis above would suggest that monetary policy implementation could conceptually be divided into two rather distinct parts. The first, liquidity management is largely used to neutralize distortions in short-term rates arising from working balance constraints. The second, signaling is used to alter market expectation via adjustments in the operating target. As discussed in section 3.3 B, the signaling channel has recently become much more important by inducing financial institutions to adjust their longer term interest rates.

In Appendix C, the relationships between short and long rates were tested for the sample countries using (i) cross correlation, (ii) cointegration, and (iii) Granger causality tests during 1957-2000 for the sample countries. From this analysis, it is confirmed that there are significant relationships running between short and long rates, and in the majority of sample countries from short to long rates.

In addition, to better appreciate the evolution of these relationships between short and long rates during different periods, the present study calculates long-term average correlation coefficients (36-month moving average of the 12-month backward moving correlation coefficients) between money market rates, prime lending rates and 3-month

deposit rates of respective countries. The results of these calculations are shown in Figures 11 for both IT and non-IT countries.

From these results, an upward trend (strengthening of the links between short and long rates) may be noticeable among the IT countries[29]. Given the fact that the non-IT countries are among the most developed monetary system with established credibility of monetary policy, the correlations have always been consistently high and close to unity throughout the period without noticeable trend.

In the case of Thailand, the results seem to indicate that some structural impediments may have weakened the channel between the short-term interest rate and the cost of credit and deposits before the financial crisis. As a consequence, the correlation has been falling consistently up to 1997. Since then, with the structural and financial reforms, the short-long rates links appear to have been improving slowly.

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[29] Although it may be argued that this strengthening of the transmission mechanism took place well before these countries adopted inflation targeting , it may also be argued that these countries normally developed necessary mechanisms well before institutionalizing it in inflation targeting framework. On the whole, it may be quite safe to say that IT is a symbol if not the cause of good management.

Figure 11.1

IT Correlation r & rd

| T | 36 per. Mov. Avg. (Thai) | A | 36 per. Mov. Avg. (Aus) | K | 36 per. Mov. Avg. (UK) | C | 36 per. Mov. Avg. (Can) | N | 36 per. Mov. Avg. (NZ) |

Figure 11.2

Non- IT Correlation r & rd

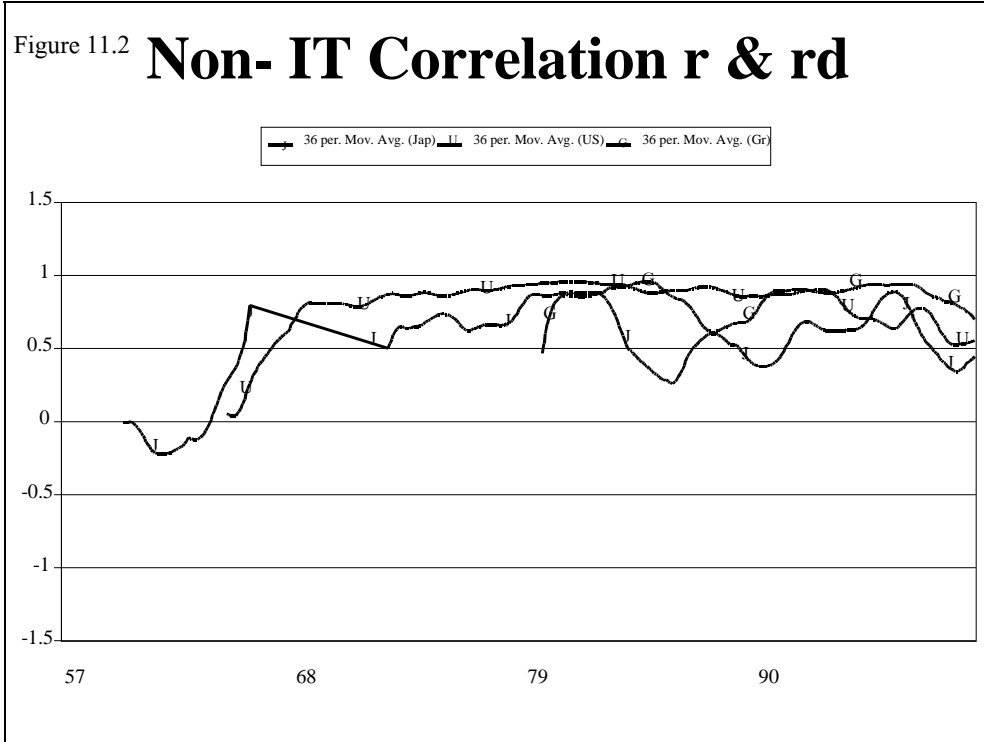| | 36 per. Mov. Avg. (Jap) | U | 36 per. Mov. Avg. (US) | G | 36 per. Mov. Avg. (Gr) |
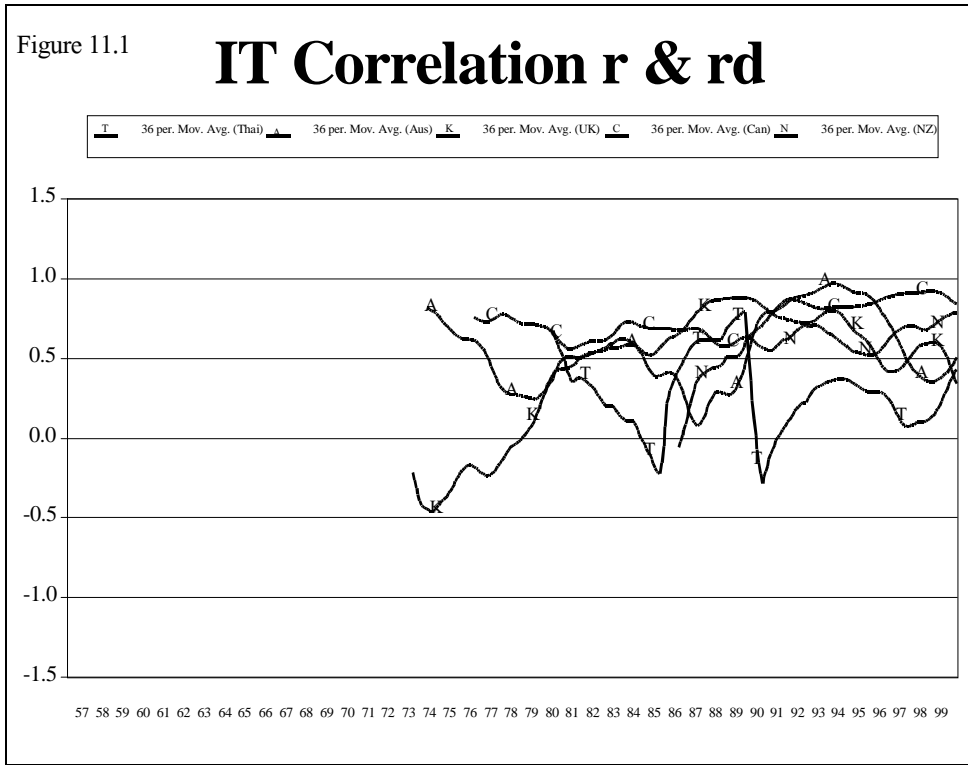
Figure 11. **Correlations between money market and 3-month deposit rates.**

Figure 12.1 **IT Correlation r & rl**

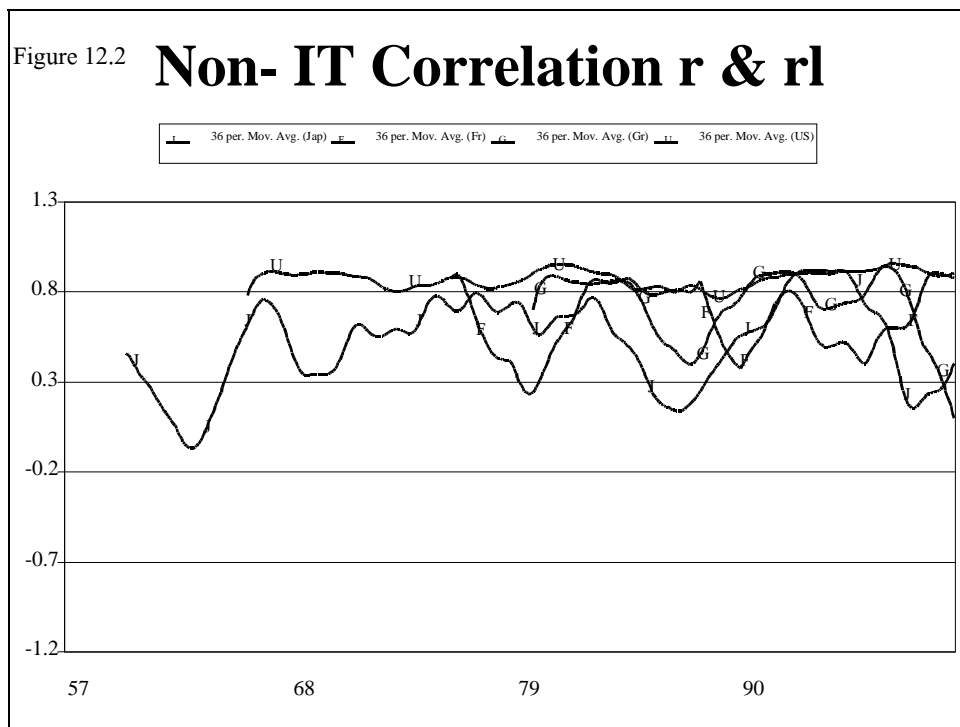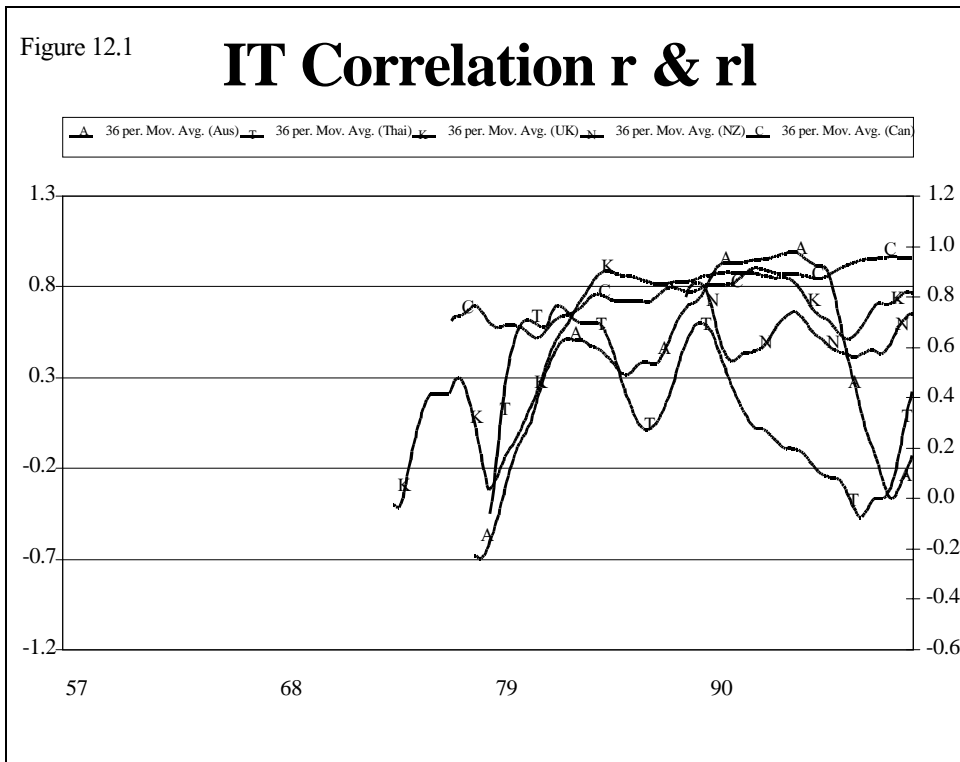Figure 12.2 **Non- IT Correlation r & rl**

Figure 12. **Correlations between money market and loan rates.**

5. So has Thailand been effective?

5.1 Description of the Present System

The Thai financial system has been dominated by commercial banks (67 %) and finance companies (around 20 %). Due to this rather concentrated structure, the recent financial crisis has generated a number of serious impediments to financial markets, particularly with bank recapitalization through the FIDF: reaching some 12 % of GDP. This renders FIDF to become a major player in daily money market transactions, makes it almost impossible to separate noise from signals, or Repo activities from real money market conditions.

At present, the domestic money market can be divided into the interbank market, the Repo market, and the foreign exchange swap market. Daily trading volume of Repos is about 30 billion baht while volume on the interbank market is around 40 billion baht.

Table 2. Average Daily Volume as of June 2000 (bB)

Repo Market	
Overnight	10
14-day	15
Other	5
Total	30
Interbank Market	
1-day	10
2 days to 1 month	17
Other	13
Total	40

Source: IMF (2000).

The interbank market in Thailand involves uncollateralized direct loans between financial institutions. In Repo, on the other hand, the BOT as major counterparty currently takes no haircut on collateral (except 5 percent for Treasury bills) and prices the securities at their nominal value (no mark-to-market practices).

Almost all loans have maturities of less than two weeks, with overnight call loans as the most common duration. On demand side, foreign banks lacking the branch networks to mobilize deposits rely heavily on the interbank market to manage their liquidity. On supply, Thai

commercial banks and finance companies are by far the most active suppliers in the money market.

There is also a 1 (3.5 % including vault cash) percent reserve requirement on bank deposits. Reserves held at the BOT are unremunerated. The reserve maintenance period is 14 days averaged over 28 days. The reserves provide a buffer of liquidity in the absence of full standing facilities.

5.2 What is missing?

The BOT is handicapped in the implementation of monetary policy by limits on its capacity to actively intervene in domestic money markets. This is due to the short-term need to continually manage the funding of FIDF in the Repo market, and by the way in which open market operation are conducted. Against long-term structural developments, some market practices and thin secondary market conditions still inhibit the development of a private Repo market.

At the moment, the lack of a haircut does not pose as an urgent problem because the market value of bonds is above corresponding face value. However, these practices on haircut and pricing implicitly increase risks and prevent the development of a private Repo market, leaving BOT as the central counterparty.

Also, pricing collateral to market, both when initiating the Repo and during the life of the Repo, is important to the sound and efficient operation of Repo markets. The development of a secondary securities market is thus crucial to the development of a private Repo market as it improves pricing and provides actively traded collateral to the market.

In addition, the settlement systems between Repo market and cash market are not harmonized and inhibit market-making and arbitrage functions. The BOT currently uses two systems to settle securities transactions. The system used for Repo transactions is a book-entry system while the system for other transactions is a physical system. These two systems are not integrated and can bring liquidity risk for counterparties reducing incentives for arbitrage and market-making.

6. Policy Implications

It follows from the analysis above that if Thailand were to follow the broad principle of the more advanced economies in the sample studies, a more active liquidity management based on signaling via market-

oriented operations may be an appropriate path. Although an effective standing facility would also need to be established, this should be aimed to be only as a safety valve and strengthen signals in the market whose volatility is bound to increase with economic recovery, clouding yet again policy intentions.

Like the sample countries studied, the OMO approach will need to balance between short-term interest rate stability, policy discretion, and abuses prevention to ensure (i) an efficient functioning of the money market, (ii) market participants compiling and utilizing all necessary information effectively, and most importantly (iii) delivery of clear policy signals specified above.

Further, if the short-term variability of the monetary base of sample advanced economies of around 5 percent per month was to be used as a rough guide, there is perhaps room to increase the degree of volatility of monetary base on a month-by-month basis of around 2.5 percent (approximately 12.5 billion baht) at the maximum. Here, there is perhaps a need to emphasize that these changes in monetary base will only be short-term and can be either withdrawal or injection. The aim is not to create a permanent shift in the long-term money supply growth but rather to dampen interest rate volatility to strengthen policy credibility and thus the transmission mechanisms.

Here, market participants may look to the experiences of the more advanced economies and perhaps better prepare themselves for volatility both in terms of short-term money supply and exchange rates. This warning may be rather unnecessary given the volatility experienced over the recent past as a consequence of both the Y2K effects (in terms of money supply) and the regional environment (in terms of exchange rates). Nevertheless, the private sector could probably be assured that any degrees of volatility would only be within the boundaries specified by the authorities' monitoring and scrutiny measures on FX transactions with no underlying economic transactions as well as by strengthened regional economic and monetary cooperation framework.

Three questions may then be raised as to what would society, financial institutions and the Bank of Thailand gain from this approach? First, right at the heart of this approach is the aim to promote an efficient money market that presumably will ensure appropriate allocations of

resources, sustain growth and financial stability over the longer terms. Second, what would commercial banks and other financial institutions gain? The answer is more convenience in adjusting to their short-term liquidity needs as well as a channel to gather, analyze and disseminate information about other participants' (including the authorities) needs and market directions as a whole, all of which will be necessary to maintain their long-term profit performances. Third, what is the benefit for the Bank of Thailand? The obvious answer to this is the strengthened transmission mechanism (particularly in terms of the short and long rates link) that will enable it to steer the macro economy more effectively, in accordance with mandates given to it by the society, focusing around a sustainable economic development framework.

Perhaps needless to say, international experiences can only serve as a broad guideline and there are a number of parameters yet to be decided both in the context short-term post-crisis management and the long-term structural development paths. Some of these pending issues pertinent to open market operations are bond market developments (private Repo etc.) and the movements towards real time gross settlement system possibly around 24 hours a day. With the irreversible trend towards faster transactions among broader groups of participants with asymmetry of information, the value of clear communication strategy via policy signaling cannot be over-emphasized.

Here, some useful experiences of the more developed countries are the attempts to encourage market participants to trade among themselves as much as possible first e.g. via 'pre-settlement rounds'[30] before turning to the central bank, granting it a free hand to stabilize market rather than permanently engaged in liquidity management activities. Other than this, there is also a common although slow movement towards central banks' intervention in shorter maturity (especially overnight where they do have monopoly power) to maintain effectiveness of policy implementation.

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[30] This practice was adopted in some sample countries e.g. Australia, France, Germany, Japan, UK, US to effectively allow financial institutions to conduct at least one round of interbank borrowings after all the third party transfers have already ceased operations such that settlement positions are approximately known before approaching the central bank's end-of-day facility.

References

Alexander, W.E. et al. (1995), The Adoption of Indirect Instruments of Monetary Policy, IMF Occasional Paper No. 126, Washington, D.C.

Allen, Bill (2001). Current Issues in UK Market Operations, Centre for Central Banking Studies, March.

Axilrod, S. (1996). Transformation of Markets and Policy Instruments for Open Market Operations, IMF working paper No. 95/146. Washington D.C.

Bank of Thailand (1998), Thai Monetary System (in Thai), December 1998.

Batten, D.S. et al. (1990), The Conduct of Monetary Policy in the Major Industrial Countries: Instruments and Operating Procedures, International Monetary Fund Occasional Paper No. 70, Washington D.C.

Bennet, P. and Spence Hilton (1997). Falling Reserve Balances and the Federal Funds Rates, Federal Reserve Bank of New York, Current Issues in Economics and Finance, April.

Blinder, A. (1998), Central Banking in Theory and Practice, MIT.

Borio, C.E.V. (1997), The Implementation of Monetary Policy in Industrial Countries: A Survey, BIS Economic Papers no. 47, Basle.

Campbell, F. (1998 and 2001). The Implementation of Monetary Policy: Domestic Market Operations, Reserve Bank of Australia Teachers Seminar, www.rba.gov.au/publ/pu_teach_98_1.html

Cottarelli, C. and Curzio Giannini (1997). Credibility Without Rules? Monetary Frameworks in the Post-Bretton Woods Era, IMF Occasional Paper No. 154, Washington D.C.

Dornbusch, R. and Stanley Fischer (1994), Macro Economics sixth edition, McGraw-Hill.

Downes, J. and Jordan Elliot Goodman (1995). Dictionary of Finance and Investment Terms, 4th edition, Barron's Financial Guide.

ECB (1997). The Single Monetary Policy in Stage III: General Documentation on ECB Monetary Policy Instrument and Procedures, September. WWW.ECB.INT

Edey, M. (1996), The Future of the Financial System, Reserve Bank of Australia.

Fitch, Thomas et al. (1993). Dictionary of Banking Terms, 2nd edition, Barron's Business Guide.

FRB (undated). Training Materials on Implementation of Monetary Policy; Open Market Operations; Standing Facilities, Washington D.C.

Hardouvelis, G.A. (1994), The Term Structure of Spread and Future Changes in Long and Short Rates in the G7 Countries: Is there a Puzzle? Journal of Monetary Economics No. 33, pp. 255-83.

Hardy, D.C. (1997), Information Efficiency, Interest Rate Variability, And Central Bank Operations, IMF Working Paper No. WP/97/26.

Hardy, D.C. (1997), Market Information and Signaling in Central Bank Operations, or, How Often Should a Central Bank Intervene?, IMF Working Paper No. WP/97/28.

IMF (2000), Monetary Policy in Thailand during the transmission to Inflation Targeting, an Unpublished Report of a Mission to review Optimal Aspects of Monetary Policy in Thailand.

Kasman, B. (1992), A Comparison of Monetary Policy Operating Procedures in Six Industrial Countries, Federal Reserve Bank of New York Quarterly Review, Summer 1992, Volume 17 No. 2, pp. 5-24.

Kato, T.. (1999). Open Market Operations in Japan, SEACEN Course on Open Market Operations, Financial Market Department, Bank of Japan.

Lall, S. (1997). Speculative Attacks, Forward Market Intervention and the Classic Bear Squeeze, IMF Working Paper No. WP/97/164.

Mishkin, F.S. (1995). Symposium on Monetary Transmission Mechanism, Journal of Economic Perspectives Vol 9, No.4, pp. 3-10

Miyanoya, A. (2000). A Guide to Bank of Japan's Market Operations, Financial Market Department Working Paper Series 00-E-3, August.

Poole, W. (1970). Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model, Quarterly Journal of Economics Vol. 84, No 2, pp. 197-216.

RBNZ (1999). Monetary Policy Implementation: Changes to Operating Procedures, Reserve Bank of New Zealand Bulletin, volume 62 no. 1, March.

RBNZ (2000). Does a Stitch in Time Save Nine? , Reserve Bank of New Zealand Bulletin, Vol. 64 No. 1.

Sellon, G.H. and Ronald L. Teigen (1981). The Choice of Short-Run Targets for Monetary Policy, Economic Review 1981, pp. 3-16.

Sellon, G.H. and Stuart E. Weiner (1996). Monetary Policy without Reserve Requirements: Analytical Issues, Federal Reserve Bank of Kansas City Economic Review, Fourth Quarter.

Sellon, G.H. and Stuart E. Weiner (1997). Monetary Policy without Reserve Requirements: Case Studies and Options for the US, Federal Reserve Bank of Kansas City Economic Review, Second Quarter.

Sheng, H. and Reuven Glick (1988), Monetary Policy Change in Pacific Basin Countries, Kluwer Academic Publisher.

Smith, R.C. (1989), The Global Bankers, Trueman Talley Books, New York.

Woodward, R. (2000). Maestro: Greenspan's Fed and the American Boom, Simon & Schuster, New York.

CHARACTERISTICS	OVERVIEW	AUSTRALIA	CANADA	NEW ZEALAND
1. r Stabilization Methods General approach	r-volatility=>disrupt smooth functioning of fin mkt. 3 groups of countries - overnight interbank rate - tender rates / discretionary operations maturity mostly 1-2 weeks (1d-1m)	Zero reserve approach with deposit facility	Zero reserve approach with deposit facility	Zero reserve approach with deposit facility

2. Key Policy Variables	Depends on tolerance on O/N r fluctuations
	 - O/N rate ~ treated as operating target =>
	  v.high freq fluctuation o.k. if purely technical
	  But O/N r normally shadows policy rate
	 - Tender r & longer maturity => greater freedom
		O/N
		'cash rate' since 1990
		(manage to get within 5-10 bps)
			O/N
			Before market open ~ settlement of yesterday
			About 9.00: announce liquidity forecasts / bid /
			offer
				Official cash rate (OCR): an o/n r around which it is
				prepared to borrow or lend via Repo to settlement
				banks, introduced 17 March 99; in 25 bps multiple

3. Operating Target	To make sure that MP is effective, central bank sometimes seeks feedbacks from a different market from where it operates, incl market expectations	O/N cash rate target	O/N with a 50 bps band in line with 3m Tbill weekly tender rate & 90d prime corporate paper rate Also target end-of-day reserve position with unusual precision	90-day rates

4. Corridor	Mostly ~ Standing Facilites at posted rates
	 - Lower bound ~ subsidized lending facility
	 - Upper bound ~restricted or granted at
	  maturity>1d
	Steering r within corridor by
	 - Discretionary market operations
	 - Various signalling mechanisms
		50 bps
		 - O/N Repo credit ~ cash r + 25 bps
		 - Exchange Settlement A/C balances ~
		  cash r - 25 bps
			Limits are set by discretionary operations whose
			impacts on end-of-day liquidity is actually
			sterilized.
			 - Implicit corridor of plus/minus 25 bps (IMF
			  report)
			 - Special Purchase and Resale Agreement
			  (SPRA) ~ ceiling => "bank rate"
			 - Sale and Repurchase Agreement (SRA)
			  ~ lower bound (including outright)
				OCR plus/minus 0.25% with no limits, supplement by
				 - float tender
				 - Reserve Bank Bills discount with penal rate (plus 90 bps)
				  reduced in 1991
				 - remunerated positive balances
				 - RBNZ RP rate ~ upper bound
				 - RBNZ remuneration on settlement balances ~ lower bound

4.1 How active is Standing Facility	Not active unless mistake in liq forecasts or inefficiency in the system, or RR absence		Increasing with LVTS (previously repeated uses in 1 maintenance period => penal rate) - RP still indicator of policy stance - Free access after Nov 91 => zero RR in June 92 (finish 94)	
4.2 Marginal accommodation - discretion - interest rates charged - frequency of uses	Represent and extreme ceiling of the corridor - to prevent too frequent uses & ensure market equilibrium - usually at penal rates - often rare	Rediscount Yes merket + 0.75% very rare	Overdraft No Bank rate (plus penalty on cumulative avg. deficiency) active	Rediscount Yes mkt + 0.9% rare
5. Signalling Strategy	- r-target announcement - deviation from "normal" RR fulfilment patterns - Compare Liq forecast with actual supply	r Target Announcement since Jan 90	Explicit 50 bp r-band since Jun 94; announced Jan 96 - Validated by offer to enter into RP transactions - Additional transfer of Gov Deposits to alleviate / absorb liquidity problems (termed "drawdown / redeposit) EOD	RBNZ increasingly relied on "signalling statements" that were released to encourage financial market prices to move in an appropriate direction, through different mechanism at different time e.g. - Slope of yield curve - Exchange rate - MCI (from early 97-Mar 99); & OCR since

6. Strategy for Offsetting
Reserve Shocks
	Two ways
	 - RR as Buffer
	  Normally Averaging 1m
	 - Active Liquidity Management (*increasing
	  recently)
	 - Effectiveness depends on ability to forecast
	  shocks
		No RR or not Allow RR to be used for settlement
		 - 2d averaging with carry-over=>O/N Cr at 0 cost
		 - Central bank generally intervenes once a day
			No RR or not Allow RR to be used for settlement
			 - Also allow reserve averaging => limit r variability
			  0 RR with 1m averaging
			 - Central bank generally intervenes once a day
				- RBNZ upto 3/d: 9-12, 13-16, 7.30-8 next day

6.1 Liquidity Forecast	Liquidity management activism works only if accurate forecasts=> Volume, maturity & frequency - Most difficult usually net lending to government	Without RR and averaging provisionings & less use of buffer mechanism e.g. standing facilities => also forecast further ahead - Participants can choose settlement date T or T+1		The indicative conditional forward path of MP, contained in the projections included with RBNZs MP statements, continues to be expressed in MCI If there is high demand for settlement cash balance, RBNZ will provide funds through longer than O/N RP

CHARACTERISTICS	OVERVIEW	AUSTRALIA	CANADA	NEW ZEALAND
6.2 Forecast of RR vs. Working balances	Where RR~semi-lagged or almost contemporaneous Efforts are devoted to forecast RR itself - Can be modelled or surveyed, or judgemental			Rolling projected eod settlement a/c balances are noted on RBNZ electronic news service page - O/N Repo outstanding & total autorepos rolled-rolled-over as well as settlement cash estimate are also published early in the morning
6.3 Publish Liq Forecast	Most central banks do not make forecasts public	Central bank does make liq forecasts public - 9.30 Announce system cash position; RBA dealing intention; participants submit r & volume - If forecasting error => second round		Publish policy intent, desired ST r and exchange rate
7. Instruments Used 7.1 Repo	RP (and reversed Repo) more popular > outright - RP not require liquid underlying market but helps to develop security market - Have only indirect impact on Pr of securities - Break link between maturity of paper & transaction - Private Repo markets => popularize even more Issue own or Gov paper in primary market Weekly RP to induce shortage in liquidity Choice of underlying instruments ~ emphasis on liquidity	Use flexible maturities to pre-empt reserve shocks Two types of OMO ~ 900 m$/d - Outright ~ Commonwealth Government Securities (CGS) - RP (90%) ~ CGS & State Gov securities - Occasional FX swap	Mainly through Transfer of Gov deposits instead of RP Also weekly tender - Both outright and RP (3m Tbill tender) - All OMOs are sterilized by TGD (hence no volume effects)	Repo - more quantity-oriented than ST r i.e. "settlement cash" target - use 63d RBNZ bills (28d or less remaining maturity) ~ OMO - recently O/N or longer depending on the strength of Md
7.2 Reserve Requirements	RR => 4 functions - Buffer function: stabilize O/N r (most common) - Liq Management Function: Represent a source of demand for Reserves =>offset shocks - Monetary Control Function: control Ms - Income & Tax Function: on financial system i.e. not allowed for settlement purpose and holding period lags the calculation period	Yes (~1% since 90) but not binding - Tax purpose e.g. Aus Special Deposits ~ seigniorage	Full elimination of RR in June 1994 (started 1992) Before: the maintenance period 15d-1m	Elimination in mid-1980s
7.3 Lags between A/C & Maintenance period	Lags or semi-lags to limit uncertainty of amount of balances to be held			
7.4 Reserve Averaging period	Most countries have averaging periods (upto 1m)		~1m period	No
7.5 Vault Cash Accounting	Some countries count vault cash as part of Reserves: - Security risks - Transportation costs - Competitive equality			
8. Pushing Demand to the Right beyond Working Balances to increase r-sensitivity	Typically working balances => insensitive to r - Pre-settlement rounds plus active monitoring and management of cash position during the day - Expectation to finance imbalance at non-penal r - Existence of efficient interbank market Blend of liquidity and signalling effects - Find out directly how much CBs target balances - Distinguish technical liq operations from signals Discretionary EOD O/D in RR averaging		Use uncertainty in end-of-day positions by - Transferring Gov dep after interbank closes i.e. in the following morning before mkt open (T+1) =>Settlement retroactively with value date T Deficit banks need to draw on BOC O/Ds - i.e. EOD settlement occurs following morning & backdated - Not knowing how much to count on BOC => estimate own demand for Reserves accurately	Set settlement cash balance target such that banking system ~ occasionally short - More recently move to r target
9. Legal Requirement for Private to Settle only on Central Bank's Money	Banks are legally required to settle on the books of the central bank in a few cases.	Yes	Yes for 12 banks and nonbank direct clearers	No but there are 11 banks with settlement account with RBNZ

CHARACTERISTICS	OVERVIEW	AUSTRALIA	CANADA	NEW ZEALAND
10. Handling financial Innovation & Banks' willingness to arbitrage	RTGS requires more reserve balances > net settlement system	RTGS June 98 - Intraday Repo facility ~ reversed EOD	Large Value (net) Transfer System late 97 => - Eliminate uncertainty about settlement balances - No need for averaging - Zero settlement balances supply everyday - Cleared through O/N auction for Gov Deposits	RTGS => introduce intra day RP
11. Remunerated Reserves		Since Aug 96: interest on electronic settlement balances ~ cash rate - 0.1% => cash rate - 0.25% from Oct 97	Under new system: bank rate ~ ceiling & BOC deposits => bank rate - 50 bps	Yes at 3% below 7d cash rate for first 20m$
12. FX Intervention	Except under attack, Fx intervention =>not major shock - FX settlement 2d => known ahead of OMO			
13. Handling of Gov Deposits	Vary from country to country - Ensure that surplus balances are invested in the market, some with limits on O/N market		BOC uses transfer of Gov Deposits between BOC and clearer banks => sterilized OMO	
14. Regular Interval OMO	Most central banks have at least one - Partly for basic liquidity management - Timing bears close relations to maintenance period - Act as keynote operation => tone of MP	Reversed transactions averaged 7d; once a day	Weekly participation in 3m T-bill tender and purchase of LT Gov bonds at issue	
15. Calibrating day-to-day market condition at short notice or fine-tuning	Both countries with or w/o RR - RR Buffer ~ insufficient or sparse regular intervention Increased importance recently because - Reduction in RR - Greater sensitivity to dom & int developments	monthly	Transfer of Gov deposits 1/d - Allocations are bid 2/m by banks - Others include: purchase of ST Gov sec & RP	Every six weeks with full forecasts quarterly - possible to make unscheduled r adjustments - Aim to leave a pre-determined level in a/c eod. - This level has no policy significance & st. freq rev.
16. Gross (or "rough") tuning	Usually longer maturity - Repond to predictable patterns e.g. seasonal or FX intervention			
17. Counterparty Ranges	Pros anc cons of market-makers - Operational efficiency vs. broad participation - Also depending on instruments used, e.g. FX swap usually done on bilateral basis at ruling market prices	Authorised money market dealers earlier. Since Aug 96 ~ all major financial institutions Reserve Bank Information & Transfer System (RITS): 148 member - 52 banks - 96 non-banks Deal regularly with a dozen institutions (1/2 ~ banks)	Include non-bank financial institutions	Broader recently
18. Main Settlemet System - Presettlement round - Intraday monitoring		Net => RTGS Yes Yes	Net => LVTS No No	=> RTGS

Appendix A: International Comparisons (Cont.

Source: Borio (1977); Sellon and Weiner (1996)

CHARACTERISTICS	UK	THAI	FRANCE
1. r Stabilization Methods General approach	Zero reserve approach + active daily liquidity management No remuneration on deposits yet 9.45: announce estimated shortage / surplus 12.00: second assessment 2.30: third round	Market-oriented: switching from monetary targeting towards signaling approach	Reserve accumulation pattern management Occasional reverse repo
2. Key Policy Variables	tender:1-33d (avg2 wks) laregly fixed rates dealing rates" narrower & shorter since Mar 97 SONIA~Sterling O/N Index Average Attach little importance to O/N r =>long maturity focus	RP 14d Tender: 1d - 6m	Official tender-7d (5-10d) Referred to as 'intervention rate' once-twice / week (Early morning bid)
3. Operating Target	ST 30-90d & Mo Also CB base lending rate; 3m interbank loan rate Monetary aggregate (since mid-70s-Mar 87)	Monitor yield curve closely	O/N (interbank) Previously monetary aggregate until earlu 90s Since then, still monitor M3
4. Corridor	A number of facilities ~ceiling - deviation of 1-3m r from stop rate monitored closely - also late-day lending directly to settlement banks since Mar 97 BOE lending at 15.55 at 25 bps above market, penalty accelerates afterwards upto 150 bps for disc houses Ceiling ~ Minimum lending rates (~Lombard type) before 81; 85 Floor: Occasional reverse Repo in the afternoon - same day settlement (can also be initiated by disc houses)	Intervention is largely passive and involves the BOT borrowing or lending at a rate plus/minus 6 basis points arount the target - Excess bid/offer at 14d all absorbed by BOT-like a S.Facilty	Corridor of 150 bps - Official tender ~ 50-70 bps < interbank - 5-7d standing Repo ~ analogous to GR Lombard access is discretionary ~ intervention rate + 150 bps - Also transfer of Gov Dep ~ reinforce floor
4.1 How active is Standing Facility	BOE end of day assistance is discretionary. Depending on whether BOE's faults or market participants'; also depending on counterparties: priority settlemt bks	Three windows available: penalty rate upto 6% - Commercial bill rediscount (phasing out) - Intra-day Liquidity Fund: for settlement purposes - Repo late hour	
4.2 Marginal accommodation - discretion - interest rates charged - frequency of uses	Overdraft Yes Usually base rate + 1% occasional	Overdraft RP(t-1) + 6.5% (payment system penalty) or Max RP + 2.5%	Overdraft Yes 5-10d rate + 2% (Max) rare
5. Signalling Strategy	Before: 2.30 pm ~ "Stop rate" plus "2.30 pm lending" Since ERM crisis in 92 => announce 14d r target 2.30 lending ~ publish	RP14d	RP5-10d
6. Strategy for Offsetting Reserve Shocks	No RR or not Allow RR to be used for settlement - BOE operates upto 3 times/ day:9.45,12.00,14.30 - 0 RR with no averaging	RR Effective	RR Effective - But RR so low that compromise buffer function
6.1 Liquidity Forecast	Without RR and averaging provisionings & less use of buffer mechanism e.g. standing facilities => also forecast further ahead Intraday revisions are also possible.		In France, the main horizon is determined by the maturity of the twice-weekly tender

CHARACTERISTICS	UK	THAI	FRANCE
6.2 Forecast of RR vs. Working balances	BOE talks to discount houses regularly on daily basis Also ask clearing banks to specify their 'target' reserve balance on daily basis	28d horizon (14d accounting+14d maintenance): not announced - Based on swaps and repos unwinding - Government financing requirements	
6.3 Publish Liq Forecast	Central bank does make liq forecasts public - Also publish dealing rates later	Best bids & offer with details ~ published on Reuters realtime - Real time since Oct 96	
7. Instruments Used 7.1 Repo	Outright purchase of eligible bills - Possible <= deep commercial bills markets - Since 94, BOE uses more Repo - Open private repo market since Jan 96 Use varying frequency & variety of operations to offset (pre-empt) reserve shocks - Rapid growth in gilt repo (established in 96) Weekly T-bill tenders Also Gilt-Repo since Mar 97; Euro area bond (99)	Also securities outright transactions & BOT bonds auctions - Mainly ~ Repo and reversed repo esp. for dom banks using continuous-matchning method Changed from Dutch Auction to continuous matching on7 Oct 96 Two rounds - 9.30 - 10.30 - 15.30 - 16.30 Established 1979 Also issued BOT bonds began 1987: 10bB => max 130bB in 97	Repo sometimes used for fine-tuning or as a structual source of central bank money - Possible <= large debt markets Two types - Official tender ~ avg maturity 3 weeks - Standing RP ~ 5-10 d
7.2 Reserve Requirements	Yes but not binding for over a decade - Tax purpose only e.g. UK Cash Ratio Deposits of 0.35% for 6m at a time. Since RTGS (96), however, 'Cash' can be used for intraday settlements - Intraday repo facility unwound in the same day	1% on bank deposits 2.5% vault cash 2.5% Gov Bonds Total 6% - Reserve provides a buffer of liquidity in absence of S.Facilty	Repo with dom nonbanks exempted from RR: Feb97 maintenance period ~ 1 month
7.3 Lags between A/C & Maintenance period	3m	14d	- Also allow for some carry-over across periods
7.4 Reserve Averaging period	(6m)		
7.5 Vault Cash Accounting			Vault cash first included in Oct 90 => drop deposits at central bank (80 to 20 bFF) => 92 response by - Intro special collateralized current accounts - Step monitor towards end of day - Contact leading bank directly - Bilateral operations if necessary
8. Pushing Demand to the Right beyond Working Balances to increase r-sensitivity	Weekly T-bill tender (disc houses underwrite) - Keynote operations can only inject - induce an ex ante net liquidity shortage Stop over-funding Public Sector Borrowing Requirement (PSBR) temporarily 85-89 because of automatic drain by maturing commercial bill RP ~ sufficient After 89 ~ resume 300-800 mP/wk		
9. Legal Requirement for Private to Settle only on Central Bank's Money	No but there are 15 clearing bnks with settlemnt account at BOE		If subject to RR entering into transactions with central bank

CHARACTERISTICS	UK	THAI	FRANCE
10. Handling financial Innovation & Banks' willingness to arbitrage	Significant changes since 92: almost no trade at 2.30 pm after announcing explicit interest rate target		
11. Remunerated Reserves	No interest on positive balances	no	
12. FX Intervention		Onshore FX swaps are also used to provide ST baht liquidity - Particularly for foreign banks	
13. Handling of Gov Deposits	Aim to offset by OMO		- Ensure that surplus balances are invested
14. Regular Interval OMO	Outright transactions 1-33d Maximum three daily: 9.45, 15.30, 16.20		RP 7d twice a week RP tender offer is the primary instrument to change supply of reserves
15. Calibrating day-to-day market condition at short notice or fine-tuning	monthly	six weekly & twice / week	RP 24-48 hrs or outright purchase or sales of Tbills => confirm stance
16. Gross (or "rough") tuning			Outright purchase of Gov Sec Usually announced but not frequently used because of limited size of Tbill market
17. Counterparty Ranges	In UK, each market operation and standard facility has a specific set of counterparties - Keynote => discount houses only - Weekly T-bill tenders => No restriction Two types (total 20 approximately) - Settlement banks (~15) since Mar 97 - Discounthouses: traditionally intermediate between BOE and settlement banks	Banks and nonbank financial institutions Including primary dealers appointed recently - 13 banks + 5 other specialized institutions + a no. of SEs - 10 recently appointed primary dealers	France attempts to strike a balance. In the twice-wkly tenders, all banks can bid but the bids are channelled through a few principal market operators (OPMs) - Thus MP impacts through interbank market - ST RP for fine-tuning => restricted no. of FIs
18. Main Settlemet System - Presettlement round - Intraday monitoring	RTGS Yes Yes		Net Yes Exist but rarely used

CHARACTERISTICS	GERMANY	JAPAN	US	ECB
1. r Stabilization Methods General approach	Reserve accumulation pattern management Occasional reverse repo	Reserve accumulation pattern management (recently moving back to settlement balance taget) Use early intervention to stabilize rate & freq forcast revision & same day settlement operations ~ r volatility < 0.05% Since late 70s: credit control & regulate r moving more towards monetary control with flexible interest rates (6 members: Governor + 1MOF + 4 Private)	Deciding between - Providing incentives to hold more reserves - Zero reserve approach Compromise: "Clearing balances"~ implicit remuneration OMO discovered 1922 12 members (7BoG+4Reg Fed+1NY) FOMC	Reserve accumulation pattern management Cocktail of NCBs' approaches Started 1 Jan 99 (11 members)
2. Key Policy Variables	tender-14d (3 pm submission)	O/N max 6m discount rate until Mar 95 Since then, OMO => ST r fell below discount rates (Jul 95)	O/N (1-7d) max 15d RP ~ morning after 15m conference call (10.2) Outright ~ at various time during the day (usually early afternoon)	ST interest rate 14d Repo Standard Tender: Announce 3.30 pm => 11.15 am next day
3. Operating Target	O/N Largely M3 with due consideration to r-stability Also RP rate (1-2m) Interbank 3m	Uncollateralized O/N call rate (since late 70s) Shortening in steps from 2-3m=>1-3wks=>O/N Switch to settlement balance in 2001 to be consistent with zero rate' policy (4tY => 5tY) ~ r = 0.02-0.03% since Feb 99 via FIs' Current Account Balances (CAB) at BOJ Monetary aggregate 'projection' (from mid-78 to 79) +emphasis on call & bill disc rates; also 2m bill disc r (from 89)	O/N Fed Funds Rate prior to Oct 79 & since July 95 Before: discount rate; monetary aggregate (since mid-70s); non-borrowed reserves (net disc window from Oct 79-82); borrowed reserves from 82; reserve pressure (translated into borrowing targets e.g. 33 m$/1bp in 88) i.e. Borrowing ~ 221 + 3.3 /r	Combined money and inflation target
4. Corridor	Bundesbank occasionally issued "liquidity paper" 200 bps - Sales of Tbill (3d) .25% below RP rates => set floor to interest rates - Bundesbank may resist downward pressure on o/n r by allowing reserve to run down near end-maintenance period=>raising impacts of Lombard rate - Lombard ~ RP+1%	BOJ employ disc window as active liq management at discretionary amount & maturity, recallable at will. Since July 95, call r fell below disc r=>ineffective since - Disc window ~ below market (abandoned Jan 96) (over 10% of BOJ assets in early 90s) - Floor: option of withdrawing outstanding loans at will => eliminate excess liquidity	The US discount window has been to limit pressure on o/n r to avoid end-of-day o/d. Allowed only when CBs cannot obtains funds at reasonable cost. Since early 90s, fin distress => disc window phobia. r < market - Upside penalty 2-4% if daily reserves < 0 or 14d avg<RR	Penalty significantly above market or non-interest bearing deposit requirement - bound by standing facility ~ discretionary r - fixed term deposit r ~ floor: equal to main refinancing operations during the period via quick tender or bilateral procedures (no collateral required)
4.1 How active is Standing Facility	Usually Lombard ~ O/N but can be longer (upto one week) depending on maturity of securities rediscounted	Alternate injection / withdrawal up to four times / day - Direct lending through disc window to FIs especially banks~ most flexible instrument typically used to smooth intraday fluctuations (a unique feature)	Disc lending is designed to provide for unexpected liquidity needs especially at end of maintenance period. Frequent uses => limit future access	Two standing facility: deposit & loan ~ NCB's rates - O/N maturity - No limit but collateralized For FIs subject to RR ~ eligible; go thru NCBs before 18.00
4.2 Marginal accommodation - discretion - interest rates charged - frequency of uses	Lombard Yes Lombard (discount + 2) rare Discount facility now <1/3 of Bundesbank's refinance	Discount Yes Discount (add 1 day) ~ can be penal very rare	Discount / overdraft Yes O/N-0.5% to O/N + 4% infrequent	
5. Signalling Strategy	Allow RP rates to drift up & touching before adjusting Lombard rate to confirm a shift in stance	O/N Call rate guideline - From 95, communicate thru quantitative signals - Reinforced by changes in discount rate - Supplementary statements on desired operating objectives Monitor "reserves progress ratio" - 9.20 am: amount of daily funds provisioned ~ finalized	Explicit Fed Funds Target since Feb 94 This helps limit the concern that r-volatility could cloud policy intentions.	
6. Strategy for Offsetting Reserve Shocks	RR Effective - Regular weekly tender only Fine-tuning operations ~ rare (ex unification)	RR Effective - Publish average remaining required reserves - BOJ operates upto 3/day	RR Effective - Ava period 2wks => limit absorption liq fluctuatn - Sweep A/C => RR ineffective - Fed intervenes several times / week	
6.1 Liquidity Forecast	The main forecasts are generally revised daily, although the information regarding the net liquidity position for the maintenance period as a whole may be acted upon only at the time of the subsequent regular tender operation	BOJ has difficulties forecasting cash holding (volatility of cash ~ 7 times US; treasury a/c ~ 4 times US) - Forecast up to 3m ahead - then revised and refined to 1m, 1w, 1d ahead - daily forecasts revised several times / day 5.30 pm: announce projection of next day	1d up to 2 maintenance period ahead - Regularly revised on a daily basis - Jun / Jul: Review target for current year + provisional target for next year - Jan / Feb: Finalized target for the year	

CHARACTERISTICS	GERMANY	JAPAN	US	ECB
6.2 Forecast of RR vs. Working balances	Forecast RR based on M3 path	BOJ gets information from FIs and Gov agencies daily BOJ also contacts the major banks directly to ensure smooth interbank net settlements (3/d) through (33) branches network	Demand for excess reserves is also partly modelled.	
6.3 Publish Liq Forecast		Central bank does disclose liq forecasts & actual outcome (signal) Since Dec 89, real time notification and bid results Also release total CAB since Apr 99	Talk to primary dealers; large money center banks; Treasury + own forecasts => 10.30 announcement: state terms but not size - Notify successful bidders early afternoon Also from 94-95, disclose MP (incl inter-meeting) decisions immediately after they are made (from 5-8 wks lag previously) Minutes released Friday after next meeting	
7. Instruments Used 7.1 Repo	Repo maturity 4-63 days avg. 14d (avg. 1 / wk) - depends on previous RP maturing There are three types of tender. (87 market crash => signif /\) - Volume tender ~ clear r signal - r tender (US bidding system since Sep 88) => different settlement rates) - Two tranches tender scheme (combined) also since Sep 88 ST money market not well developed outside interbank => uses - bill redisc (falling share recently) - RP of bonds (increasing since mid-80s)	Regular purchase Gov Bonds => fulfil legal obligation to supply base money to support economic growth - Call market ~ same day settlement 9.20 am - Other Repo ~ 1-2d normally offered at 9.20;10.10;12.10 - Approximately 10 instruments in total Tbill operations 90; JGB Repo 97; Also move more towards competitive bidding To inject/withdraw liquidity alternately from 9.20 onwards - Transfer made at the rate submitted by bidders (US system)	Periodic purchases and infrequent sales of Gov Sec=> "permanent" additions / withdrawals of reserves - RP (1-7d)-same day settlement (mkt vol. 150 b$ per day) - Outright if > 4b$ & > 4 wks consecutively (max 10 times/@) next day settlement; comprehensive maturity coverage Split into small lots since late 95 for ease of trading Mostly through secondary Gov sec market	Public and private debt instruments at ECB discretion - Outright, repo, or pledged (in case collat loans) - Two tier criteria: European & national standards mrketability Once enlisted => eligible throughout Euro area but tier II not done by outright - Issuance of debt certificates - FX swaps - Collection of fixed term deposits OMO weekly; max maturity 2 wks; meet fortnightly - Use both Dutch and American Auctions
7.2 Reserve Requirements	Repo with dom nonbanks exempted from RR: Jan97 - Bundesbank often defends RR stabilizing property maintenance period ~ 1 month	1m maintenance First introduced in 1957 Basis for 'normal' level of settlement balances	3-10% on transaction accounts with 4% excess/deficit carryover US cut RR => high r variability late 90-91 because reserve held < working balances temporarily - Exacerbated by reluctance to use disc window - RR for monetary control fn: only Oct 79 - Oct 82 80: Voluntary clearing balances once established ~ binding - Like RR ~ penalty for shortfalls 90&92: Lower RR 12=>10% (trans a/c) & 3=>0% (non-trans a/c)	1m maintenance period - For reserve accumulation pattern management rates according to balance sheet composition
7.3 Lags between A/C & Maintenance period	15d		- Almost no lag between end of calculation and maintenance period => more quantity-oriented approach but compensate by carry-over periods 14d, 2d lag	
7.4 Reserve Averaging period			In 1992, Fed doubled carryover (to 8%)	1m maintenance with averaging; based on 23rd of last month-24th of this month
7.5 Vault Cash Accounting	Vault cash included in RR until 1995. Excluded since for fear of compromising buffer function of RR		In the US, most financial institutions are now in a position to fulfil their requirements exclusively with vault cash ('non-bound' institutions). - Rules modified in 1992=> more flexible - Past removed 1917 but restored in 1959	
8. Pushing Demand to the Right beyond Working Balances to increase r-sensitivity	RP bid to allocation ratio generally < 50 percent			
9. Legal Requirement for Private to Settle only on Central Bank's Money				

CHARACTERISTICS	GERMANY	JAPAN	US	ECB
10. Handling financial Innovation & Banks' willingness to arbitrage		Late 70s: rapid development in CDs & Gensaki (RP) Transactn Euro-yen => loss of control over r => emphasis on r > Md Nov. 88 => integrate interbank and OMO via more ST(1 - 3wks) closely matching OMO maturity => increased arbitrage & commercial paper discount from 89	Since around 94, banks shift retail deposits at the end of the day from chequing or demand deposits to non-reservable money market accounts (SWEEP) => Greater reluctance to arbitrage over maintenance. => lowest RR in 30 years	
11. Remunerated Reserves		No	Over and above RR, banks also precommit to hold on average over the maintenance period an amount of clearing balances ("required clearing balances"). independent of transactions deposits: implicit remuneration ~ offset psyment services costs	With fixed formula related to market or official rates
12. FX Intervention				
13. Handling of Gov Deposits	- Ensure that surplus balances are invested	BOJ handles all Gov financing account => large fluctuation	Part of Gov Tr done through Tax and Loan A/Cs in private Fls size limited by collaterals: Normal TT&L a/c 5 b$ target - Aim: Ensure that surplus balances are invested	
14. Regular Interval OMO	Weekly tender ~ 14d	Reversed transactions 1-90d; - Outright transactions to supply LT reserves recently 2/m ~ 200 bY each (JGB only usually 10 yrs maturity) - Before: adjust direct lending to banks & intervene in interbk money market ~ bill discount	Reverse transactions 1-15d; 1/d Discount r ~ signal until announced Fed Funds target rates	Weekly ~ main RP operation - maturity 2 wks by national central banks (NCBs) - standard tender - Both fixed and variable rates possible
15. Calibrating day-to-day market condition at short notice or fine-tuning	Sale of ST Tbills (3d), FX swap (3m); shift of Gov Dep (ST at market rates) & Lombard loans to smooth r - Disc window not aim to offset shocks	Discount window lending => smooth day-to-day fluctuation	six weekly	Adhoc => steering r; outright/RP/FX swaps/Fixed Dep - Quck tender RP or bilateral outright Governing Council decides - FX swap ~ maturity & frequency flexible
16. Gross (or "rough") tuning		Outright purchase of Gov Sec - Public auction of ST Gov Financing Bills (FBs) since Apr 99 TB&FB Repo constituted almost half of OMO the rest are in JGB & CP - In the past: also deal outside interbank market in LT government bonds - LT OMO to offset seasonal fluctuation in Md	Outright purchase of Gov Sec	Regular long-term financing operations: standard tender once a month with 3m maturity: NCBs ~ rate taker - Issuance of debt certificates: NCBs standard tender/ bilateral outright ~ structural operations
17. Counterparty Ranges	Participation in regular auctions is open to all credit institutions subject to RR	Total 192 (82 Sec Cos; 79 Bnks; 31 Others) - Publish criteria for selecting counterparties - Active bid/offer; past successful bids - Expeditiously & accurately process transactions - Provide market information - Hold CAB with BOJ; BOJ-net members - Creditworthiness Purchase / sales of bills ~ 6 tanshi Cos(money mkt broker/dealer)	The Fed deals with only a restricted group of primary dealers (37-46) - Must be CBs under Fed or brokers / dealers under SEC - Substantial trading - Provide information & analysis (daily phone calls min 2/d) - Participate meaningfully in Treasury auctions	Broad ranges for both OMO & standing facilities - Uniform criteria e.g. RR compliance - Fine-tuning may be more restricted 3 types - Standard tender 24 hrs all eligible ~ 800+ - Quick tender 1 hr with narrow counterparties ~ active ones - Bilateral 1-2 parties incl. stock exchange & market agents FX swaps ~ with active players in Euro area
18. Main Settlemet System - Presettlement round - Intraday monitoring	Net / RTGS Yes No	Designated-time (net) settlement => RTGS:9; 1pm*;3pm;5pm Yes (1pm most popular because morning cash shortage) Yes (BOJ-Net intro Nov 91)	RTGS Yes Yes	

Appendix B

A Monetary Accommodation Index

In simplest form, the balance sheet of a central bank may be represented as in Figure B.1. Effectively, a central bank provides a public utility in the forms of a means of exchange -- money -- by issuing its own liability to the public (currency in circulation) and to financial institutions (reserve deposits). The resources that central bank mobilize through this method are then allocated to finance central government and public enterprise activities (CG net), to lend to commercial banks and other financial institutions (Claims on bank), and to hold international reserves (FA net).

Central Bank Balance Sheet

Vaez-Zadeh (1991)

- **FA (net)**
- **CG (net)**
- **Claims on Bank (gross)**

- **Currency in Circ**
- **Reserve Dep**
- **Other Item (net) - Capital Acc.**

Figure B.1: A simplified central bank's balance sheet.

The sum of currency in circulation and reserve deposits represent the bulk of the central bank's liability and is equal to the monetary base which is the core of the means of exchange and financial intermediation in the economy. In addition to this liability, however, a central bank may also fund its activity out of its own pocket (Capital Account) as well as gains (or losses) from valuation changes lumped together as other items net (OTH).

In summary thus, the amount of monetary base can be written as:

$$(1)\ Mb = NFA + NDCG + DCP + OTH;\ or$$
$$m = f + g + b + o$$

Given this identity, the variance of Mb may be derived as:

$$(2)\ \sigma^2_m = \sigma^2_f + \sigma^2_g + \sigma^2_b + 2\sigma_{fg} + 2\sigma_{gb} + 2\sigma_{fb} + [2\sigma_{fo} + 2\sigma_{go} + 2\sigma_{bo} + \sigma^2_o]$$

Assuming that open market operations may be narrowly defined as the attempts by central bank to reduce variance of m by (outright) buying/selling government bonds (g) or lending to/recalling loans from the commercial banks (b) via repurchase agreements and other methods. Hence, from theory σ_{fg} and σ_{fb} are expected to be less than zero representing central bank's sterilization of capital flows by open market operation and repurchase agreements, respectively. These inferences are, in fact, confirmed by experiences of the sample countries for most of the sampling period. The covariance σ_{gb}, on other hand, represents coordination between outright transactions and repurchase agreements which also arise from open market operations as a consequence of conscious policy.

Without these sterilization efforts, variance of monetary base would presumably have been somewhat higher and could be written as

$$(3)\ \sigma^2_m{}^* = \sigma^2_m - 2\sigma_{fg} - 2\sigma_{gb} - 2\sigma_{fb} > \sigma^2_m\ \text{since}\ 2\sigma_{fg};\ 2\sigma_{gb};\ 2\sigma_{fb} < 0$$

And thus, the effects of open market operations on variance of m may be written as:

$$(4)\ OMO = (-2\sigma_{fg} - 2\sigma_{gb} - 2\sigma_{fb})\ /\ \sigma^2_m{}^*$$

Since the other item (o) consists of central bank's capital account and valuation changes which are out of its control, the terms $[2\sigma_{fo} + 2\sigma_{go} + 2\sigma_{bo} + \sigma^2_o]$ could not be attributed to the open market operations. Given this relationship, the degree of central bank's accommodation may be written as:

$$(5)\ Accommodation = \sigma^2_m\ /\ \sigma^2_m{}^*$$

Appendix C
Empirical Relationships between Short and Long Rates

In this appendix, the relationships between short-term and long-term interest rates in the nine sample countries are quantitatively estimated. Here, the short-term rates are represented by the money market rates while the long-term rates are approximated by the 3-month deposit and the prime lending rate as reported in the IFS from the 1950s onwards to the present.

These relationships are first grasped roughly by cross-correlations between the short and long rates, using quarterly data the short-term fluctuations of which have been somewhat smoothed out. From this simple calculation, it was found that most of the relationships are contemporaneous rather than lagged. The degree of correlations are generally quite high, which is confirmed in the next cointegration test with all Eigen values over 95 percent significant. It may be noted, however, that the cross correlations utilize all of the sample from 1950s to the present and thus do not allow for short-term dynamics captured in the 36-month moving average of 12-month moving correlations approach below.

Since correlations do not imply causal relationships, the Granger causality test was conducted next on these rates. From these last tests, it was found that most causal relationships run from short to long rates during 1985-2000. (The choice of the period of analysis was determined by the fact that prior to mid-1980s, a number of sample countries were still significantly under administrative systems, whereby market operations were not expected to be effective as in fact was the case empirically). On the money market - prime lending rate, this relationship running from short to long rates was confirmed for almost all sample countries (allowing up to 5 quarter lags) except Canada and Japan where the relationships appear to run both ways. On money market-deposit rates, the short-to-long rates links were confirmed in all except Germany where the relationships were rejected for both ways.

Based on these findings, the 36-month moving average or 12-month backward moving correlations between the short and long rates were used to indicate degrees of "effectiveness" of monetary policy during different periods in section 4.3. The 36-month moving average was done to eliminate short-term breaks which usually represents commercial banks' inability to respond to policy immediately, and that it usually takes up to a few years for monetary policy come into effects (Blinder 1998).

Table C5

CAUSALITY TEST : MARKET & DEPOSIT RATE

(test period : 1985-2000)

	Ha	F-Stat	Prob	Result	(no.of lags)
AUSTRALIA	RD CAUSE RS	0.00257	0.95974	Rejected	1
	RS CAUSE RD	25.5647	0.0000046	Accepted**	1
CANADA	RD CAUSE RS	1.45771	0.24103	Rejected	2
	RS CAUSE RD	4.1071	0.02138	Accepted*	2
ENGLAND	RD CAUSE RS	1.99634	0.09743	Rejected	5
	RS CAUSE RD	3.3114	0.01247	Accepted*	5
NEW ZEALAND	RD CAUSE RS	1.71955	0.19492	Rejected	1
	RS CAUSE RD	67.4531	2.7E-11	Accepted**	1
FRANCE	RD CAUSE RS	2.2934	0.13509	Rejected	1
	RS CAUSE RD	11.0569	0.0015	Accepted**	1
GERMANY	RD CAUSE RS	2.54896	0.08674	Rejected	2
	RS CAUSE RD	2.29475	0.10971	Rejected	2
UNITED STATES	RD CAUSE RS	3.05982	0.0544	Rejected	2
	RS CAUSE RD	7.93009	0.00089	Accepted**	2
JAPAN	RD CAUSE RS	1.6366	0.2035	Rejected	2
	RS CAUSE RD	9.54043	0.00026	Accepted**	2
THAILAND	RD CAUSE RS	0.12892	0.7208	Rejected	1
	RS CAUSE RD	9.01726	0.00387	Accepted**	1

NOTE : Hypothesis(Ha) test result :

: "Accepted" means to accept Ha at 90% confidence.

: "Accepted*" means to accept Ha at 95% confidence.

: "Accepted**" means to accept Ha at 99% confidence.

Appendix D

Relationship Between Reserve Money and Monetary Base

In conventional monetary policy implementation in developed countries, analyses are normally focused on reserve money, i.e. deposits of commercial banks and eligible financial institutions, at the central bank rather than the total monetary base (Borio, 1997).

In the present study, however, the analysis is largely based on total monetary base for a number of reasons. First, by looking at total monetary base as a whole, the shift in policy stances can be related directly to changes in net foreign assets, lending to commercial banks and government as shown in Appendix B. This framework, with a slight shift in the focus, allows a quantitative measurement of degree of monetary accommodation as a whole which cannot otherwise be done. Second, using the simple money multiplier framework, monetary base can be directly linked to broad monetary aggregate and thus inflationary pressure which is the focus of central banking. Finally, in the short run, the relationships between reserve money and monetary base may be fairly stable except perhaps for New Zealand and recently Australia and France[1]. This is demonstrated by the ratios between reserves and monetary bases of the sample countries as shown in Figures D.1 to D.2. Of course, this argument cannot be stretched over a very long period of time.

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[1] On quarterly basis, i.e. three-month moving averages, these relationships remain reasonably stably.
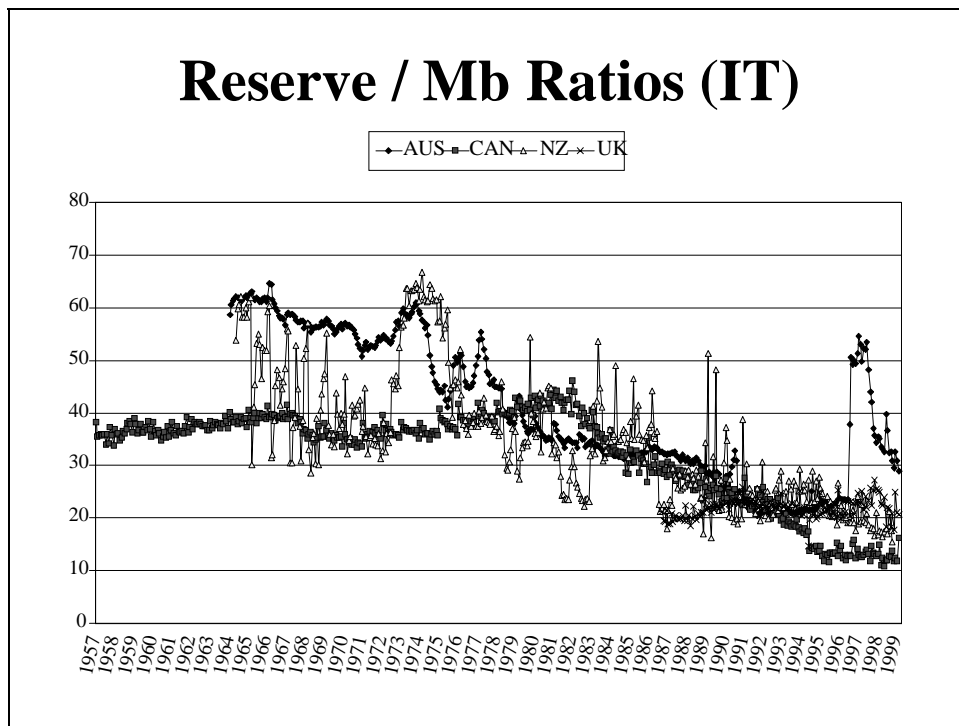
Figure D.1. The ratios of reserves to Mb of inflation targeting countries.

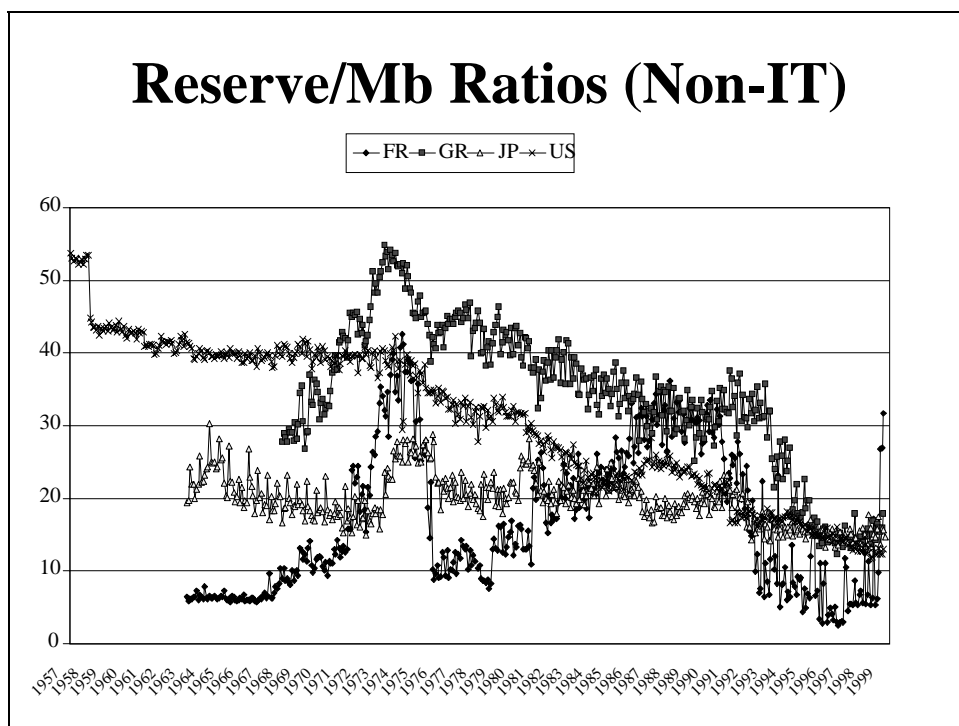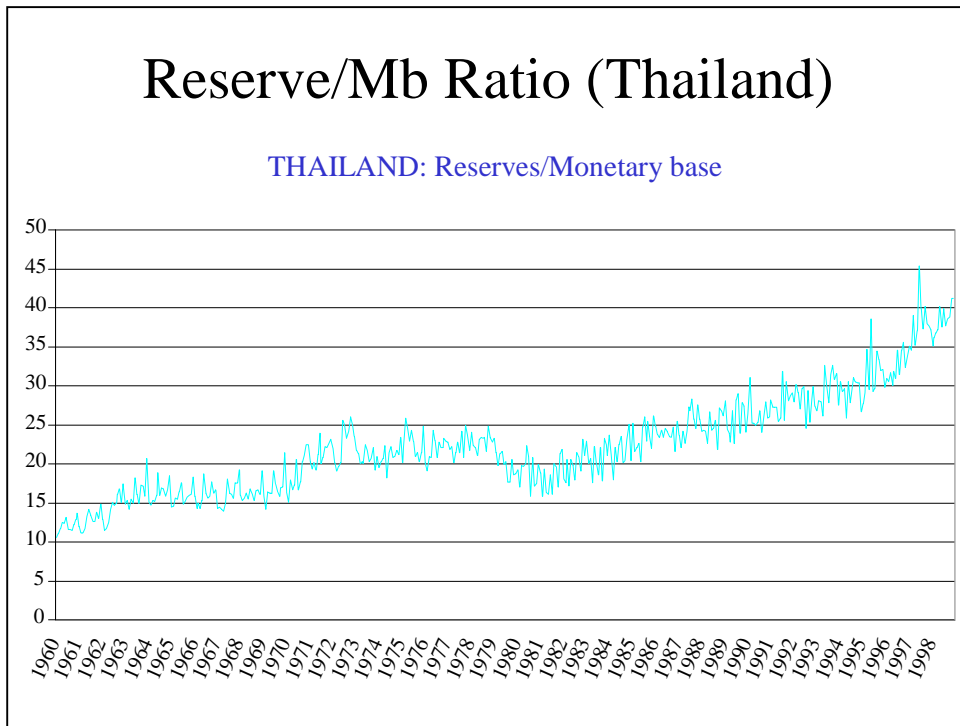**Figure D.2**. The ratios of reserves to Mb of non-inflation targeting countries.

Figure D.3. The ratios of reserves to monetary base of Thailand.