WORKING PAPERS DA FEP

Investigação - Trabalhos em curso - nº 128, Abril de 2003

40 YEARS OF MONETARY TARGETS AND FINANCIAL CRISES IN 20 OECD COUNTRIES

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ABSTRACT

This paper examines differences in the stability of the foreign exchange, money, and stock markets, associated with the use of alternative monetary policy targets, based on data from a panel of 20 OECD countries, for the period 1961-2000. The main conclusion of the paper is that the choice of monetary policy target will significantly affect stability in financial markets. The use of inflation targets reduces the likelihood of crises in the foreign exchange and money markets (relative to *any* other monetary policy framework), suggesting that a central bank concerned with financial stability should adopt this framework. Results also suggest that exchange rate targeting frameworks tend to have higher likelihood of foreign exchange and money market crises, but multilateral exchange rate arrangements have lower likelihood of crises than unilateral pegs. The paper also includes a complete description of the monetary policy targets used in the countries analysed.

Keywords: *monetary policy, rules, financial crises.*

RESUMO

O presente artigo analisa diferenças na estabilidade dos mercados financeiros, nomeadamente os mercados cambial, monetário, e de acções, associadas à utilização de metas de política monetária alternativas, para uma amosta de 20 países da OCDE, no período 1961-2000. A principal conclusão do trabalho é que a escolha da estratégia de política monetária tem uma influência significativa na estabilidade dos mercados financeiros. A utilização de *inflation targets* reduz a probabilidade de ocorrência de crises nos mercados cambial e monetário (relativamente a qualquer outra estratégia), o que sugere que um banco central preocupado com a estabilidade do sistema financeiro deverá adoptar esta estratégia. Por outro lado, os resultados também sugerem que estratégias baseadas em metas para a taxa de câmbio estão associadas a uma maior probabilidade de crises nos mercados cambial e monetário, apesar de acordos cambiais multilaterais terem uma menor probabilidade de crise que as estratégias assentes em paridades definidas unilateralmente. Finalmente, o artigo inclui também uma descrição detalhada das metas de política monetária utilizadas nos países e período da amostra.

Palavras-chave: *política monetária, regras, crises financeiras.*

This paper examines the likelihood of financial crises under different monetary frameworks in 20 OECD countries in the period 1961-2000. Economists and central bankers have long debated the merits of alternative frameworks for the conduct of monetary policy. One of the main questions in this debate has been whether the central banks should announce quantitative targets, and commit to achieving them, or alternatively, whether they should retain the discretion to decide monetary policy on a case-by-case basis. An associated question is which target to choose, if the choice is for the former. These questions have been the starting point of a large body of research in recent years.

In the evaluation of monetary policy frameworks, the most popular approach is to build structural models of the economy and then simulate the models stochastically under different monetary policy frameworks. A framework would be considered better than another if the performance of the model economy is better under that framework, in terms of yielding desirable values of postulated objective functions, with these pertaining primarily to root-mean-square deviations from desired values of variables such as inflation or real GDP relative to trend.[1] Despite the usefulness of the model-based approach, it cannot be the sole grounds for making policy decisions. As Taylor (1999) argues, an historical analysis of monetary policy is a useful complement to the model-based approach, since it may give a better sense of how a policy framework might work in practice.

The existing empirical literature only provides results that are model or country specific. One form of overcoming this problem is to analyse historical data from a panel that includes a sufficiently large number of countries, and a wide variety of frameworks. This is the first contribution of this paper. It studies the monetary policy targets used in 20 OECD countries,[2] all the countries in the OECD with a sufficiently long history of

[1] Almeida (1998) provides a review of this literature, including the expected implications of each monetary framework for the stability of financial markets.

[2] The countries in the sample are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK, and the US.

'tolerably liberalised' financial markets,[3] for a period of 40 years, long enough to include all the targets usually considered in the literature.

The focus of most studies of monetary frameworks is on the performance of the economy in terms of inflation and output. However, price stability and growth are not the *only* objectives of central banks. As Mishkin (2000) argues, because central banks care about output fluctuations and the most serious economic contractions arise when there is financial instability, central banks also need to focus on preventing financial instability. However, many economists (e.g. Folkerts-Landau and Garber, 1992, Summers, 1991, and Solow, 1982) have expressed doubts as to the compatibility of a strict monetary policy rule with central bank acceptance of responsibilities about the stability of the financial system.

The possibility of conflict between macro and microeconomic objectives suggests that the evaluation of alternative monetary policy targets will not be complete without an analysis of the implications of the adoption of a policy target to the stability of financial systems. In particular, the propensity of a given monetary framework to be associated with recurring financial crises has to be seen as a major drawback of that framework. The second contribution of this paper is to provide an analysis of the relation between policy targets and financial crises, using a historical approach. The paper assesses the likelihood of financial crises under different monetary policy targets, using data for three financial assets (exchange rates, interest rates and stock prices) from a panel of OECD countries, for the period 1961-2000.

The paper is organised as follows. Section 1 discusses the actual policy targets used by central banks in OECD countries. Section 2 identifies the financial crises that the OECD countries in the sample have experienced in the last 40 years of the 20th century. Section 3 is dedicated to the empirical exercise that constitutes the core of the paper: the study of the likelihood of financial crises under each policy target. Concluding comments are provided in Section 4.

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[3] The expression 'tolerably liberalised' is used here in the sense of a financial market that may be restricted by regulatory constraints, but these constraints are not enough to render prices meaningless. Note that not all countries in the sample fulfilled this condition throughout the whole sample period.

1. MONETARY POLICY TARGETS IN OECD COUNTRIES

1.1. Rules or discretion?

The basic choice in the definition of a monetary framework is whether monetary policy should be guided by stable *rules*, or whether central banks should be given the *discretion* to decide what is the optimal policy at each moment in time. A monetary rule specifies policy actions as a simple function of economic or monetary conditions, and is selected as the outcome of a multiperiod optimisation process. Kydland and Prescott (1977) and Barro and Gordon (1983) saw their demonstration of the time-inconsistency problem as making the case for a monetary policy rule. By adopting a rule the central bank could pre-commit to avoiding monetary surprises, and the problem of dynamic inconsistency would disappear. The problem with a monetary rule is that in an uncertain world it is impossible to design ex-ante a rule that would deliver the optimal response to all possible contingencies. In contrast, discretion implies period-by-period re-optimisation on the part of the monetary authority, without any prior restrictions on the actions that the central bank can take at each date. This led some authors (e.g., Fischer, 1990) to argue that discretion is preferable to rules, because the benefit of having the flexibility to respond to unanticipated contingencies is greater than any advantage gained from pre-commitment to a fixed rule.[4]

As McCallum (1999) points out, the distinction between rules and discretion is straightforward in the context of the theoretical models of Kydland and Prescott (1977) and subsequent writers, but it is less clear when it comes to practical application to the behaviour of actual central banks. Taylor (1993) distinguishes 'rule-like' from discretionary behaviour in practice, by describing the former as 'systematic' in the sense of "methodical, according to a plan". This is a necessary, but not sufficient, condition for a rule, since the period by period optimisation process of the discretionary central

[4] The concept of monetary rule is been used here in the sense of a "targeting rule", not of a "instrument rule", in the definition of Svensson (2002).

bank of Kydland and Prescott (1977) may be presented as a systematic application of a formula. The needed additional criterion for a rule, according to McCallum (1999), is that the central bank takes account of the private sector's expectational behaviour, committing not to attempt to exploit temporary inflation-output trade-offs. This could be achieved by announcing a (preferably quantified) target, and sticking to it. The same line is taken by Laidler (1997), when he claims that a target value for a variable is one of the things we might signify when we speak of a policy rule.

1.2. The choice of a monetary policy target

Clarida, Gali and Gertler (1999), Cottarelli and Giannini (1997), Goodhart and Viñals (1994), McCallum (1999), Mishkin (2000), and the survey by the Federal Reserve Bank of New York (1990) are some examples of the vast literature reviewing the issues involved in the choice of a monetary policy target. A good policy target should be reliably under the central bank control, should have a predictable relationship with the final objective, and must be capable of affecting the public's expectations. Although other variables have been proposed (e.g., nominal GNP, interest rates), the variables that have been widely used by central banks as policy targets are the inflation rate, a monetary aggregate or the exchange rate.[5]

The choice of the exchange rate as a target depends on what is perhaps the most basic of all monetary policy choices, whether or not to adopt a fixed exchange rate.[6] The initial discussion in this area related to the optimal currency area literature began by Mundell

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[5] It follows from the previous discussion that the expression 'policy target' is being used in the sense of an 'intermediate' or 'final' target, that the central bank sets for the medium term and commits to stick to it. It does not cover 'instrument targets', which are frequently adjusted. Several central banks have used money market interest rates as 'operating targets', but not as 'policy targets', in the sense being used here. Taylor (1993) argues that some central banks have been using interest rate rules, which are a function of inflation and output. No central bank has ever committed to follow a Taylor rule, not even they have explicitly admitted that such rules were used. As such, a Taylor rule cannot be considered a policy target under the McCallum (1999) definition.

[6] Exchange rate targets do not imply fixed exchange rates. A crawling peg in which the currency is allowed to depreciate at a steady rate is also a form of exchange rate targeting. Because the implications of a crawling peg for the conduct of monetary policy are very similar to that of a fixed exchange rate, at least when the depreciation rate is kept unchanged, the discussion in the paper assumes fixed exchange rates on the grounds of simplicity.

(1961), McKinnon (1963) and Kenen (1969), and was widely extended in the 1990's by research associated with the move towards monetary integration in Europe (see survey in Isard, 1995, ch. 11). The main problem of a fixed exchange rate is the loss of an independent monetary policy, i.e., the loss of the ability to use monetary policy to achieve the desirable levels for the domestic macroeconomic objectives. The key advantage is its simplicity and clarity, which makes it easily understood by the public. An exchange rate peg anchors price inflation for internationally traded goods, and when the peg is credible, this helps bring inflation expectations in line with that of the targeted country. It is also easily controllable by the central bank.

The use of monetary aggregates as intermediary targets become very popular among central bankers after the collapse of the fixed exchange rate Bretton-Woods regime, and was the subject of intense discussions in the 1970s and 1980s (see Goodhart, 1989, for a survey). A major advantage of money targets is that they enable a central bank to adjust its monetary policy to cope with domestic considerations. Money targets can also provide good anchors for inflation expectations, although not as good as exchange rate targets: they are less easily understood by the public, and information about monetary aggregates is only known with a lag of a couple of weeks, at least. However, money aggregates can only be good targets if they can be well controlled by the central bank, and if there is a strong and reliable relationship between the final objective and the targeted aggregate. These two conditions were seldom verified, and during the 1980s most central banks abandoned money targeting.

The early 1990's introduced inflation targeting (IT) in the discussion of monetary policy targets. IT has been the topic of vast economic research, of which the books edited by Bernanke, Laubach, Mishkin and Posen (2000), Leiderman and Svensson (1995), and Haldane (1995) are some examples. The main advantages of IT are that it provides the best anchor for inflation expectations, and it uses more information than money targeting; the main drawback is that the control of the central bank over inflation might be less than what is required in a good target (Almeida and Goodhart, 1998).

1.3. Monetary policy targets in practice

Although in theory the distinction between the different targets is clear, it becomes less obvious when one has to classify the frameworks addopted by actual central banks. For example, some central banks do not announce any targets, even though policy decisions are based on one (and this may be widely recognised by private agents).[7] Others announce a target, but policy decisions are not guided by that variable, or they may even announce more than one target. Because one of the rationales for adopting a target is its effect on (private sectors') expectations, it is important whether or not the target is announced. But talk is cheap, and announcing a target does not force the central bank to take policy actions consistent with its attainment. What determines policy outcomes is the target that drives policy decisions, not the announced one. Thus, both the *actual* and the *announced* targets are important, since both will have an effect on the outcome of the framework, and potentially on the stability of financial markets. This paper analyses monetary policy frameworks from both points of view.

The previous discussion on the choice of a monetary policy target identified four basic targeting frameworks that central banks in OECD countries have used in the last forty years: exchange rate targets (ET), money targets (MT), inflation targets (IT), and a framework in which the central bank does not announce a target, that will be designated as *discretion* (DS).[8]

The use of an exchange rate target does not imply that the exchange rate is fixed. Exchange rate targets are usually formulated in terms of a central parity, with associated fluctuation bands. As long as the width of the band is strictly positive, the exchange rate will not be fixed. Also, the central parity may be changed; in some ET frameworks these changes follow a pre-announced schedule (e.g., crawling peg), while in others they occur in irregular occasions and amounts. Different widths of the fluctuation bands and different arrangements for changes in the central parity are likely to be associated with

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[7] An example was the Austrian Central Bank, which before 1995 had an unpublished target for the schilling/DEM exchange rate.

[8] If the central bank announces a target but it accepts misses on a discretionary basis, it will be classified as having *announced* a target, but as a discretionary central bank *in practice* (because it is not committed

different levels of stability in financial markets, so this paper distinguishes between several ET frameworks. In particular, multilateral exchange rate agreements, like the Bretton-Woods agreement (BW), the European 'snake' (SK), and the exchange rate mechanism of the European Monetary System (ERM), are treated separately from unilateral exchange rate targets (XT). In addition, the original ERM arrangement (OR), with fluctuation bands of ±2.25% (±6% for some countries), is distinguished from the ERM with 'wide bands' (fluctuation margins of ±15%) that emerged after August 1993 (WR).

1.4. 40 years of monetary policy targets in OECD countries

Figures 1.1 and 1.2 summarize the policy targets used by the central banks in 20 OECD countries, which are fully described in the Appendix. The figures and the appendix are the first contribution of this paper: they provide a systematic and detailed classification of the monetary policy targets used by OECD central banks since 1960, including the discussion of whether the announced target was the actual target.[9]

The countries in the sample were all part of the Bretton-Woods arrangement (BW) during the 1960's, under which the main objective of monetary policy was to maintain a fixed exchange rate against the USD.[10] In 1970 three countries decided to suspend their participation in the Bretton-Woods arrangement, and many others followed in August 1971, after the suspension of the convertibility of the USD into gold. In December 1971,

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to follow the target it set).

[9] Some of the sources of information used are official (e.g., central banks, IMF), others are not. It was assumed that the target described in the official sources was the announced one, and that the target described in the non-official sources was the actual target, when different. Some of latter descriptions might represent subjective ex-post opinions of the authors, but it was assumed that they represent the contemporaneous view of private market agents. A large part of this work was conducted before Cottarelli and Giannini (1997) became available, and the classification used in this paper differs from theirs. Their database covers a wider range of countries, but it is less detailed than the one in the Appendix, and they do not distinguish between actual and announced targets. Nevertheless, the two databases are consistent, and no contradiction was found between the two.

[10] The USD had a fixed parity to gold. Under a fixed exchange rate target, with perfect capital mobility, monetary policy is totally constrained by the external objective, and cannot be used to achieve domestic objectives. In the Bretton-Woods period, exchange controls and limited capital mobility allowed some independence in monetary policies, but, nevertheless, the policy framework was basically set by the regime's constraints.

there was an attempt to restore the Bretton-Woods system (the Smithsonian agreement), with a general devaluation relative to gold, and the widening of the fluctuation bands, but by early 1973 the Bretton-Woods system had been abandoned.[11]

After 1973 the diversity of monetary policy frameworks increased significantly. Eight countries opted for a discretionary framework (DS), by floating their currency and not adopting any new target. Five countries opted to maintain the peg to the dollar, now unilaterally (XT). A third group of seven european countries tried to limit the variability of their exchange rate against the DEM, under the European Common Margin Arrangement, also known as the "snake" (SK), a multilateral system of fixed exchange rates, with fluctuation bands of 2.25%. The "snake" would be replaced in 1979 by the European Monetary System (OR), another system of fixed exchange rates, with fluctuation bands of 2.25% or 6%. Initially the ERM was a constraint on the monetary policy of only six countries, but in the late 1980's and early 1990's three other countries joined.[12]

Unsatisfaction with the lack of a clear target for monetary policy, and in some cases with unilateral pegs, led to the adoption by 11 central banks of money targets (MT) in the second half of the 1970's. However, money targets were not seen to be a successful framework, and during the 1980's most countries abandoned monetary targeting, generally for a discretionary policy. In the early 1990's inflation targeting become a popular monetary policy framework, having been adopted by eight central banks.

Meanwhile, in 1993 the fluctuation bands in the ERM were widened to 15%, under pressure from speculative attacks. With such wide bands the external constraint on monetary policy is very weak, and it could be argued that this framework was more discretionary than exchange rate targeting. Nevertheless, most countries in the ERM decided to limit the variability of their exchange rates to narrower bands, subjecting

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[11] In the classification used in this paper it was considered that the period of August-December 1971 was still part of the Bretton-Woods system, because all the events related to exchange rates during this period were a direct consequence of the system.

[12] Germany participated in the "snake" and in the ERM, but was not classified as having an exchange rate target because the DEM was the anchor currency of both systems, which allowed the Bundesbank to follow an independent monetary policy.

their monetary policy to the external constraint. Finally in January 1999 the creation of the Euro reduced the number of monetary policy frameworks in our sample to eleven.[13]

[13] In the empirical work, the target adopted by the European Central Bank was associated with Germany, the largest country in the Euro area.

Figure 1.1: ANNOUNCED MONETARY POLICY TARGETS IN SELECTED OECD COUNTRIES

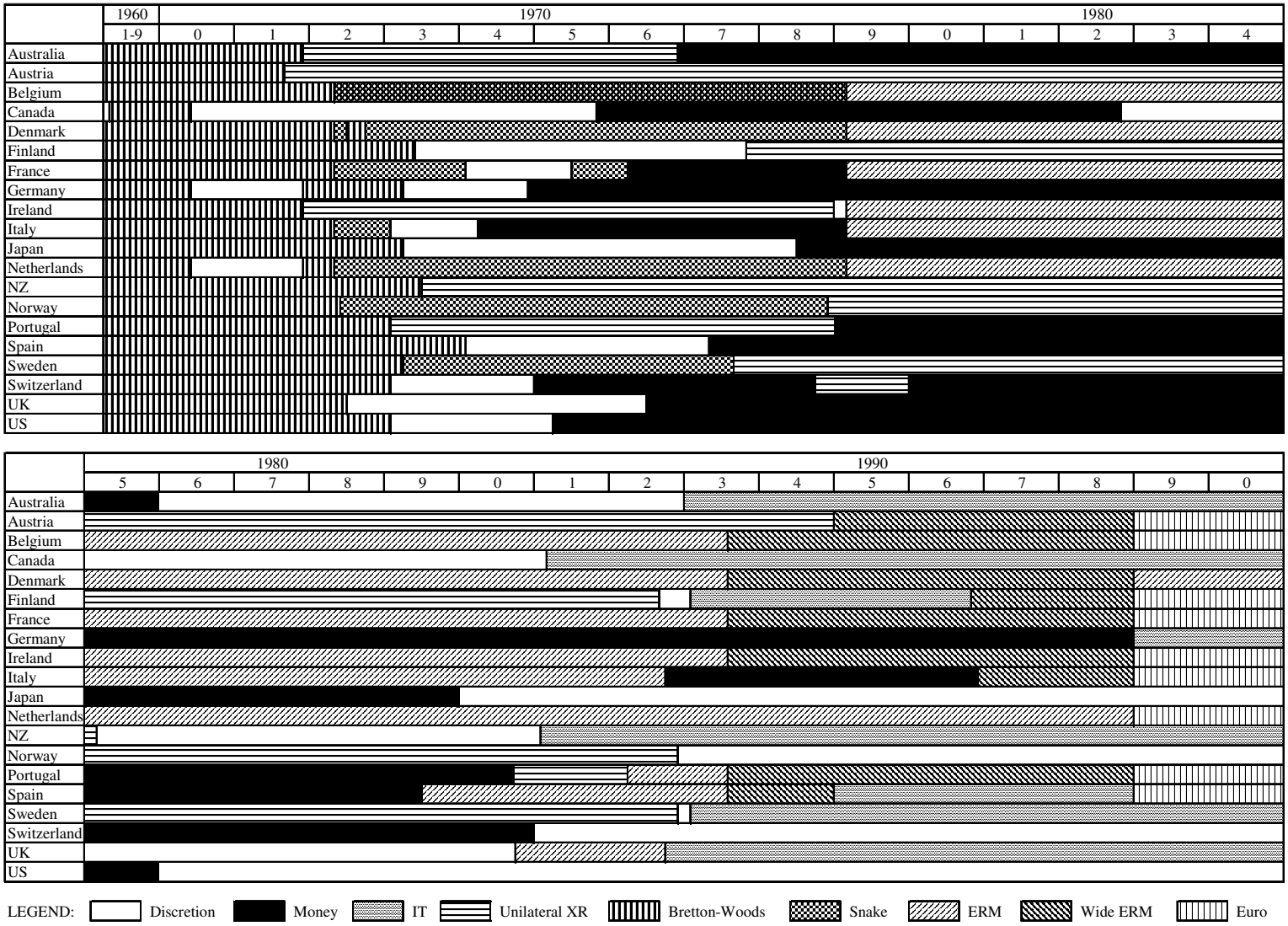
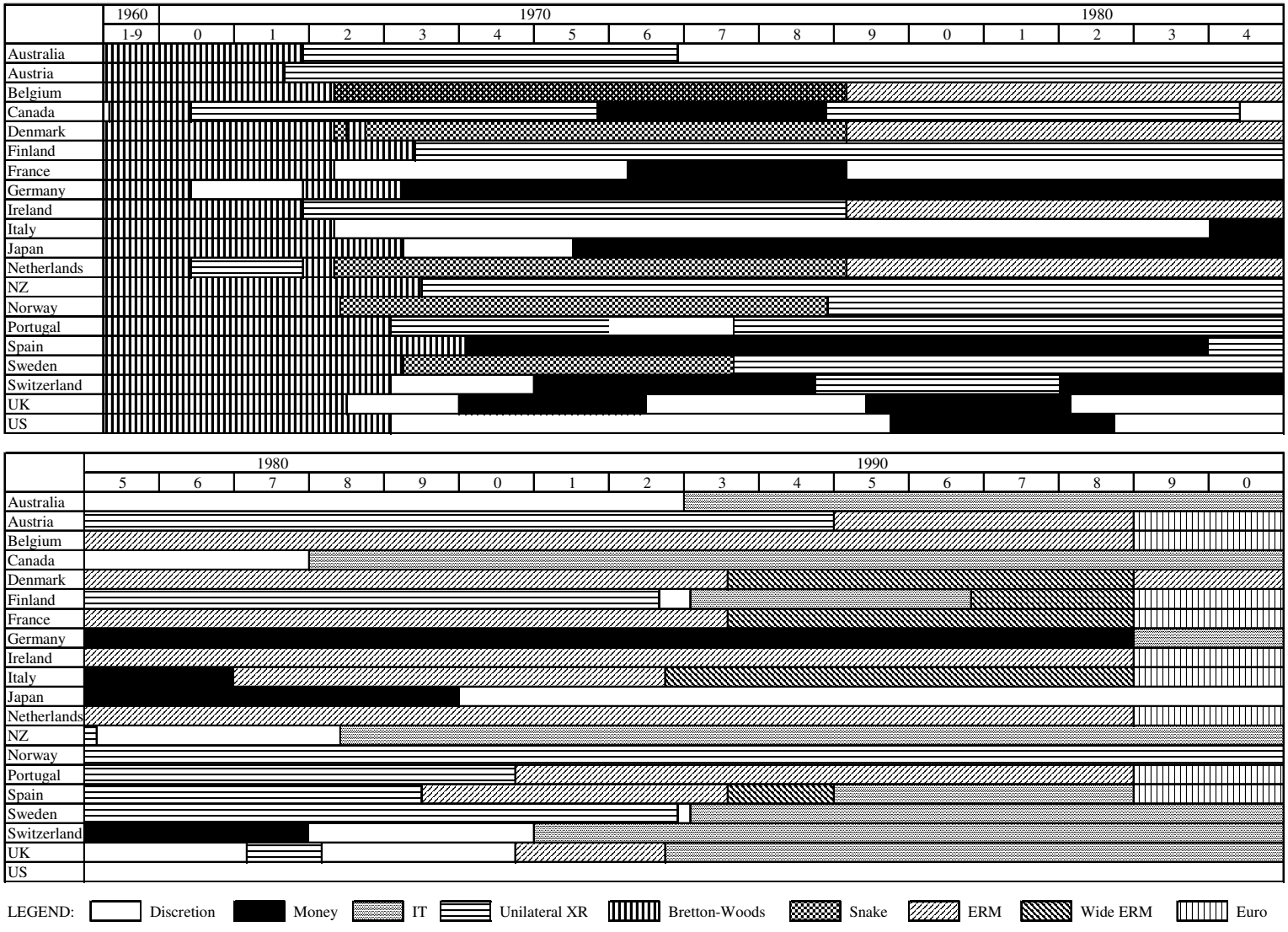


Figure 1.2: ACTUAL MONETARY POLICY TARGETS IN SELECTED OECD COUNTRIES



2. FINANCIAL CRISES

Central banks concerned with the stability of the financial system should be concerned with situations when financial institutions may suffer large losses due to large and sudden variations in financial prices, a situation that could be described as a 'financial crisis'. There is no established definition of what constitutes a financial crisis, but most people would know one when they see it. As long as a large number of financial institutions find themselves in distress due to adverse movements in financial markets, one could say that there is a financial crisis.

2.1. Identification of financial crises

Given the purposes of this paper, a 'financial crisis' is described as a period when the value of the portfolios of financial institutions could decline significantly due to large and sudden variations in the prices of the financial assets included in these portfolios. The financial variables that have the largest impact on the value of financial institutions' portfolios are exchange rates, interest rates, or share prices. As such, whenever these financial variables change adversely by very large amounts in a short period of time, one could say that there is a financial crisis.

Following this approach, 'financial crises' are defined as periods of abrupt and very large adverse changes in exchange rates, interest rates, or share prices, so large and abrupt that its occurrence is highly unlikely and potentially disruptive of the stability of the financial system. Adverse changes are large declines in share prices, large increases in interest rates, or a large depreciation of the exchange rate. Most financial institutions hold large portfolios of shares, implying that declines in share prices have a direct impact in the value of their assets. Furthermore, declines in share prices might also have a indirect impact on the value of the assets, since it reduces the value of the collateral of any loans that might be collateralised by shares. On the other hand, financial institutions tend to hold liabilities with shorter maturities than their assets. Abrupt increases in interest rates may cause a mismatch between the cost of the liabilities and the return on the assets, serious enough to lead to the collapse of the institution. Finally, many financial institutions have large foreign exchange liabilities, and an unexpected

depreciation of the exchange rate will increase significantly the value of those liabilities.

In order to identify financial crises, one still needs to define what is a 'large and abrupt' change in an asset price. The criterion used in this paper is to consider as a financial crisis any price change that is 'very large' relative to the past history of price changes for that asset, as measured by the ratio of the forecast error of a rolling ARMA model over its standard deviation. Since the change has to be 'abrupt', price changes were measured over relatively short periods, using monthly data. [14]

2.2. Data and methodology

The financial asset prices series are monthly data for the period 1957:1-2000:12, obtained from the *IMF International Financial Statistics* and *OECD* historical databases. The exchange rate data are *IFS*'s SDR end period exchange rates.[15] Bilateral exchange rates are influenced by factors originating in the two countries involved, and the use of SDR exchange rates reduces the influence of external elements in the analysis, since the value of the SDR is a composite of five different exchange rates.[16] Domestic factors, like the monetary policy targets analysed in this paper, are more closely related to the SDR exchange rate than to any bilateral exchange rate, which also depends on other factors unrelated to domestic conditions, like, for example, the framework adopted by the central bank of the other country.[17] Interest rates are money market call rates, mostly from the *IFS* database.[18] The share price data correspond to the

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[14] Even though large asset price changes occurring gradually over the medium term may have a serious impact on the economy, they are less likely to cause significant disruption in financial institutions. If the change in asset prices occurs over the medium term, financial institutions can gradually adjust their portfolios, or hedge against potential losses. This is why the analysis is based on month-to-month changes in asset prices.

[15] Measured in terms of national currency units per SDR.

[16] During the Bretton-Woods period, the value of the SDR was defined in terms of gold.

[17] Since the value of the SDR is a weighted average of five currencies, SDR exchange rates are not immune to external factors, in particular those influencing the currencies with the larger weights in the SDR basket. However, their influence is smaller than in any given bilateral exchange rate.

[18] The exceptions are: Canada (IFS, Treasury Bill rate); Ireland (OECD, Interest Rate on Call Money, end period); New Zealand (OECD, 90 Day Bank Bill Rate); Portugal (IFS, Average Interest Rate on Time Deposits); Spain (OECD, Interest Rate on Call Money, end period); Switzerland (Datastream, Interest Rate on 3 Month Swiss Franc Deposits in London, end period). Data were not available for the following

main national stock market indices.[19]

The criterion defined in the previous subsection to identify a financial crisis, is any price change that is 'very large' relative to the past history of price changes for that asset, as measured by the ratio of the forecast error of a rolling ARMA model over its standard deviation. The basic asset price variable in this exercise was the (continuously compounded) percentage short term change in the asset price for country i in period t, r_{it}, measured by the first difference of the log of the asset price, P_{it}, multiplied by 100,

$$r_{it} = (\log P_{it} - \log P_{i,t-1}) \times 100 \qquad 2.1$$

ARMA models, chosen according to the Schwarz criterion, were then fitted to each of the r_i series. Subsequently, rolling ARMA models were estimated using data for the previous 3 years, and a forecast based on the estimated model, f_{it}, was computed for each period. The indicator used to identify financial crises, TF_{it}, was computed as the ratio of the forecast given by the rolling ARMA model and its standard deviation

$$TF_{it} = f_{it} / \text{standard deviation } (f_{it}) \qquad 2.2$$

If the indicator TF_{it} was larger than 4.0 it would identify a 'large and abrupt' financial asset price change in country i in period t.[20] Given that one has defined 'financial crises' as periods of *'large and abrupt' adverse* changes in exchange rates, interest rates, or share prices, two additional steps were required for the identification of the financial crises. First, one had to identify which changes were 'adverse'. These were defined as exchange rate depreciations larger than 2%, interest rate increases of at least 100 basis points, or declines in share prices.[21] Second, when two or more very large price changes

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periods and countries: Austria, France, Germany, Italy, Netherlands, and Sweden: until 1959:12; Switzerland: until 1962:12; New Zealand, Norway, and Spain: until 1963:12; Australia, until 1969:06.

[19] International Financial Statistics, Share Prices (line 62), except: Denmark (IFS, Share Prices: Industrial, line 62A); Germany (OECD, Share Price Index, CDAX, monthly average); Portugal (OECD, Share Prices – Lisbon Stock Exchange). Data were not available for the following periods and countries: Australia, UK: until 1957:12; Germany: until 1959:12; New Zealand and Spain: until 1960:12; Switzerland: until 1961:12; Portugal: until 1980:12.

[20] The cut-off value (4.0) is an arbitrary number. It was chosen such that the total number of crises identified in the sample would be around 200, which corresponds roughly to the occurrence of a crisis every 4 years in each country.

[21] If a small change in exchange rates or interest rates occurred after a long period during which those rates were fixed, it could be identified as 'large and abrupt' by the methodology described above. A 25

were identified inside three consecutive months, it was assumed that these refer to the same financial crisis.

2.3. 40 years of financial crises in OECD countries

Table 2.1 presents the financial crises identified using this methodology, for the countries in the sample, and for the foreign exchange markets, money markets and stock exchanges. In the foreign exchange market a total of 73 crises were identified, with Germany being the country with fewest crises (only one, in December 1971, corresponding to problems in the Bretton-Woods system) and Sweden being the country with most crises (seven, five occurring during the 70's and early 80's, and two in the early 90's). In the money market, the total number of crises identified was 74, ranging from zero in Australia to nine in Ireland (seven occurring during the 70's and early 80's, and two in the early 90's). Finally, 43 crises in the stock markets were identified, ranging from one in Finland, Germany, Italy, Netherlands, and New Zealand, to four in Belgium, Norway, and Spain.

In some periods, financial crises are identified in several countries simultaneously. The methodology used identified a exchange rate crisis for six countries in the last quarter of 1967, when there was a rearrangement of parities under the Bretton-Woods system. The problems in the Bretton-Woods system in December 1971 were identified as crisis in all the countries in the sample, except France. Money market crises in September 1992 were identified in seven countries, reflecting the sharp increases in interest rates some central banks were forced to adopt in response to problems originating in the Exchange Rate Mechanism of the European Monetary System. Finally, the stock market crashes of October 1987 and August 1998 were identified as crises in 15 and 9 countries, respectively.

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basis point increase in interest rates, or an exchange rate devaluation of 0.5% are unlikely to jeopardize the financial stability, even if they are unexpected. As such, only devaluations larger than 2% or interest rate increases of at least 100 basis points were considered to be financial crises.

Table 2.1 **Crises in financial markets of OECD countries**

	Foreign exchange market		*Money market*		*Stock market*	
Country	#	Dates	#	Dates	#	Dates
Austria	2	71:12, 78:11	1	69:12	2	89:11, 98:08
Australia	5	71:12, 74:09, 76:11, 83:03, 85:02	0		2	80:03, 87:10
Belgium	3	71:12, 78:11, 82:02	3	69:07, 81:04, 93:08	4	73:12, 81:06, 87:11, 98:08
Canada	4	61:06, 71:12, 73:02, 76:11	3	74:04, 79:10, 92:09	3	80:03, 87:10, 98:08
Denmark	2	67:11, 71:12	4	67:12, 73:12, 89:10, 93:02	3	64:01, 84:05, 92:8
Finland	6	67:10, 71:12, 77:04, 82:10, 91:11, 92:09	5	71:06, 75:09, 77:05, 83:05, 86:08	1	96:07
France	3	69:08, 73:08, 82:06	3	81:05, 87:01, 92:09	2	82:03, 87:11
Germany	1	71:12	2	69:06, 73:03	1	87:11
Ireland	4	67:11, 71:12, 72:06, 93:02	9	72:06, 73:03, 73:06, 74:06, 74:09, 79:06, 83:03, 92:09, 92:11	2	87:11, 98:08
Italy	4	71:12, 73:02, 80:03, 92:09	7	69:05, 70:02, 74:06, 76:03, 79:12, 86:02, 92:09	1	86:06
Japan	2	71:12, 74:01	2	61:03, 80:03	2	61:10, 70:05
Netherl.	2	71:12, 78:11	4	73:12, 76:08, 86:05, 88:07	1	87:11
NZ	6	67:11, 71:12, 75:08, 83:03, 84:07, 98:08	1	85:03	1	87:11
Norway	3	71:12, 86:05, 97:04	6	69:09, 73:10, 77:12, 86:05, 92:09, 98:08	4	62:06, 87:11, 90:12, 98:08
Portugal	4	71:12, 77:02, 82:06, 83:06	6	73:12, 77:08, 89:05, 90:10, 91:04, 92:09	2	87:11, 88:02
Spain	6	67:11, 71:12, 76:02, 77:07, 82:12, 92:09	2	78:08, 87:04	4	73:11, 80:04, 87:10, 98:08
Sweden	7	71:12, 73:02, 77:08, 81:09, 82:10, 91:06, 92:11	4	67:09, 90:02, 91:12, 92:09	2	87:10, 98:08
Switzer.	2	71:12, 78:11	5	74:01, 79:10, 81:02, 89:12, 99:10	2	87:10, 98:08
UK	4	67:11, 71:12, 72:06, 92:09	4	64:12, 78:01, 84:07, 74:02	2	87:11, 98:08
US	3	71:12, 73:02, 78:10	3	73:07, 79:10, 80:03	2	80:03, 87:10
Total	73		74		43	

3. ARE MONETARY POLICY TARGETS AND FINANCIAL CRISES RELATED?

The goal of this paper is to study the stability of financial markets under different monetary policy targets. This section investigates whether financial crises are more likely to occur under certain monetary policy frameworks.

3.1. Policy targets and financial crises

A simple analysis of the number of the financial crises under each monetary policy target suggests that financial crises are more likely to occur under some frameworks than others. The data in Table 3.1 reveal that very few crises occurred under inflation targeting or the wide ERM arrangement. On the other hand, the number of crises that occurred under the exchange rate targeting frameworks seems to be large.

Table 3.1 **Policy targets and number of financial crises**

Model	*Exchange rates*		*Interest rates*		*Share prices*	
Target	*Announced*	*Actual*	*Announced*	*Actual*	*Announced*	*Actual*
Discretion	7	8	9	9	7	6
Money	9	5	14	6	9	5
Inflation	1	1	1	2	5	6
XT	18	25	16	25	4	10
BW	27	27	12	12	5	5
ERM	6	4	17	15	9	10
Wide ERM	0	0	0	0	3	0
Snake	5	3	5	5	1	1

3.2. The logit model

A more formal analysis of the relationship between the occurrence of a crisis and the policy target the central bank was using when the crisis erupted, may be achieved by the estimation of a binary choice model, using a logistic distribution.[22] The logit model

[22] The logistic distribution (logit model) was preferred to the normal distribution (probit model) because

used is of the type of equation 3.1:

$$CR_{it} = l\left(\gamma + \sum_m \beta_m S_{it}^m\right) \qquad 3.1$$

where CR_{it} is a dummy variable taking the value 1 if a crisis occurs in country i in period t, S^m_{it} are variables taking the value 1 if country i adopted target m in period t, γ and β_m are parameters to be estimated, and $l(.)$ denotes the logistic distribution. This model was estimated independently for each of the 3 types of financial assets under analysis (exchange rates, interest rates and share prices), using a quarterly periodicity.[23]

3.3. Results of the extended logit model

The logit models explaining the likelihood of crises as a function of the policy target adopted by the central bank when the crisis was declared (equation 3.1) were estimated using, alternatively, the actual and the announced targets, and in both cases 'IT' was set as the base framework.[24] Table 3.2 presents the estimates of the logit parameters, while Table 3.3 provides some statistical analysis of the results.

The models for the foreign exchange market are highly significant, showing that there are significant differences in the probability of an exchange rate crisis associated with different policy targets, with the significance being higher for the model with the actual targets. The parameters of the models suggest that the probability of crisis is higher for the exchange rate targeting frameworks, significantly so for XT, BW and SK. The probability of crisis under IT is lower than under any other framework, but this is not

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the logistic distribution has fatter tails than the normal distribution, and thus is more appropriate to describe the data under analysis. Both models produce similar results when the estimated probabilities are close to 50%, but the results may differ widely across models when the estimated probabilities are very large or very small (Greene, 2002, ch. 21). Nevertheless, estimates of probit models were also calculated, and it was found that all the qualitative results were similar to the ones presented here (details of the estimations may be obtained from the author).

[23] The choice of a quarterly periodicity is a consequence of the procedure used, since it does not identify two crises occurring on two consecutive calendar months. This rules out the use of a monthly periodicity. Note that much care was taken to ensure that the occurrence of a crisis was associated with the target in place when the crisis started.

[24] I.e., $l(\gamma)$ is the estimated probability that a crisis will occur under IT, while $l(\gamma+\beta_m)$ (m≠IT) is the estimated probability that a crisis will occur when the central bank is using target m.

significant relative to MT and DS frameworks.

Table 3.2 **Estimates of the extended logit models**

Model	*Exchange rates*		*Interest rates*		*Share prices*	
Target	*Announced*	*Actual*	*Announced*	*Actual*	*Announced*	*Actual*
γ	-5.429	-5.656	-5.429	-4.959	-3.802	-3.847
	-5.42	*-5.65*	*-5.42*	*-6.99*	*-8.41*	*-9.32*
β (MT)	1.346	1.541	1.797	1.031	-0.281	-0.268
	1.27	*1.40*	*1.73*	*1.26*	*-0.50*	*-0.44*
β (DS)	1.475	1.772	1.732	1.196	-0.152	-0.330
	1.38	*1.67*	*1.63*	*1.52*	*-0.26*	*-0.57*
β (XT)	2.304	2.491	2.180	1.795	-0.861	-0.259
	2.23	*2.44*	*2.11*	*2.43*	*-1.27*	*-0.50*
β (BW)	1.962	2.189	1.134	0.664	-1.376	-1.332
	1.92	*2.14*	*1.09*	*0.87*	*-2.16*	*-2.19*
β (SK)	2.126	1.934	2.126	1.765	-1.139	-0.990
	1.93	*1.67*	*1.93*	*2.09*	*-1.03*	*-0.91*
β (OR)	1.250	1.000	2.320	1.651	0.036	0.121
	1.15	*0.89*	*2.25*	*2.18*	*0.06*	*0.23*
β (WT)					0.097	
					0.13	

Notes: The table presents the estimates of the parameters in the logit model given by equation 3.1., using 'IT' as the base framework. The dependent variable is a dummy variable taking the value 1 if a crisis in the financial market (named in the heading of the column) of country i=1 to 20 occurred in quarter t=1961:1 to 2000:4. The explanatory variables are alternatively, the announced or the actual policy targets. Values in italics are t-statistics; at the 5% (10%) level, the critical value for the t-statistics is 1.96 (1.67). Since the estimation procedure does not converge when the dependent variable always takes the value 0 when one of the explanatory variables takes the value 1, some models had to be estimated without the observations corresponding to the WT, for which no crises occurred.

The results of the models for the money market are similar to the foreign exchange market models. Both models for interest rates are highly significant, again showing that there are significant differences in the probability of an interest rate crisis associated with different policy targets. However, in this case the significance of both models (with the actual and with the announced targets) is very similar. The parameters of the models suggest again that the probability of crisis is higher for the exchange rate targeting frameworks, but now the difference is significant for XT, SK, and OR. The probability of crisis under IT is again lower than under any other framework

None of the models for the stock market is significant, suggesting that monetary policy targets are not relevant to the likelihood of stock market crises. However, the tests of equality of coefficients suggest that under the Bretton-Woods regime stock market crises were significantly less likely.

Table 3.3 **Statistical inference from the extended logit models**

	Exchange rates		*Interest rates*		*Share prices*	
	Announced	*Actual*	*Announced*	*Actual*	*Announced*	*Actual*
Predicted probabilities						
Discretion	1.88	2.02	2.42	2.27	1.88	1.51
	(0.71)	*(0.71)*	*(0.80)*	*(0.75)*	*(0.71)*	*(0.61)*
Money	1.66	1.61	2.58	1.93	1.66	1.61
	(0.55)	*(0.71)*	*(0.68)*	*(0.78)*	*(0.55)*	*(0.71)*
Inflation	0.44	0.35	0.44	0.70	2.18	2.09
	(0.44)	*(0.35)*	*(0.44)*	*(0.35)*	*(0.44)*	*(0.35)*
XT	4.21	4.05	3.74	4.05	0.94	1.62
	(0.97)	*(0.79)*	*(0.92)*	*(0.79)*	*(0.47)*	*(0.51)*
ERM	1.51	0.94	4.27	3.53	2.26	2.35
	(0.61)	*(0.46)*	*(1.01)*	*(0.90)*	*(0.75)*	*(0.74)*
Wide ERM	0.00	0.00	0.00	0.00	2.40	0.00
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(1.37)*	*(0.00)*
Snake	3.55	2.36	3.55	3.94	0.71	0.79
	(1.56)	*(1.35)*	*(1.56)*	*(1.73)*	*(0.71)*	*(0.78)*
BW	3.03	3.03	1.35	1.35	0.56	0.56
	(0.57)	*(0.57)*	*(0.39)*	*(0.39)*	*(0.25)*	*(0.25)*
Joint tests						
1. No difference among non-exchange rate targeting (ET) frameworks						
$\chi(2)$	1.91	2.78	3.02	2.33	0.25	0.36
2. No difference among non-ET frameworks and no difference among ERM and XT frameworks						
$\chi(.)$	$\chi(5) = 6.9$	$\chi(5) = 10.7$	$\chi(5) = 14.1$	$\chi(5) = 13.3$	$\chi(6) = 8.6$	$\chi(5) = 7.8$
3. Significance of the model (all $\beta(m)=0$)						
$\chi(.)$	$\chi(6) = 16.1$	$\chi(6) = 21.6$	$\chi(6) = 19.1$	$\chi(6) = 19.4$	$\chi(7) = 11.5$	$\chi(6) =9.8$
Tests of equality of coefficients (rejections of the null)						
5%	MX,XO	BO,XO	BX,BO	BX,BO,BS	BO,BD,BW	BO
10%	XD	MX,XD	MB,BS	MX	MB	MB,BX,BD

Notes: the results in this table are based on the estimated logit models presented in Table 3.2. 'Predicted probabilities' are given by $l(\gamma)$ for 'IT', and $l(\gamma+\beta(m))$ for the other targets, where l(.) is the logistic distribution. Figures in parenthesis are standard errors for the predicted probabilities. At the 5% (10%) level, the critical value for the χ^2 statistics are 5.99 (4.61), 7.82 (6.25), 9.49 (7.78), 11.07 (9.24), 12.59 (10.64) and 14.07 (12.02), for 2 to 7 degrees of freedom, respectively. The lines for the 'test of equality of coefficients' present target pairs (identified by the first letter of each target) for which the null of the two coefficients being equal was rejected at the significance level displayed in the first column. The title of each joint test describes the null hypothesis. Test 1 is performed by imposing the restriction $\beta(MT)=\beta(DS)=0$. Test 2 adds to the restriction in test 1, the restriction $\beta(BW)=\beta(XT)=\beta(OR) = \beta(SK)= \beta(WT)$.

3.4. Results of the reduced logit model

The results in Tables 3.2. and 3.3 suggest that there are no significant differences between the likelihood of crises under MT and DT. They also suggest that there are no significant differences between the different multilateral exchange rate targeting arrangements. As such, the model in equation 3.1 was estimated with only four different monetary policy frameworks: inflation targeting (IT), multilateral exchange rate targeting (ERT), unilateral exchange rate targeting (XT), and other (MDT, covering money targets and discretion). Tables 3.4 and 3.5 present the results of the estimation of the restricted logit models, with IT set as the base framework.

Table 3.4 **Estimates of the restricted logit models**

Model	*Exchange rates*		*Interest rates*		*Share prices*	
Target	*Announced*	*Actual*	*Announced*	*Actual*	*Announced*	*Actual*
γ	-5.429	-5.656	-5.429	-4.959	-3.802	-3.847
	-5.42	*-5.65*	*-5.42*	*-6.98*	*-8.41*	*-9.32*
β (MDT)	1.270	1.677	1.640	1.126	-0.182	-0.302
	1.23	*1.61*	*1.60*	*1.49*	*-0.36*	*-0.60*
β (ERT)	1.827	1.881	1.714	1.123	-0.745	-0.694
	1.80	*1.85*	*1.68*	*1.53*	*-1.43*	*-1.44*
β (XT)	2.303	2.491	2.181	1.795	-0.861	-0.259
	2.23	*2.43*	*2.11*	*2.43*	*-1.27*	*-0.50*

Notes: See Tables 3.2 and 3.3.

The results confirm that the monetary policy framework adopted by the Central Bank has a relevant influence in the likelihood of exchange rate and interest rate crises, but not in the likelihood of stock market crises. Crises are less likely to occur under IT than under any other framework, although the differences to the MDT framework are not significant. Crises are more likely to occur under XT, and the difference to all other frameworks is significant at the 5% level for the actual targets exchange rate and interest rate models.

Table 3.5 **Statistical inference from the restricted logit models**

	Exchange rates		*Interest rates*		*Share prices*	
	Announced	*Actual*	*Announced*	*Actual*	*Announced*	*Actual*
Predicted probabilities						
Inflation	0.44	0.35	0.44	0.70	2.18	2.09
	0.44	*0.35*	*0.44*	*0.35*	*0.44*	*0.35*
MDT	1.54	1.84	2.21	2.12	1.83	1.55
	0.38	*0.51*	*0.46*	*0.54*	*0.42*	*0.47*
ERT	2.65	2.24	2.38	2.11	1.05	1.06
	0.43	*0.38*	*0.40*	*0.37*	*0.27*	*0.26*
XT	4.21	4.05	3.74	4.05	0.94	1.62
	0.97	*0.79*	*0.92*	*0.79*	*0.47*	*0.51*
Joint tests						
1. No difference among non-ET frameworks and no difference among ERT and XT frameworks						
$\chi(2)$	4.17	7.78	4.86	8.36	0.17	1.49
2. Significance of the model (all $\beta(m)=0$)						
$\chi(3)$	14.65	15.16	8.63	11.69	4.27	2.60
Tests of equality of coefficients (rejections of the null)						
5%	DX	DX,EX		DX,EX		
10%	DE,EX					

Notes: See Tables 3.2 and 3.3.

4. CONCLUSIONS

This paper examined the differences in the stability of the foreign exchange, money, and stock markets, associated with the use of alternative monetary policy targets, based on data from a panel of 20 OECD countries, for the period 1961-2000. The investigation included an analysis of which targets were used by each country in each period of time, and a study of the likelihood of financial crises under different policy targets.

The main conclusion to be drawn is that the choice of monetary policy framework will significantly affect stability in financial markets. The likelihood of crises in foreign exchange markets and money markets differ significantly when central banks are using alternative policy targets. Some frameworks appear to be unambiguously preferable

from the financial stability perspective.

The use of inflation targets reduces the likelihood of crises in the foreign exchange and money markets (relative to *any* other framework), suggesting that a central bank concerned with financial stability should adopt this framework. With a credible inflation target there is less uncertainty on the future direction of monetary policy, and thus less uncertainty regarding exchange rates and interest rates, reducing the potential for foreign exchange or money market crises.

Another interesting result is that unilateral exchange rate targeting frameworks tend to have higher likelihood of foreign exchange and money market crises, consistent with the common view that they are more prone to speculative attacks, which may force central banks to increase interest rates to defend the exchange rate, sometimes unsuccessfully. However, it might be surprising to find out that multilateral exchange rate arrangements have lower likelihood of crises than unilateral arrangements. It would seem that the strong discipline of a multilateral arrangement could be a better deterrent to speculation than the (soft) domestic constraint of a unilateral exchange rate peg.

Financial stability ranks high on the list of concerns of the typical central bank, but it is seldom the most pressing concern. It is more likely that the monetary policy framework will be chosen according to its effect on inflation (and employment) than on financial stability. Nevertheless, existing research on this area suggests that no framework clearly outperforms the others. If the effects of different frameworks on macroeconomic variables do not differ significantly, the choice should be made on the basis of their impact on financial stability. The evidence provided in this paper could provide pertinent guidelines for those situations.

Appendix: Monetary Policy Targets in Selected OECD Countries

This appendix lists the monetary policy targets used by the central banks in the sample, during the period 1961-2000. Unmarked text describes the official target announced by the central bank. Text in square brackets refers to the actual (unofficial) target, as described in the sources consulted. Each policy framework period starts in the beginning of the 'start date' (i.e., if the start date is '1985' the period is assumed to start on 1/1/85), and ends immediately before the beginning of the 'start date' of the following period. In each period, the policy target is classified with a 2 letter code. The first letter refers to the officially announced target, and the second letter to the actual target. The letter code is as follows:

b - multilateral exchange rate target, Bretton-Woods arrangement;
d - discretionary policy, with no explicit policy target;
o - multilateral exchange rate target, original ERM (before August 1993);
i - inflation target;
m - monetary target;
s - multilateral exchange rate target, European 'snake';
w - multilateral exchange rate target, 'wide' ERM (after August 1993);
x - unilateral exchange rate target.

During the 1960's, all the countries in the sample were participating in the Bretton-Woods arrangement, which was revised by the Smithsonian agreement (SA), in December 18, 1971. The table below lists the monetary policy targets adopted after the country decided to abandon the Bretton-Woods arrangement.

Start date	*Code*	*Comments*
AUSTRALIA		
1971, Dec 18	xx	USD peg maintained after SA; par value changed 23/12/72, 12/2/73, 9/9/73
1974, Sep 25	xx	XR peg changed to constant trade-weighted exchange rate index;
1976, Nov 29	md	XR peg abandoned for managed floating; M targets (or 'conditional projections') adopted [but these were never elevated to the centre piece of monetary policy];
1983, Dec 12	md	managed floating ends;
1986	dd	M targets abandoned; no intermediate targets adopted (discretion);
1993	ii	IT adopted.
AUSTRIA		
1971, Aug 15	xx	USD peg abandoned; CB pledged to 'maintain XR stability against main European currencies, especially of the large industrialised neighbours' [implicit DEM peg];
1981	xx	[implicit DEM peg becomes more restrictive, with smaller XR fluctuations allowed]
1995, Jan 9	wo	ERM participation;
1999, Jan 1		Euro adopted.
BELGIUM		
1971, Dec 18	bb	narrower margins of fluctuation (1%) with Dutch guilder after SA
1972, Apr 24	ss	Snake participation;
1979, Mar 13	oo	ERM participation;
1990, Jun 1	oo	[implicit DEM peg];
1993, Aug 2	wo	ERM margins widened to 15% [but implicit DEM peg maintained];
1999, Jan 1		Euro adopted.

CANADA

1962, May	bb	Joined BW (before the XR was floating);
1970, May 31	dx	floated XR [but the authorities main concern remains XR stability];
1975, Nov 6	mm	M targets announced;
1978, 4th qrt	mx	[worries about monetarism; M targets continue to be announced, but XR stabilisation becomes the main concern; implicit effective XR peg];
1982, Nov	dx	M targets formally abandoned; no intermediate target adopted;
1984, 2nd qrt	dd	[implicit effective XR peg abandoned];
1988, Jan	di	price stability becomes primary objective;
1991, Feb 26	ii	IT adopted.

DENMARK

1972, May 1	ss	Snake participation;
1972, Jun 23	bb	Snake participation abandoned;
1972, Oct 10	ss	Snake participation rejoined;
1979, Mar 13	oo	ERM participation;
1993, Aug 2	ww	ERM margins widened to 15%;
1999, Jan 1	oo	Joins EMS2.

FINLAND

1973, June 4	dx	USD peg formally abandoned [but XR remains the main concern];
1977, Nov 1	xx	Effective XR peg adopted;
1991, Jun 7	xx	Peg changed to ECU;
1992, Sep 8	dd	ECU peg abandoned;
1993, Feb	ii	IT adopted;
1996, Oct	ww	ERM participation;
1999, Jan 1		Euro adopted.

FRANCE

1972, May 1	sd	Snake participation [but policy was discretionary, geared towards domestic objectives, with equilibrium assured by XR adjustments];
1974, Jan 19	dd	Snake participation abandoned;
1975, Jul 10	sd	Snake participation rejoined [but policy remained discretionary];
1976, Mar 15	mm	Snake participation abandoned; M2 target announced;
1979, Mar 13	od	ERM participation [M2 targets retained, but these were frequently missed; policy was discretionary, with XR peg defended through capital controls and frequent devaluations];
1984, 4th qtr	oo	[XR stability becomes primary concern];
1993, Aug 2	ww	ERM margins widened to 15%.
1999, Jan 1		Euro adopted.

GERMANY

1970, May	dd	USD peg suspended;
1971, Dec 18	bb	USD peg resumed, after SA;
1973, Mar 19	dm	USD peg abandoned; Snake participation [but participation in European XR agreements was never a binding constraint for German monetary policy; M targeting attempted, but not announced];
1974, Dec	mm	M target announced.
1999, Jan 1	ii	Euro adopted; ECB adopts two pillar framework, with targets for inflation and M3 [but second pillar never played a role in policy decisions]

IRELAND

1972, Jun 23	xx	1:1 parity with GBP maintained, after GBP abandons USD peg;
1978, Dec 18	dx	GBP parity formally abandoned [but maintained in practice];
1979, Mar 13	oo	ERM participation;
1993, Aug 2	wo	ERM margins widened to 15% [but policy is still aimed at maintaining the DEM peg];
1999, Jan 1		Euro adopted.

ITALY

1972, May 1	sd	Snake participation [but interest rate policy was not consistent with XR commitments; instead the CB resorted to capital controls and a 2-tier XR system];
1973, Feb 12	dd	Snake participation abandoned;
1974, Mar 22	md	Total Domestic Credit expansion adopted as intermediate target [under pressure from the IMF; in practice, targets were not observed];
1979, Mar 13	od	ERM participation [but interest rate policy was still inconsistent with XR commitments; it is arguable whether ERM membership was a serious constraint on policy];
1984	om	M2 target adopted [but TDC target not abandoned; conflict with XR target settled with the imposition of capital controls];
1987	oo	[policy aimed first and foremost at maintaining XR stability; M2 targets not abandoned, but were not pursued rigidly];
1992, Sep 17	mw	ERM participation suspended; M2 becomes intermediate target [but XR is also monitored closely];
1996, Nov 24	ww	ERM participation resumed;
1999, Jan 1		Euro adopted.

JAPAN

1973, Feb 12	dd	USD peg abandoned [no explicit policy target adopted];
1975, Jul	dm	[M2 used as intermediate target, but not announced];
1978, Jul	mm	M2 'forecasts' announced [these were not 'targets', but represented the movements in M2 the CB was willing to accept];
1990	dd	[CB allowed for increased variability of M growth]; no intermediate targets; CB pays attention to international financial conditions and the maintenance of an adequate XR.

NETHERLANDS

1970, May	dx	USD peg suspended [peg to DEM maintained];
1971, Dec 18	bb	USD peg resumed; narrower margins of fluctuation (1%) with Belgium franc;
1972, Apr 24	ss	Snake participation;
1979, Mar 13	oo	ERM participation;
1984	oo	[unpublished DEM target of 1.12/1.13 NLG/DEM];
1993, Aug 2	oo	ERM margins widened to 15%, but not for the NLG/DEM [unpublished DEM target is not affected];
1999, Jan 1		Euro adopted.

NEW ZEALAND

1973, Jul 9	xx	effective XR peg adopted;
1979, Jun	xx	effective XR crawling peg adopted;
1982, Jun 22	xx	effective XR fixed peg adopted;
1985, Mar 4	dd	effective XR peg abandoned [no explicit target adopted; checklist approach in conducting monetary policy];
1988, Jun 1	di	price stability becomes primary objective;
1990, Feb 1	ii	IT adopted.

NORWAY

1972, May 23	ss	Snake participation;
1978, Dec 12	xx	end of Snake participation; effective XR peg adopted;
1990, Oct 19	xx	ECU peg, with fluctuation bands of ±2.25%;
1992, Dec 10	dx	ECU peg abandoned; policy aimed at a broadly stable XR;

PORTUGAL

1973, Feb 12	xx	USD peg changed to effective XR fixed peg;
1976	xd	[Frequent revisions to effective XR peg];
1977, Aug 26	xx	Effective XR crawling peg adopted;
1979	mx	Annual targets for broad money (L-) set by Bank of Portugal [but concern over the XR dominated policy]
1990, October	xo	[ERM shadowing];
1992, April	oo	ERM participation (with ±6% bands);
1993, Aug 2	wo	ERM bands widened [but XR flexibility is limited by the CB];
1999, Jan 1		Euro adopted.

SPAIN

1974, Jan 22	dm	USD peg abandoned; [explicit use of M3 intermediate target, but targets are not made public];
1977, May 2	mm	M3 targets announced;
1984	mx	change to liquid assets targeting [importance of M targets gradually downgraded; concern for XR gradually increasing; initially concern was for effective XR (1984-85), then for index of EEC countries' XR (1986-87), finally for DEM/ESP (1988-89)];
1989, Jun 19	oo	ERM participation (with ±6% bands); [liquid assets targets were not abandoned, but XR target took precedence];
1993, Aug 2	ww	ERM margins widened to 15%;
1995, Jan 1	ii	IT adopted;
1999, Jan 1		Euro adopted.

SWEDEN

1973, Mar 19	ss	Snake participation;
1977, Aug 29	xx	Snake participation abandoned; effective XR peg adopted;
1991, May 17	xx	ECU peg adopted, with fluctuation margins of ±1.5%;
1992, Nov 19	dd	ECU peg abandoned; no target adopted;
1993, Jan 15	ii	IT adopted.

SWITZERLAND

1973, Jan 23	dd	USD peg abandoned;
1975	mm	M1 target adopted [but the XR is an important concern, and in periods of large pressures in forex markets, the XR goal may take precedence over the M target];
1978, Oct 1	xx	DEM target announced, M1 target suspended;
1979, Jun 25	xx	[return to M targeting, but not announced; XR concerns still dominate policy];
1980	mx	return to announced M targets, but target changed to M0 [XR concerns still dominate policy];
1982, Jan 3	mm	[return to domestic concerns; importance of XR downgraded];
1988, Jan 6	md	definition of M0 changed [M target followed less rigidly];
1991	di	M0 target for 1991 not announced; CB emphasises the XR oriented nature of policy, but refrained from defining targets; policy set to be consistent with 1% inflation rate [implicit IT].

UNITED KINGDOM

1972, Jun 23	dd	USD peg abandoned (discretionary policy); Snake participation from May 1 to June 26, 1972;
1973, 4th qtr	dm	[informal M3 target adopted];
1976, July	md	M target announced [under IMF pressure; targets were not taken as a serious constraint on policy, and were consistently overshot];
1979, June 12	mm	[new government more committed to £M3 targets];
1982, Mar	md	£M3 target de-emphasised; targets for M1 and PSL2 also adopted [discretionary policy in practice];
1985	dd	£M3 target suspended;
1987, Mar	dx	[unpublished DEM target adopted];
1988, Mar	dd	[unpublished DEM target abandoned];
1990, Oct 8	oo	ERM participation (with ±6% bands);
1992, Sep 17	ii	ERM participation abandoned; IT adopted (Oct 8).

UNITED STATES

1971, Dec 18	bb	SA; [discretionary policy oriented to domestic conditions, based on Fed Funds rate targeting; weekly money targets were more 'forecasts' than 'targets' (desired)];
1973, Feb 12	dd	major currencies abandon peg to USD; [M targets become real objectives, instead of mere forecasts];
1975, April	md	M1 target announced [targets were quarterly revised and frequently overshot; policy still based on Fed Funds rate targeting];
1979, Oct 6	mm	non borrowed reserves targeting announced; [greater weight on M targets];
1982, Oct	md	borrowed reserves targeting [M targets de-emphasised];
1986	dd	[abandon of M targets; concern for financial asset prices].

Sources: General: IMF *Annual Report on Exchange Arrangements and Exchange Restrictions*, OECD *Economic Surveys*, Bernanke and Mishkin (1992), Goodhart and Viñals (1994); Australia: Stevens and Debelle (1995); Canada: Freedman (1995), Howitt (1993); France: Mélitz (1993); Germany: Bernanke and Mihov (1997), Clarida and Gertler (1997), Kloten (1992), Neumann and von Hagen (1993), von Hagen (1995); Italy: Spinelli and Tirelli (1993), Visco (1995); Japan: Ichimura (1993), Tamura (1992); New Zealand: Fischer (1995); Spain: Ayuso and Escrivá (1997); Sweden: Svensson (1995); Switzerland: Wasserfallen and Kursteiner (1994); UK: Artis and Lewis (1991), Bowen (1995), Goodhart (1992), Minford (1993); US: Mayer (1992), Meulendyke (1990).

REFERENCES

ALMEIDA, Alvaro (1998): *Monetary Policy Strategy and the Behaviour of Exchange Rates: an empirical investigation*, Ph.D. thesis, London School of Economics and Political Science.

ALMEIDA, Alvaro, and Charles GOODHART (1998): "Does the adoption of inflation targets affect central bank behaviour?," *Banca Nazionale del Lavoro Quarterly Review* 204 (supplement), 19-107.

ARTIS, Michael, and Mervyn LEWIS (1991): *Money in Britain: Monetary Policy, Innovation and Europe*. Philip Alan, Hertfordshire.

AYUSO, Juan, and José Luis ESCRIVÁ (1997): "La evolución de la estrategia de control monetario en España," in *La Política Monetaria y la Inflación en España*, Servicio de Estudios del Banco de España. Alianza Editorial, Madrid, 89-120.

BARRO, Robert, and David GORDON (1983): "A positive theory of monetary policy in a natural rate model," *Journal of Political Economy* 91 (4), 589-610.

BERNANKE, Ben, and Ilian MIHOV (1997): "What does the Bundesbank target?," *European Economic Review* 41 (6), 1025-1053.

BERNANKE, Ben, Thomas LAUBACH, Frederic MISHKIN, and Adam POSEN (1999): *Inflation Targeting: Lessons from the International Experience*. Princeton University Press, Princeton, New Jersey.

BERNANKE, Ben, and Frederic MISHKIN (1992): "Central bank behavior and the strategy of monetary policy: observations from six industrialized countries," in *NBER Macroeconomics Annual*, edited by Olivier Blanchard and Stanley Fischer. MIT Press, Cambridge, 183-228.

BORDO, Michael, and Anna SCHWARTZ (1999): "Monetary policy regimes and economic performance: the historical record," in *Handbook of Macroeconomics*, vol. 1A, edited by John B. Taylor and Michael Woodford. Elsevier Science, North-Holland, Amsterdam, 149-234.

BOWEN, Alex (1995): "Inflation targetry in the United Kingdom," in *Targeting Inflation*, edited by Andrew Haldane. Bank of England, London, 59-74.

CLARIDA, Richard, and Mark GERTLER (1997): "How the Bundesbank conducts monetary policy," in *Reducing Inflation: Motivation and Strategy*, edited by Christina D. Romer and David H. Romer. NBER Studies in Business Cycles, vol. 30, University of Chicago Press, Chicago, 363-406.

CLARIDA, Richard, Jordi GALI, and Mark GERTLER (1999): "The Science of Monetary Policy: a New Keynesian Perspective," *Journal of Economic Literature* 37 (4), 1661-1707.

COTTARELLI, Carlo, and Curzio GIANNINI (1997): "Credibility without rules? Monetary frameworks in the post-Bretton Woods era," International Monetary Fund Occasional Paper 154, December.

FEDERAL RESERVE BANK OF NEW YORK (1990): *Intermediate Targets and Indicators for Monetary Policy*. Federal Reserve Bank of New York, New York.

FISCHER, Andreas (1995): "New Zealand's experience with inflation targets," in *Inflation Targets*, edited by Leonardo Leiderman and Lars Svensson. Center for Economic Policy Research, London, 32-52.

FISCHER, Stanley (1990): "Rules versus discretion in monetary policy," in *Handbook on Monetary Economics, vol. 2*, edited by Benjamin Friedman and Frank Hahn. North Holland, Amsterdam, 1155-1184.

FOLKERTS-LANDAU, David, and Peter GARBER (1992): "The ECB: a bank or a monetary policy rule?," in *Establishing a Central Bank: Issues in Europe and Lessons from the US*, edited by Matthew Canzoneri, Vittorio Grilli and Paul Masson. Cambridge University Press, Cambridge, 86-110.

FREEDMAN, Charles (1995): "The Canadian experience with targets for reducing and controlling inflation," in *Inflation Targets*, edited by Leonardo Leiderman and Lars Svensson. Center for Economic Policy Research, London, 19-31.

GOODHART, Charles (1989): "The conduct of monetary policy," *Economic Journal* 99 (June), 293-346.

GOODHART, Charles (1992): "British monetary policy: October 1990," in *Monetary Policy and Financial Innovations in Five Industrial Countries*, edited by Stephen Frowen and Dietmar Kath. Macmillan, Basingstoke, Hampshire, 142-159.

GOODHART, Charles, and José VIÑALS (1994): "Strategy and tactics of monetary policy: examples from Europe and the Antipodes," in *Goals, Guidelines, and Constraints Facing Monetary Policymakers*, edited by Jeffrey Fuhrer. Federal Reserve Bank of Boston, Boston, 139-187.

GREENE, William (2002): *Econometric Analysis (5th ed.)*. Prentice-Hall, New Jersey.

HOWITT, Peter (1993): "Canada," in *Monetary Policy in Developed Economies*, edited by Michele Fratianni and Dominick Salvatore. North-Holland, Amsterdam, 459-508.

ICHIMURA, Shinichi (1993): "Japan," in *Monetary Policy in Developed Economies*, edited by Michele Fratianni and Dominick Salvatore. North-Holland, Amsterdam, 433-457.

INTERNATIONAL MONETARY FUND (1957-2000): *Annual Report on Exchange Arrangements and Exchange Restrictions*, Washington, DC.

ISARD, Peter (1995): *Exchange Rate Economics*. Cambridge University Press, Cambridge.

KENEN, Peter (1969): "The theory of optimum currency areas: an eclectic view," in *Monetary Problems of the International Economy*, edited by Robert Mundell and Alexander Swoboda. University of Chicago Press, Chicago, 41-60.

KLOTEN, Norbert (1992): "The control of monetary aggregates in the Federal Republic of Germany under changing conditions," in *Monetary Policy and Financial Innovations in Five Industrial Countries*, edited by Stephen Frowen and Dietmar Kath. Macmillan, Basingstoke, Hampshire, 32-58.

KYDLAND, Finn, and Edward PRESCOTT (1977): "Rules rather than discretion: the inconsistency of optimal plans," *Journal of Political Economy* 85 (3), 473-491.

LAIDLER, David (1997): "Inflation control and monetary policy rules," in *Towards More Effective Monetary Policy*, edited by Iwao Kuroda. Macmillan Press, New York, 67-93.

MCCALLUM, Bennett (1994): "Monetary policy rules and financial stability," NBER working paper 4692, April.

McCALLUM, Bennett (1999): "Issues in the design of monetary policy rules," in *Handbook of Macroeconomics*, vol. 1C, edited by John B. Taylor and Michael Woodford. Elsevier Science, North-Holland, Amsterdam, 1483-1530.

McKINNON, Ronald (1963): "Optimum currency areas," *American Economic Review* 53 (4), 717-725.

MAYER, Thomas (1992): "Federal Reserve policy since October 1979: a justified response to financial innovations?," in *Monetary Policy and Financial Innovations in Five Industrial Countries*, edited by Stephen Frowen and Dietmar Kath. Macmillan, Basingstoke, Hampshire, 16-31.

MÉLITZ, Jacques (1993): "France," in *Monetary Policy in Developed Economies*, edited by Michele Fratianni and Dominick Salvatore. North-Holland, Amsterdam, 335-369.

MEULENDYKE, Ann-Marie (1990): "A review of Federal Reserve policy targets and operating guides in recent decades," in *Intermediate Targets and Indicators for Monetary Policy*. Federal Reserve Bank of New York, New York, 452-473.

MINFORD, Patrick (1993): "The United Kingdom," in *Monetary Policy in Developed Economies*, edited by Michele Fratianni and Dominick Salvatore. North-Holland, Amsterdam, 405-431.

MISHKIN, Frederic (2000): "What Should Central Banks Do?," *Federal Reserve Bank of St. Louis Review* 82 (6), 1-13.

MUNDELL, Robert (1961): "A theory of optimum currency areas," *American Economic Review* 51 (4), 657-665.

NEUMANN, Manfred, and Jürgen VON HAGEN (1993): "Germany," in *Monetary Policy in Developed Economies*, edited by Michele Fratianni and Dominick Salvatore. North-Holland, Amsterdam, 299-334.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (1957-2000): *Economic Surveys*, Paris.

SOLOW, Robert (1982): "On the lender of last resort," in *Financial Crisis: Theory, History and Policy*, edited by Charles Kindleberger and Jean Laffargue. Cambridge University Press, Cambridge.

SPINELLI, Franco, and Patrizio TIRELLI (1993): "Italy," in *Monetary Policy in Developed Economies*, edited by Michele Fratianni and Dominick Salvatore. North-Holland, Amsterdam, 371-403.

STEVENS, Glenn, and Guy DEBELLE (1995): "Monetary policy goals for inflation in Australia," in *Targeting Inflation*, edited by Andrew Haldane. Bank of England, London, 81-100.

SUMMERS, Lawrence (1991): "Planning for the next financial crisis," in *The Risk of Economic Crisis*, edited by Martin Feldstein. University of Chicago Press, Chicago, 135-158.

SVENSSON, Lars (1995): "The Swedish experience of an inflation target," in *Inflation Targets*, edited by Leonardo Leiderman and Lars Svensson. Center for Economic Policy Research, London, 69-89.

SVENSSON, Lars (2002): "What is Wrong with Taylor Rules? Using Judgment in Monetary Policy through Targeting Rules," NBER working paper 9421, December.

TAMURA, Tatsuya (1992): "Monetary control in Japan," in *Monetary Policy and Financial Innovations in Five Industrial Countries*, edited by Stephen Frowen and Dietmar Kath. Macmillan, Basingstoke, Hampshire, 101-119.

TAYLOR, John (1993): "Discretion versus policy rules in practice," *Carnegie Rochester Conference on Public Policy* 39, 195-214.

VISCO, Ignazio (1995): "Inflation, inflation targeting and monetary policy: notes for discussion on the Italian experience," in *Inflation Targets*, edited by Leonardo Leiderman and Lars Svensson. Center for Economic Policy Research, London, 142-168.

VON HAGEN, Jürgen (1995): "Inflation and monetary targeting in Germany," in *Inflation Targets*, edited by Leonardo Leiderman and Lars Svensson. Center for Economic Policy Research, London, 107-121.

WASSERFALLEN, Walter and Guido KURSTEINER (1994): "Interest rates and exchange rates under money supply targets: the Swiss evidence," *Journal of Monetary Economics* 33 (1), 201-230.