Properties of the monetary conditions index

Grande, Giuseppe

Bank of Italy

December 1997

BANCA D'ITALIA

Temi di discussione

del Servizio Studi

Properties of the Monetary Conditions Index

by Giuseppe Grande

Number 324 - December 1997

Temi di discussione

del Servizio Studi

BANCA D'ITALIA - Roma - 1998

Properties of the Monetary Conditions Index

by Giuseppe Grande

Number 324 - December 1997

PROPERTIES OF THE MONETARY CONDITIONS INDEX

by Giuseppe Grande (*)

Abstract

In recent years increasing use has been made in monetary policy analysis of the so-called Monetary Conditions Index (MCI). The index is defined as a linear combination of changes in a short-term real interest rate and in the real effective exchange rate, whose coefficients are equal to the estimated effects of the two financial variables on real aggregate demand or, alternatively, on a price index. The MCI is usually regarded as a measure of the degree of tightness of monetary policy in an open economy. In this paper the properties of the index and its possible uses in monetary policy are investigated by means of a macroeconomic model of the Mundell-Fleming-Dornbusch type; the reaction of the index to different kinds of aggregate shock is considered. Two possible meanings of the index are discussed: as a measure of the stance of monetary policy in an open economy and as an inflation indicator. It is shown that the index can be misleading in both cases. The MCI is ineffective in signalling changes in the stance of monetary policy in the cases of a financial shock and an exchange rate shock and it may also be misleading in the case of a supply shock. As an inflation indicator the index is also subject to some drawbacks in the case of real shocks. The MCI is to be properly interpreted as a summary measure of the inflationary pressures stemming from the short-term real interest rate and the real exchange rate. An MCI constructed for Italy turns out to have been affected in recent years by the wide fluctuations of the lira exchange rate, which were mainly due to shocks originating in the financial and foreign-exchange markets.

Contents

(*) Bank of Italy, Research Department.

1. Introduction[1]

The central banks of some industrialized countries have recently published a so-called Monetary Conditions Index (MCI) with the aim of providing an overall measure of the restrictiveness of interest rates and the exchange rate, regarded as the main channels whereby monetary policy is transmitted to prices in an open economy.[2] The index is a linear combination of the changes in a real short-term interest rate and in the real effective exchange rate, whose coefficients are equal to the estimated effects of these two financial variables on real aggregate demand or, alternatively, on a price index. In recent years, international organizations and private banks have also made use of indexes of this kind.[3]

In this paper, the theoretical properties of the MCI are analyzed by means of a standard macroeconomic model of the Mundell-Fleming-Dornbusch type. This kind of model still constitutes one of the main tools for the study of the macroeconomic consequences of aggregate shocks[4] and provides a sound theoretical framework for the MCI. Two possible uses of

---

1 The author is grateful for helpful discussions on an earlier draft to Eugenio Gaiotti and for useful comments and suggestions to Ignazio Angeloni, Luca Dedola, Roberto Rinaldi, an anonymous referee and participants at a seminar at OCSM (LUISS University) in Rome. He also thanks Angela Gattulli and Miria Rocchelli for editorial assistance. The author remains wholly responsible for the views expressed and any possible errors. The opinions expressed do not necessarily correspond to those of the Bank of Italy.

2 The MCI was first proposed in 1994 by the Bank of Canada, which has been using the index for several years (Freedman, 1994). Subsequently, the Bank of Sweden, the Bank of Norway and the Bank of Finland also published MCIs.

3 The use of indexes similar to the MCI has been proposed for Italy by Lane and Prati (1994).

4 See for instance Whitley (1997).

the index are discussed: as a monetary policy indicator and as an inflation indicator.[5] In the last section, an MCI is constructed for Italy and its trends in recent years are examined.

The paper is organized as follows. Section 2 contains a brief presentation of the index (definition and methodology of construction). In Section 3 some applications of the index are reviewed and the different meanings attributed to the MCI are discussed. In Section 4 a standard macroeconomic model is used to analyze the reaction of the index to different kinds of shock and its informative content. Section 5 presents an MCI for Italy and the last section concludes. The Appendix contains the algebra.

2. A brief presentation of the index

The MCI is defined as a linear combination of the change in a real short-term interest rate and the percentage change in the real effective exchange rate, both measured with respect to a reference period (Table 1).

The weights are equal to the estimated effect of the two financial variables on real aggregate demand, according to a macroeconomic model in which inflationary pressures pass mainly through that variable. As an alternative, they are directly referred to a consumer good deflator. Usually, the weights refer to the effects of the two financial variables computed on a time span of about six to eight quarters.

---

5 This paper focuses on the information content of the MCI. The possible use of the index as the operational target of monetary policy is discussed by Gerlach and Smets (1996) in a model similar to the one adopted in this paper (see Section 4.3).

Table 1

MONETARY CONDITIONS INDEX: DEFINITION

$$MCI_t = b_1 \times \left(SRIR_t - SRIR_{t_0}\right) + b_2 \times \left[\left(\frac{REER_t}{REER_{t_0}} - 1\right) \times 100\right]$$

where:

MCI_t Monetary Conditions Index at time *t*.

$SRIR_t$ Short-term Real Interest Rate at time t in percentage points.

$REER_t$ Real Effective Exchange Rate index at time t. The index is expressed as foreign currency per unit of domestic currency; an increase means an appreciation of the latter.

b_1, b_2 weights associated with financial variables.

t_0, t respectively, base and current period.

Since the degree of tightness of the real interest rate and the real exchange rate can be properly assessed only in relation to all the other factors which have an effect on prices (such as foreign demand, fiscal policy and import prices), no meaning can be attached either to the levels of the two financial variables or to the level of the MCI. For this reason, in the use of the index it is important to remember that:[6]

1) the index is based on the *changes* in the two financial variables;
2) in interpreting the MCI, only the *changes in the index* must be considered;
3) the index is most useful for *short horizons* (when the *ceteris paribus* condition is more likely to be met).

---

[6] Freedman (1994), pp. 469-70.

Points 1) and 2) imply that in computing the changes in the two financial variables the choice of the base period is irrelevant.

The real effective exchange rate is a measure of the competitiveness of the country; recourse is usually made to the index computed with respect to the country's main trading partners and deflated with producer prices. The interest rate usually has a short maturity; it must have a significant and stable relationship with aggregate demand. Since the real exchange rate is observed with a lag (usually two or three months) and data on prices are monthly, in day-to-day analysis recourse is made to the index constructed with the financial variables defined in nominal terms.

3. Different meanings attributed to the MCI

A schematic outline of the first applications of the MCI is provided in Table 2. For each study, the table shows the country considered, the methodology used to estimate the weights, the weights referred to aggregate demand (and, if available, those relative to consumer prices) and, finally, the role attributed to the index.

As regards the latter aspect, the MCI is viewed either as a measure of the degree of tightness of monetary policy (thereby belonging to the class of indicators of monetary policy defined by Brunner and Meltzer, 1967) or as an information variable related to inflation (in agreement with the concept of indicator prevailing in the literature since

Table 2

STUDIES OF THE MONETARY CONDITIONS INDEX

Study	Country	Methodology used to estimate the coefficients	Relative weight of the exchange rate (*): real demand	prices	Role attributed to the index
			CENTRAL BANKS		
Freedman (1994)	Canada	Reduced form of GDP and prices	1/3	1/2	Operational target of monetary policy Indicator of the stance of monetary policy
Hansson, Lindberg (1994)	Sweden	Reduced form of GDP and prices	1/3;1/4	-	Indicator of the stance of monetary policy - Inflation indicator
Norges Bank (1995)	Norway	Structural model	1/3	3/1	Indicator of the stance of monetary policy - Inflation indicator
Pikkarainen, Ripatti (1995)	Finland	?	1/2.5	-	Indicator of the stance of monetary policy - Inflation indicator
			INTERNATIONAL MONETARY INSTITUTIONS		
Corker (IMF; 1995)	Germany	Reduced form of GDP and prices	1/3	-	Inflation indicator
Kennedy, van Riet (EMI; 1995)	Main European countries	Multi-country structural model (NIGEM)	several cases	several cases	Indicator of the stance of monetary policy - Inflation indicator
			PRIVATE BANKS		
JP Morgan (1995)	Main industrial countries	?	several cases	-	Indicator of the stance of monetary policy
IBJ (1995)	Main industrial countries	Degree of "openess" of the economy	several cases	-	Indicator of the stance of monetary policy

(*) Ratio of the exchange rate coefficient to the interest rate coefficient (according to the notation of Table 1, b_2/b_1).

the seventies).[7] It can even be taken as the operational target of monetary policy. The following discussion of the different interpretations of the MCI assumes that the index is well constructed, i.e. that the coefficients associated with the interest rate and the exchange rate represent sound measures of the effects of the two financial variables on aggregate demand and the relationship between the latter and consumer prices is stable. Of course, this assumption is not at all warranted, as will be argued in Section 4.3.

According to the Bank of Canada, the MCI helps to take the exchange rate into account in monetary policy decisions:[8] the index is interpreted as a synthetic measure of the overall restrictive effects of monetary policy in an open economy. For some years now, the Bank of Canada has used the MCI as the operational objective of monetary policy.[9]

---

7 The first meaning dates back to Brunner and Meltzer (1967, pp. 187-88): "What information about monetary policy is conveyed by the position of, or change in, a particular variable? ... By what criteria do we decide that a particular variable is a good or better indicator of current or recent monetary policy? ... The problem is referred to as the 'indicator problem', since we are concerned with the relative merits of a number of variables often used to indicate the current direction of monetary policy or the future effect of recent policies." Starting from Poole (1970), the literature has mainly regarded as "indicators" the (financial or real) variables which contain information on the trends in the final variables of economic policy. The distinction between the two concepts is recalled by McCallum (1989).

8 Freedman (1994, p. 474); Bank of Canada (1995, p. 14).

9 Bank of Canada (1995, p. 14): "The Bank has been using the MCI as an operational target of policy for several years ... An operational target is a variable that the central bank can influence fairly directly when it changes the setting of its instrument variable. In Canada, the instrument is the size of the central bank's balance sheet." Freedman (1994) points out that the MCI, even if it is regarded as an operational objective and not as a mere indicator, cannot constitute a nominal anchor of the economy (a variable which in the long run sets the level and the rate of increase in prices), as instead happens for intermediate objectives such as monetary aggregates or (the level of) exchange rates.

In Canada, the use of the index is strictly linked to that of a macroeconomic forecasting model. The procedure for implementing monetary policy can be set out as follows (Freedman, 1994; Longworth and Poloz, 1995): on a quarterly basis, the staff of the central bank updates the macroeconomic forecasts for the next quarters and derives

According to Sveriges Riksbank's economists,[10] the MCI can be viewed not only as an indicator of monetary policy but also as an indicator of future inflation, because it measures the overall effects of two important channels of inflationary pressures. This interpretation is also sketched out in the publications of the other two North-European central banks. No central bank except the Bank of Canada regards the index as an operational target.

Most of the other works consider the MCI an indicator of the stance of monetary policy. This view seems to be shared by private banks.[11] On the other hand, Corker (1995), who constructs an MCI for Germany, analyses it mainly as an inflation indicator.

---

a profile of the operational objective which is consistent with the fulfillment of the inflation target; this exercise is based on the hypothesis that the model provides a good representation of the economy and that the trends in the exogenous variables will be equal to those projected. The results of the model simulations are communicated to the management of the Bank; the latter can supplement the forecasts with other information available and with its own judgments and finally decides the stance of monetary policy. It is at this point that recourse is made to the MCI. In the period until the next forecasting session, every significant deviation of the index from the targeted path is carefully assessed, with account also being taken of additional information accrued since the last simulation, and appropriate changes in liquidity conditions are made. Clearly, if the index constitutes the operational target itself, as in Canada, the central bank should in general tend to offset any deviation. Significant deviations of the index from the targeted path signal the presence of shocks (current or future) that at the time of the last forecasting session were not foreseen. To arrive at the optimal reaction, the central bank must achieve a clear understanding of the kind of shock affecting the economy, its degree of persistence and the reaction of financial markets, as revealed by variations in interest and exchange rates before making any change in monetary policy.

10 Hansson and Lindberg (1994).

11 However, in J. P. Morgan (1995) the MCI is often referred to as the "financial" conditions.

The different arguments put forward for these two interpretations are summarized below in five points.[12] The first two are the relevant ones if the index is regarded as an indicator of the stance of monetary policy; the third argument also backs this interpretation, if one assumes that the central bank could counter any change in the exchange rate. All the points support the view that the MCI is an inflation indicator:

1) In an open economy, monetary policy affects economic activity through both the interest rate and the exchange rate. The overall effects of monetary policy on prices can be properly assessed only by a joint evaluation of the two financial variables.
2) The "endogenous" response of the exchange rate to aggregate shocks can anticipate the reaction of the central bank, to the point of making it unnecessary.[13]
3) Both financial variables – and particularly the exchange rate – are subject to idiosyncratic shocks. The MCI provides a measure of the inflationary effects of such shocks.
4) The reactions of the two financial variables to aggregate shocks can have effects on prices of opposite sign. The MCI helps to assess which of them prevails.
5) Expectations and risk premiums built into the prices of financial assets can change the reaction patterns of the interest rate and the exchange rate to aggregate shocks. The MCI provides a measure of the overall inflationary effects stemming from these variables, regardless of the factors which are behind their movements.

---

[12] Cf. for instance Freedman (1990; 1994, pp. 466-69 and 473-74), Hansson and Lindberg (1994).

[13] This could be the case, for instance, of an expansionary fiscal shock, which according to the conventional wisdom leads to an appreciation of the exchange rate.

It is worth observing that the distinction between the two kinds of indicator breaks down if one makes the extreme assumption that the central bank is responsible for *every* change in inflation: in this case, actual inflation would be the best indicator of the stance of (past) monetary policy. Following this line of reasoning, the MCI is an indicator of the restrictiveness of monetary policy if the central bank is exclusively responsible for inflationary pressures stemming from the real short-term interest rate and the real exchange rate.

In the studies relative to Canada, Sweden and Germany the weights are estimated using reduced form models, which include a highly stylized equation for real aggregate demand and a Phillips curve.[14] In the first two papers, it is argued that the results are consistent with those obtainable from VAR models and large-scale structural models. The latter are used by Norges Bank (1995) and by Kennedy and van Riet (1995). In the methodology used by IBJ (1995), the coefficients are computed without resorting to econometric techniques; recourse is made instead to a measure of the degree of "openess" of the economy, defined as the ratio of the sum of imports and exports to GDP.

The studies reported in Table 1 do not differ significantly with respect to the choice of the financial variables included in the index, except that of Kennedy and van Riet (1995), which includes a long-term interest rate.[15]

---

14 The methodology is carefully presented in Dugay (1994).

15 This choice can be justified on the grounds that in financial structures with a large stock of fixed-rate loans with medium- or long-term maturities there could be an effect of long-term rates on aggregate demand independent of that of the first part of the yield curve if financial markets are segmented (thus hampering the transmission of changes in short-term interest rates) or if term premiums are unstable. It is clear, however, that such an indicator

The weights used in the MCI are almost always related to the effects of the two financial variables on real aggregate demand. In most cases, the ratio between the coefficient of the exchange rate and that of the interest rate is around 1/3: an increase in the short-term interest rate of 1 percentage point has the same restrictive effect as an appreciation of the exchange rate of 3 per cent. Where the coefficients are calculated with respect to a consumer good deflator, the relative weight of the exchange rate is much higher because of the latter's direct effect on prices through imported goods.[16]

4. A theoretical assessment of the information content of the index

As demonstrated by the literature on policy indicators, the information content of a variable can change according to the kind of shock affecting the economy. In this section, a reference macroeconomic model is used to analyze the reaction of the MCI to different kinds of aggregate shock.

---

risks being even less related to the action of the central bank than the MCI in the standard specification.

16 MCIs have been constructed for the main industrialized countries by the Japanese private bank IBJ International (IBJ, 1995) on the basis of a uniform methodology (see above in the text). According to this methodology, for the main European countries the appreciation of the exchange rate which has effects comparable to those of a 1 percentage point increase in short-term interest rates ranges from 2.9 to 4.0 per cent. The relative effect of the exchange rate is very low in the United States (7.7 per cent) and Japan (7.1); quite high, in Germany (2.9), Canada (2.7) and Denmark (2.7) and reaches a maximum in Belgium (1.1).

4.1 *The model*

The theoretical framework is of the Mundell-Fleming-Dornbusch type. It is a small open economy, with sticky prices, perfect foresight and no restriction on capital flows. The equations are shown in Table 3.[17]

Table 3

A REFERENCE MACROECONOMIC MODEL OF A SMALL OPEN ECONOMY

(1)	$m - q = a_1 y - a_2 r + m_0^d$	LM Curve
(2)	$y = -b_1(r - Dq) + b_2(e + p_f - p) + f$	IS Curve
(3)	$Dp = c_1 y + h$	Phillips Curve
(4)	$q = d_1 p + (1 - d_1)(e + p_f)$	Consumer Prices
(5)	$De^e = r - r_f - k$	Open interest parity with a risk premium
(6)	$De^e = De$	Perfect Foresight

The *LM curve* represents the equilibrium on the money market; the money supply (m) is deflated by consumer prices (q) and the real demand for money depends upon the domestic product (y), the nominal interest rate (r) and a constant which is subject to shocks (m_0^d). The *IS curve* implies that real aggregate demand depends on the real interest rate ($r - Dq$, where Dq represents the rate of increase in consumer prices), the real exchange rate (defined as the ratio between the price of foreign goods in domestic currency and the price of the domestic product: $e + p_f - p$, where e represents the

[17] All the variables are logs, except interest rates; the parameters ($a_1, a_2, b_1, b_2, c_1, d_1$) are positives. The D operator means "derivative with respect to time" (i.e.: $De \equiv de/dt$).

nominal exchange rate[18] and p_f and p, respectively, foreign and domestic prices) and a constant, which represents an autonomous component subject to shocks (f).[19] The *Phillips curve* implies that variations in the deflator of the domestic product (Dp) are due to movements in the capacity utilization rate[20] and an exogenous factor (h).[21] Since a quota of domestic demand ($1-d_1$) is directed towards foreign goods, the price of the latter, expressed in domestic currency, enters into *consumer prices* (equation (4)). An *uncovered interest parity condition* states that the expected depreciation rate of the domestic currency (De^e) is equal to the differential between domestic (r) and foreign (r_f) interest rates, *adjusted for a risk premium* (k).[22] Finally, it is assumed that there is *perfect foresight*, so that the expected change in the exchange rate is equal to the actual value.

---

18 Domestic currency for a unit of foreign currency; an increase means a depreciation.

19 For instance, fiscal policy, foreign demand, the climate of confidence of consumers or entrepreneurs.

20 The stationary level of the real product is assumed to be zero.

21 The latter variable represents expectations concerning the long-term inflation trend; it can be considered equal to the rate of growth of the nominal money supply. In the short run it can also be viewed as an autonomous factor in the supply function, which may be subject to shocks. Alternative specifications of the expectations of "core inflation" are discussed in Obstfeld and Rogoff (1984), who point out that the hypothesis in which h represents the growth rate of money is not consistent with the rational expectations assumption in some cases.

22 The uncovered interest parity condition with a risk premium implies that there is full mobility of capital but an imperfect substitutability of domestic and foreign assets. An analogous hypothesis in a very similar model is made by Branson, Fraga and Johnson (1986). Buiter (1986) points out that the certainty equivalence holds in models such as the one shown in Table 3 if one adds additive disturbance terms to the equations, provided that some general hypotheses on the stochastic processes driving the model apply.

This model is particularly suitable for analyzing the MCI as an indicator of the stance of monetary policy:[23] the uncovered interest parity condition, coupled with rational expectations, allows the nominal exchange rate to be strongly influenced by current and prospective monetary policy. The effects of monetary policy are standard: in the long run production is equal to its stationary level and monetary policy can influence only the level and rate of increase in prices;[24] in the short run, because of price stickiness, monetary policy can cause temporary variations in real activity, which affect inflation through the Phillips curve.

To assess the ability of the MCI to signal changes in the monetary policy stance, it is necessary to know how the central bank reacts to exogenous shocks. To this end it is assumed that monetary policy aims at preventing any deviation, even if only temporary, of inflation from a target value (g);

---

23 This model is used by Buiter and Miller (1983), who analyze it through numerical simulations. Buiter and Miller (1980) perform an algebraic analysis of a simpler version of the model, in which the consumer good basket does not include imported goods (i.e., $d_1 = 1$ in equation (4)). In this model, since $0 < d_1 < 1$, consumer prices become a jumping variable like the exchange rate and the price of the domestic product constitutes the predetermined state variable. A review of the literature can be found in Obstfeld and Stockman (1985). The model contains several simplifying assumptions. Besides the limits of the specification of "core inflation" discussed above, the model does not consider wealth effects stemming from portfolio adjustments, which are particularly important in defining the equilibrium level of the exchange rate. Moreover, it does not distinguish between short-term and long-term interest rates. Finally, the hypothesis that real output and the price level instantaneously adjust to jumps in the exchange rate seems particularly unrealistic; in practice, it takes time before a sudden change in competitiveness affects economic activity and prices. Nevertheless, the features of the model are sufficient to outline the response of the MCI to different shocks, while keeping the algebra of the model simple enough to be interpretable.

24 The stationary state of the economy can be described as follows: the level of the real product is determined exogenously; all the nominal variables grow at a rate equal to that of the money supply. The real interest rate is equal to that prevailing abroad, adjusted for a risk premium. The deflator of the domestic product and the nominal exchange rate are jointly determined by the IS and LM curves.

the central bank's behaviour can thus be represented by the solution to the following optimization problem:

$$(7) \qquad \min_{m_t} \int_t^{\infty} (Dp-g)^2 e^{-\rho t} dt \,,$$

where the rate of "impatience" (ρ) is high.

Monetary policy is implemented through the following steps: (i) the central bank picks out a target value for inflation; (ii) it sets the money growth rate equal to the inflation target, thereby stabilizing long-run inflation expectations; (iii) in day-to-day management, it changes the level of the money supply to counter exogenous inflationary shocks. Admittedly, this is a simple characterization of the central bank's behaviour; however, it allows monetary policy decisions to be figured out easily and seems consistent with the monetary policy strategy followed by most of the countries advocating the use of the MCI as an indicator of the stance of monetary policy.[25]

In this model fiscal policy can also temporarily affect the level of real activity. This is an important difference compared with the canonical version of the Mundell-Fleming-Dornbusch model, in which autonomous demand has no effect even in the short run. This is a result of the hypothesis that some consumer goods are imported from abroad: this condition, implying that the exchange rate has a direct effect on the

---

[25] The optimal monetary policy in the framework of equations (1)-(7) was derived under the simplifying hypothesis $d_1 = 1$; however, the solution turned out to be very difficult to interpret: the current-value Hamiltonian function requires two co-state variables to be added to the model, of which one is jumping (the one associated with the predetermined state variable). The optimal control problem in continuous-time models with jumping variables is examined in Buiter (1986), which also contains references to the literature.

real money supply, is sufficient to restore the effectiveness of aggregate demand shocks in models with full capital mobility (Branson and Buiter, 1983).

4.2 *The response of the MCI to exogenous shocks*

On the basis of the model shown in equations (1)-(6), the MCI is defined as:

$$(8) \qquad MCI \equiv b_1(r - Dq) - b_2(e + p_f - p).$$

The reaction of the index to six different exogenous shocks is now analyzed.[26] The sign of each shock is such that the shock is inflationary. The following cases are considered: an increase in the money supply (m; monetary policy shock); a decrease in the demand for money (m_0^d; financial shock); an increase in the risk premium on the domestic currency (k; exchange rate shock); an increase in real demand (f; demand shock); a decrease in real supply (h; supply shock); an increase in foreign prices (p_f).

The reaction of the MCI to these shocks is shown in Figure 1. The dynamics of the system is represented in the space "exchange rate-interest rate"; the diagrams on the left are related to the financial variables defined in nominal terms, while those on the right are related to variables

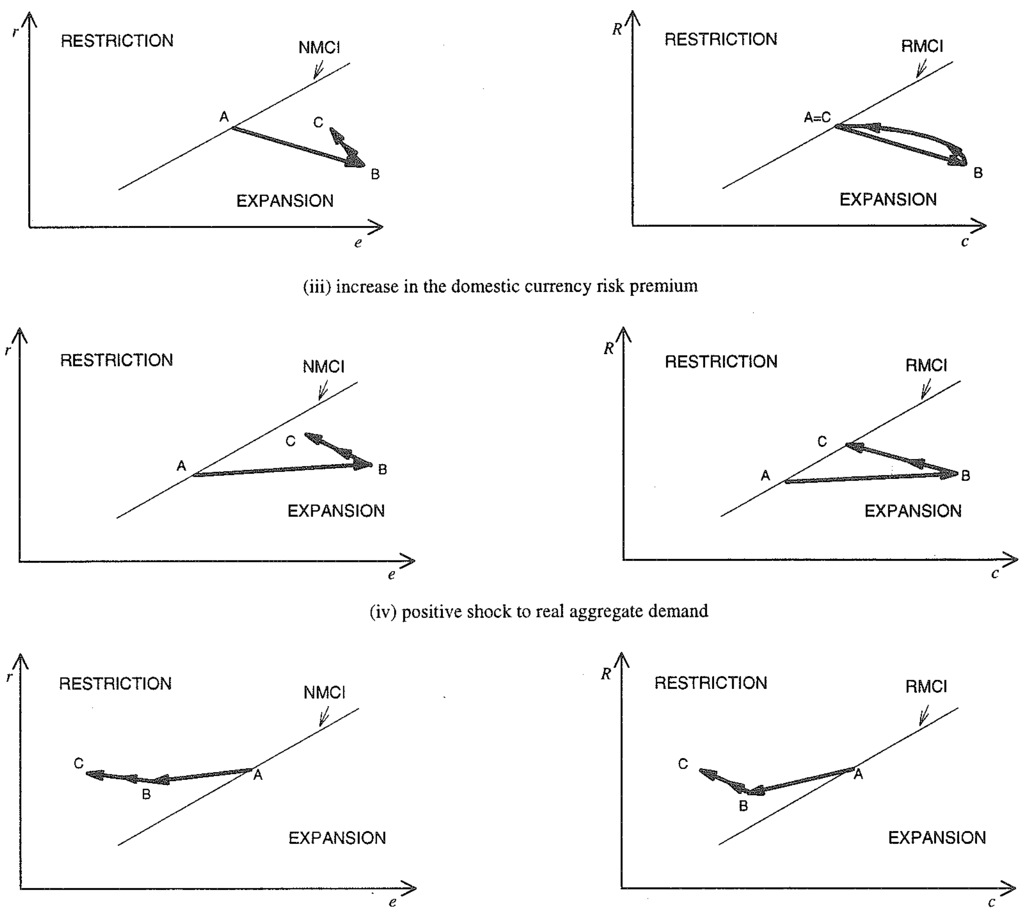
---

[26] The shocks are unexpected, immediate and permanent.

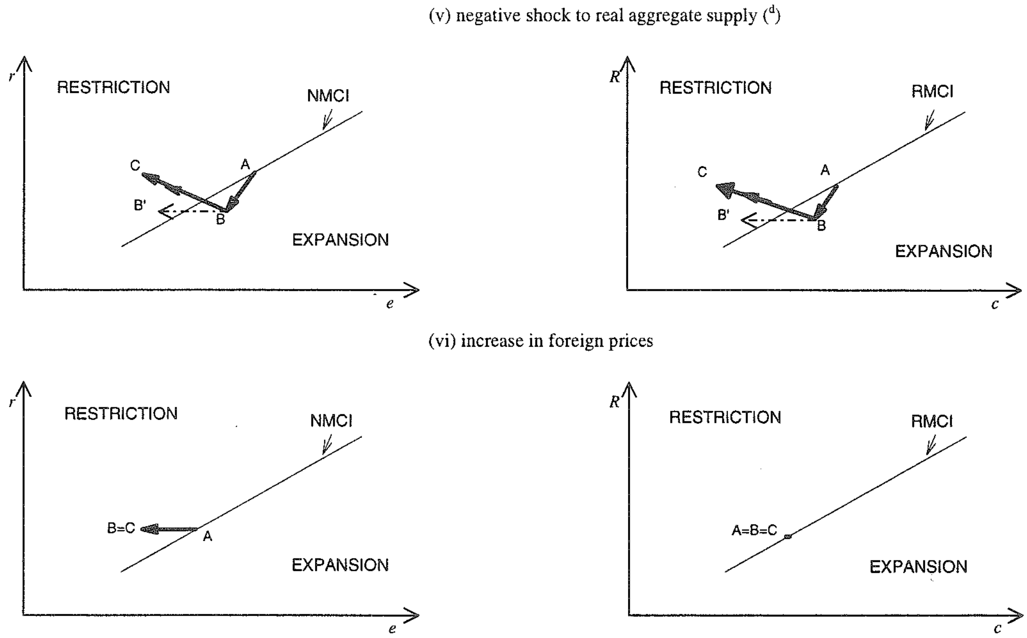
REACTION OF THE MONETARY CONDITIONS INDEX TO DIFFERENT KINDS OF INFLATIONARY AGGREGATE SHOCK ([a])

Nominal Monetary Conditions Index ([b]) Real Monetary Conditions Index ([b])([c])

(i) increase in the supply of money or (ii) negative shock to the demand for money



Nominal Monetary Conditions Index ([b]) Real Monetary Conditions Index ([b]) ([c])



([a]) The hypotheses underlying the multipliers are summarized in the last section of the Appendix. - ([b]) The NMCI and RMCI lines correspond to the points which leave, respectively, the nominal MCI and the real MCI unchanged at the pre-shock level. Without loss of generality, the slopes of the lines are both equal to 1/3. - ([c]) In the diagrams on the right, R corresponds to the real interest rate ($R \equiv r - Dq$), while c indicates the real exchange rate ($c \equiv e + p_f - p$). - ([d]) The initial appreciation of the domestic currency could be so pronounced as to move the MCI into the restriction area at first (to point "B'").

expressed in real terms. The lines labeled "RMCI" and "NMCI" represent the points which leave, respectively, the real MCI and the nominal MCI unchanged at a certain level.[27] Before the shock occurs, the system is at "A"; when the shock hits the economy, it jumps to "B"; the point "C" marks the new steady state.[28] The case of an increase in the money supply and that of a reduction in the demand for money are represented in the same diagram because they are observationally equivalent. The impact and the long-run multipliers of the two financial variables and of the MCI, in both nominal and real terms, are summarized for each kind of shock in Table 4; in the last column of the table, the reaction of the central bank according to equation (7) is also shown.

Apart from the case of a shock to foreign prices, the MCIs reaction patterns shown in Figure 1 are based on some general hypotheses.[29] Three assumptions are common to all the cases: (1) the system always moves along its saddle-path stable arm; (2) since in this model the jumps of the exchange

---

27 The slopes of the lines are equal to the ratio of the coefficients of the MCI (i.e., according to the notation adopted in this paper, they are equal to b_2/b_1); without loss of generality, the slopes of the RMCI and NMCI lines are both set equal to 1/3 in the diagrams (cf. Section 3).

28 The transition from A to B is instantaneous; the subsequent movement from B to C indicates the convergence to the new steady state.

29 The algebra is presented in the Appendix. The general hypotheses underlying the multipliers are summarized in the last section of the Appendix.

Table 4

EFFECTS ON THE INTEREST RATE, THE EXCHANGE RATE AND THE MCI OF DIFFERENT TYPES OF AGGREGATE INFLATIONARY SHOCK ([a])

	Nominal variables			Real variables			Desired change in the stance of monetary policy ([b])
	Interest rate	Exchange rate	MCI	Interest rate	Exchange rate	MCI	
(i) Increase in the supply of money							
Immediate effect	Reduction	Depreciation	Expansion	Reduction	Depreciation	Expansion	Expansion
In the new stationary state	Unchanged	Depreciated	Expansion	Unchanged	Unchanged	Unchanged	
(ii) Negative shock to the demand for money							
Immediate effect	Reduction	Depreciation	Expansion	Reduction	Depreciation	Expansion	Restriction
In the new stationary state	Unchanged	Depreciated	Expansion	Unchanged	Unchanged	Unchanged	
(iii) Increase in the domestic currency risk premium							
Immediate effect	Increase	Depreciation	Expansion	Increase	Depreciation	Expansion	Restriction
In the new stationary state	Increased	Depreciated	Expansion	Increased	Depreciated	Unchanged	
(iv) Positive shock to aggregate demand							
Immediate effect	Reduction	Appreciation	Restriction	Reduction	Appreciation	Restriction	Restriction
In the new stationary state	Unchanged	Appreciated	Restriction	Unchanged	Appreciated	Restriction	
(v) Negative supply shock							
Immediate effect	Reduction	Appreciation	Expansion ([c])	Reduction	Appreciation	Expansion ([c])	Restriction
In the new stationary state	Unchanged	Appreciated	Restriction	Unchanged	Appreciated	Restriction	
(vi) Increase in foreign-currency-denominated import prices							
Immediate effect	Unchanged	Appreciation	Restriction	Unchanged	Unchanged	Unchanged	Unchanged
In the new stationary state	Unchanged	Appreciated	Restriction	Unchanged	Unchanged	Unchanged	

([a]) The hypotheses underlying the multipliers are summarized in the last section of the Appendix. - ([b]) Consistent with the hypothesis that the central bank aims at preventing any deviation of inflation from a target value (see equation (7)). - ([c]) The initial appreciation of the domestic currency could be so pronounced as to move the MCI into the restriction area at first. See the discussion in the text and the last section of the Appendix.

rate can exhibit both overshooting and undershooting of the equilibrium values (depending on the value of the parameters), the cases considered are based on the hypothesis that when a monetary policy shock takes place, the exchange rate overshoots the new stationary level; (3) the impact movements of the nominal and real interest rates point in the same direction.

The analyses of the money supply shock and of the shock to the demand for money are based only on these three conditions. For the currency risk premium shock and the real demand shock, it is also assumed that most consumer goods are produced domestically (i.e., $d_1 \cong 1$). This condition is sufficient in both cases to assure the predominance of the exchange rate effect in the initial jump of the MCI, which for these shocks is the most realistic assumption. In the case of a supply shock, the latter assumption is irrelevant; however, the assumption concerning the size of the initial jump of the exchange rate becomes crucial: depending on the magnitude of its impact appreciation, the MCI can jump either into the expansion area or into the restriction area (this is highlighted in section (v) of Figure 1 by the line $\bar{B}B'$).

The six kinds of aggregate shock are now discussed separately. It is important to recall that the MCI is meant to be most useful for short horizons (see Section 2); therefore the information content of the index must be assessed in relation to its movement in the immediate aftermath of a shock.

(i) *Increase in the money supply. In the new steady state* (point C), real and nominal interest rates and the real exchange rate are unchanged. The increase in the money supply involves a rise in the price level and a depreciation of the nominal exchange rate. The real MCI returns to its level before the shock (point C is on the RMCI line and is coincident with point A). *In the short run,* the increase in the money supply determines a fall in both nominal and real interest rates. The initial depreciation of the nominal exchange rate exceeds the new long-run level (*overshooting*); subsequently, this is partially corrected by a gradual appreciation. Both the nominal MCI and the real MCI signal an easing of monetary conditions (point B is to the right of the NMCI and RMCI lines), and then move towards the initial equilibrium as the rise in the price level erodes the increase in the nominal stock of money.[30]

(ii) *Negative shock to the demand for money.* A reduction in the demand for money has the same effect as an increase in the money supply.

(iii) *Increase in the domestic currency risk premium. In the new stationary state,* both nominal and real interest rates are higher (to include the augmented risk premium); the restrictive effect on aggregate demand is counterbalanced by a depreciation of the real exchange rate. The real MCI is unchanged; there is a change, however, in the underlying combination of interest rate and exchange rate effects (in Figure 1 point C does not coincide with point A, but it is on the RMCI line). *In the short run,* the exchange rate depreciates, overshooting its long-run value, and the interest rate moves upwards (but less than the increase in the risk

---

30 The only difference between the two indexes is that in the long run the real exchange rate is unchanged, while the nominal exchange rate falls to balance the rise in domestic prices due to the increase in the money stock.

premium). These changes produce opposite effects on the MCI; if the quota of imported goods in the consumer good basket is small enough, the MCI signals an expansion.[31]

(iv) *Expansionary shock to real aggregate demand. In the new stationary state,* the real exchange rate has appreciated to compensate for the stronger pressure of autonomous demand; the interest rate is unchanged.[32] In the new equilibrium the real MCI signals a restriction (point C is to the left of the RMCI line). *In the short run,* the exchange rate appreciates less than is required by the new steady state (*undershooting*); the appreciation of the exchange rate causes an increase in the real value of the money supply and a reduction in interest rates.[33] Overall, under the aforementioned hypotheses, the exchange rate effect prevails and the MCI signals a restriction.

(v) *Negative supply shock. In the new stationary state,* an adverse supply shock determines a lower level of production. Since the real interest rate is unchanged, the real exchange rate must appreciate to reduce aggregate demand. The real MCI signals a restriction. *In the short run,* the exchange rate appreciates, but less than is required by the new steady state. The MCI can

---

31 The initial jump of the MCI is certain to be into the expansion area if only domestic goods are consumed (that is if $d_1 = 1$; see the Appendix).

32 The real product is equal to its long-run level. Given the constancy of h, r_f and k, both nominal and real interest rates are unchanged.

33 As already discussed, this effect is due to the share of imported products in the consumer good basket; without this effect, the exchange rate would appreciate immediately to the new equilibrium value and real variables would not be affected; on this point, cf. Branson and Buiter (1983).

jump either into the expansion area (point B) or into the restriction area (point B′), depending on the magnitude of the initial appreciation of the exchange rate compared with the downward movement of the interest rate. Therefore, according to the model, in the case of supply shocks it is not possible to determine the direction of the signal provided by the initial jump of the MCI.

(vi) *Increase in foreign-currency-denominated import prices.* An increase in import prices expressed in foreign currency is immediately sterilized by an appreciation of the nominal exchange rate; this allows the competitiveness of the country to remain unchanged. Since the price of imported goods in domestic currency does not change, the shock does not affect either the money market or the real sector of the economy. The real MCI is unchanged, while the nominal MCI signals a restriction.

4.3 *The information content of the MCI*

Although the above results are influenced by the features of the model and by the hypotheses regarding the parameters, they clearly show how changes in the MCI can be interpreted only by making an inference on the kinds of shock affecting the economy. It is now possible to establish in which cases the MCI proves to be a good indicator with reference to both of the two possible meanings discussed in Section 3.

As a measure of the degree of tightness of monetary policy, the MCI correctly signals (or anticipates) changes in the stance of monetary policy in the cases of an actual change in the central bank's instruments, a shock to real aggregate demand and a shock to foreign prices (compare the last two columns of Table 4). It is misleading in the cases of a financial shock and an exchange rate shock; it may be wrong in the case of a supply shock if the exchange rate reacts slowly to the disturbance and does not outweigh the movement of the interest rate. Recent Italian experience, discussed in the next section, provides several examples of how financial instability can make MCI indexes poor indicators of the stance of monetary policy. In sum, as far as monetary policy is concerned, the MCI is more likely to provide wrong signals in environments in which instability affects financial or currency markets, or in the case of supply disturbances.[34]

Clearly, as already observed in Section 3, if most of the changes in both the interest rate and the exchange rate could be ascribed to deliberate action by the central bank, the movements of the MCI would be strictly linked to actual changes in the stance of monetary policy. This should be the case when the MCI is regarded as the operational target of monetary policy.[35]

---

34 The difficulty in identifying the discretionary behaviour of the central bank through the observation of market-determined financial variables had already been highlighted by Brunner and Meltzer (1967, p. 190): "The indicators of monetary policy usually mentioned by economists are not even approximately related to the indicator function introduced above [i.e., measure of the stance of monetary policy]. Most of them are endogenous variables. As such, their position or rate of change at any time is the result of the joint interaction of the whole system and reflects more than the effect of current monetary policy. Fiscal policies and noncontrolled exogenous variables also influence the endogenous indicators. Moreover, their current position or rate of change is the result of partial or incomplete adjustment to the long-run position implied by the expected response to changes in policy and other exogenous forces ... The danger of misinterpreting the current direction of monetary policy exists in principle when any endogenous variable is used as an indicator."

35 It is interesting to compare the results of this section with those obtained by Gerlach and Smets (1996), who study the possible role of the MCI as the operational target of monetary policy (as in Canada)

The use of the MCI as an inflation indicator is also questionable, as the index is misleading when the effects on prices of the interest rate and the exchange rate are outweighed by the overall inflationary pressure stemming from the exogenous shock. In the model this certainly happens when a real aggregate demand shock takes place; it is also true in the case of a real supply shock if the exchange rate reacts promptly to the disturbance.

These findings set out in a consistent framework some pitfalls of the MCI which have already been sketched out in previous studies. The risks in using the MCI as a measure of the degree of tightness of monetary policy in contexts characterized by financial instability are clearly recognized

---

by means of a model similar to the one adopted in this paper. The model is specified in discrete time and includes an IS curve, a Lucas supply function and an open interest parity condition. No effect of the exchange rate on consumer prices is provided for. The interest rate is the instrument of monetary policy and the MCI is the operational target. The central bank is supposed to respond to deviations of both the price level and inflation from target values. In such a framework, it turns out that the optimal weights for defining the MCI *target* (i.e. the *desired* value of the MCI) are equal to the corresponding parameters of the IS curve; it also follows that the optimal rule for the interest rate involves canceling out the effects of currency shocks and not reacting to real *excess* demand disturbances. This means that in the case of a depreciation of the domestic currency the *desired* value of the MCI does not change; since the *actual* value of the MCI decreases because of the weakening of the exchange rate, the central bank must raise the interest rate to keep the actual MCI unchanged. If, instead, there is a positive shock to real excess demand, the desired MCI becomes more restrictive (to counterbalance the increase in net autonomous demand); the actual value of the index also becomes more restrictive (because of the exchange rate appreciation) and the central bank has to raise the interest rate only if, and to the extent that, the restrictive effect of the exchange rate is not sufficient for the actual MCI to keep its desired value. This optimal rule is consistent with the results of this paper for the cases of a currency shock and of a real demand shock. The two models differ, instead, for the treatment of a supply shock. In the model presented in this paper, after a negative supply shock the exchange rate appreciates and the interest rate declines. As argued in the text, these movements exert opposite effects on the actual MCI, and the immediate jump of the index can be either into the expansion area or into the restriction area, depending on which of the two factors prevails. In Gerlach and Smets' model, on the contrary, since the interest rate is exogenous, the initial movement of the MCI is unambiguously into the restriction area.

by Freedman (1994), who suggests some caveats in the use of the index that should be taken into careful account especially when the MCI is the operational target of monetary policy.[36,37] As regards supply shocks, the empirical estimates by Smets (1997) show that in the main industrialized countries with floating exchange rates the domestic currency responds to positive supply shocks in quite different ways: it does not react significantly in the United States, it appreciates in Japan and Germany and it depreciates in the United Kingdom and Canada. Smets observes in this respect that the steady-state effects of idiosyncratic supply shocks on the exchange rate are not unambiguous. Even if Smets' results cannot be directly compared to the theoretical analysis presented in this section,[38] they provide evidence that in the case of supply shocks the MCI can give different signals.

---

[36] Freedman (1994, pp. 472-74) observes that the MCI should not be used in an overly mechanical fashion, as the exchange rate can be quite volatile on a day-to-day basis and there are uncertainties about assessments of the economy and about the links between changes in the MCI and changes in aggregate demand or inflation: action would be taken only if the market has found a new trading range for the exchange rate that appears likely to last for some time. Secondly, central bank action in the very short run is sometimes needed to cope with disorderly markets; in this case it may even be necessary to temporarily move short-term interest rates more than would be required by the general conditions of the economy.

[37] The difficulties in interpreting changes in the MCI are also recognized by other studies on the subject; see, for instance: Hansson and Lindberg (1994, pp. 16-17): "It should be noted that although a monetary conditions index can be said to provide an approximate indication of the monetary stance ... the real interest and exchange rates are outside the direct control of a central bank because they are influenced by a broad spectrum of factors, such as fiscal policy, international economic activity and the formation of expectations"; J. P. Morgan (1995, p. 4): "With currency values subject to large fluctuations – often at odds with central bank intentions – it should be recognized that financial conditions could shift rapidly."

[38] Building on previous work by Gerlach and Smets (1995), Smets (1997) analyses the reaction function of the central bank in the main industrialized countries taking explicitly into account the role played by the exchange rate in the monetary policy decision-making process. The empirical framework is based on structural VAR models which include industrial production, consumer prices, a short-term nominal interest rate and a nominal effective exchange rate. Structural shocks are identified through a mixture of short and long-run zero restrictions; in particular, unilateral monetary policy

All in all, it follows from the foregoing analysis that the MCI is to be properly interpreted as a summary measure of the inflationary effects stemming from changes in the real interest rate and the real exchange rate.

The nominal MCI proves to be a good proxy of the real MCI in the very short run (see Figure 1 and Table 4). This property, however, holds true for the whole adjustment process only in the case of a real demand shock; in all other cases, at a certain point of the transition and in the new stationary state, the information provided by the nominal index is different from that of the real index. Moreover, the similarity between the initial reactions of the two indices depends on the hypothesis that the impact movements of the nominal and real interest rates point in the same direction. This assumption is not warranted in periods characterized by rapid and large changes in inflation, as will be shown with reference to recent Italian experience in the next section. This should caution against the practice of using the nominal index because of the lags in observing the real exchange rate.

These results can change significantly if one adopts alternative specifications of some of the hypotheses underlying the model. Some of the most critical issues are the effects on the exchange rate of real demand shocks and the mechanism whereby expectations are formed.

A restrictive fiscal budget, for instance, designed to overcome a structural imbalance in the public finances may

---

shocks are distinguished from responses to exogenous exchange rate shocks by resorting to MCI indexes. It should be noted that the impulse response functions estimated by Smets cannot be directly compared to the theoretical multipliers derived in this paper because the former also include the systematic component of monetary policy.

cause an appreciation of the exchange rate instead of a weakening (the prediction of the reference model).[39]

The formation mechanism for exchange rate expectations may not be consistent with the rational expectations hypothesis and follow trends which are uncorrelated with the fundamental conditions of the economy, or which are too volatile. In this case, a systematic reaction of monetary policy to exchange rate variations could be counterproductive.[40] In particular, it should be stressed that the dependence of the exchange rate on the inflation expectations of market participants makes a systematic reaction by the central bank to index changes inappropriate: it could provoke instability in the monetary policy instruments and in agents' expectations themselves.[41]

Finally, it should also be emphasized that the relationship between financial variables and inflation can change with contingencies and the policy regime and may be subject to non-linearities.[42]

---

39 For the effects of fiscal policy on the exchange rate see Penati (1983), Giavazzi and Pagano (1996).

40 Dornbusch (1983, p. 20): "Bubbles, peso problems, and irrelevant information all move the exchange rate away from the particular equilibrium implied by current fundamentals ... Unless policies are very exogenous, instability of policies may be provoked by instability of expectations. That means flexible exchange rates may require, as an institutional setting, that policies be more exogenous than, in fact, they are today. Without such an anchor, flexibility of exchange rates may aggravate macroeconomic instability."

41 Fuhrer and Moore (1992), Fuhrer (1993), Poole (1994), Woodford (1994).

42 A careful analysis of the econometric issues arising in the computation of the weights used in an MCI can be found in Eika, Ericsson and Nymoen (1996).

5. A Monetary Conditions Index for Italy

An MCI has been constructed for Italy on the basis of the properties of the Bank of Italy's structural macroeconometric model. Here again the effect of the exchange rate on real demand is about 1/3 of the effect of the interest rate.[43] The index is built by applying weights equal, respectively, to 1 and 1/3 to the variations in the exchange rate and the interest rate: in this way, a 1 percentage point increase in the index corresponds to an analogous rise in the interest rate.[44]

The *real MCI* for Italy is depicted in the upper panel of Figure 2. The *levels* of the two components are shown in the lower boxes.

The MCI increases markedly in the early eighties (from zero to about 5 percentage points). This is essentially due to the monetary restriction which took place in Italy as well as in other industrial countries after the second oil crisis.[45] Until 1986, the MCI shows a slight positive trend, which can be attributed to the real interest rate. A new upward movement takes place at the beginning of the nineties, when the fluctuation band of the lira in the exchange rate mechanism of the EMS was narrowed from ±6 to ±2.25 percentage points; in this period the dynamics of the MCI is mainly due to the real exchange rate appreciation. In the third quarter of 1992

---

43 See Nicoletti Altimari, Rinaldi, Siviero and Terlizzese (1995, Table IV). The *output gap* in Italy has been studied by Gavosto and Siviero (1995).

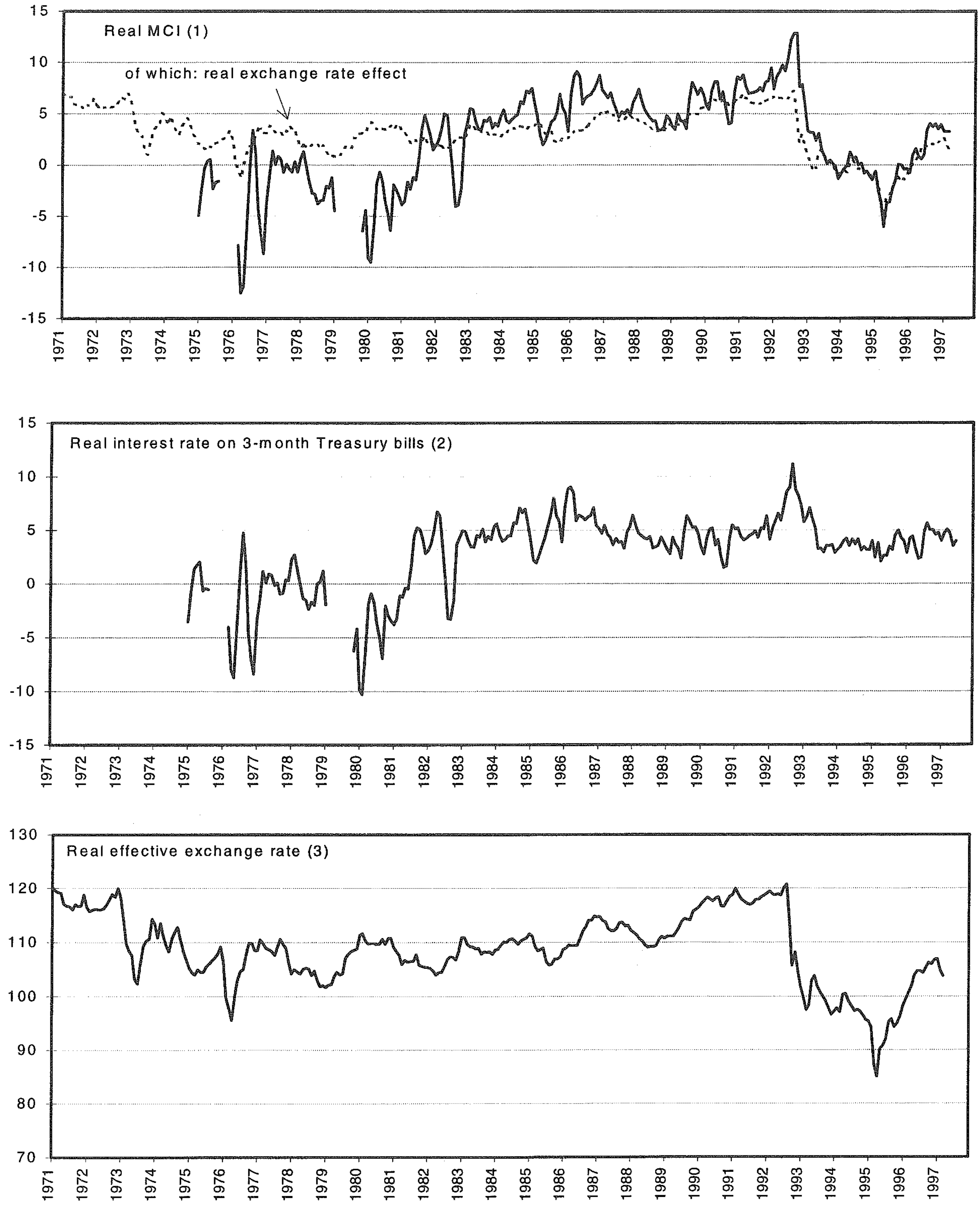
44 The changes in the financial variables are computed with respect to their average values in the second half of 1993. This choice is irrelevant (cf. Section 2).

45 See Ciocca and Nardozzi (1996, pp. 53-54). A thorough analysis of the main changes in the monetary policy framework in Italy for the period 1979-1994 can be found in Passacantando (1996).

Figure 2

REAL MONETARY CONDITIONS INDEX

(monthly data: January 1975-March 1997; II semester 1993=0)



(1) Linear combination of the change in the real short-term interest rate and of the percentage change in the real effective exchange rate; the weights are respectively equal to 1 and 1/3 and correspond to estimates of the relative effects of the two financial variables on real aggregate demand. An increase in the index signals a lowering of the inflationary pressures stemming from these two channels. - (2) Real yield on 3-month Treasury bills, net of withholding tax. The nominal yield is the monthly average of Treasury bill net-of-tax allotment rates, weighted with the amounts issued. It is deflated with the 3-month moving average of the seasonally adjusted and annualized monthly changes in the consumer price index. - (3) Real effective exchange rate of the lira vis-à-vis Italy's fourteen main trading partners; it is deflated on the basis of producer prices. An increase of the index means an appreciation of the exchange rate and, therefore, a loss of competitiveness of the country.

the MCI reaches a peak, as a result of the huge increase in interest rates during the EMS crisis.

From the last quarter of 1992 until July 1993 the strong depreciation of the real exchange rate causes a fall in the MCI. The index remains quite stable from the last quarter of 1993 until January 1995. After a new drop in February-April 1995, due to the currency turmoil triggered by the Mexican peso crisis, the trend of the MCI reverses, driven by a steady recovery of the real exchange rate and by the rise of the real short-term interest rate. From the second half of 1996 onwards, the contribution of the latter to the increase in the MCI becomes more pronounced.

The *nominal MCI* can be virtually computed in real time. In the upper panel of Figure 3 the index is shown on a daily basis from 1993 onwards.[46]

Two periods turn out to be particularly interesting: the summer of 1994, when monetary policy was tightened sharply, and the adverse shock to the exchange rate in February-March 1995.

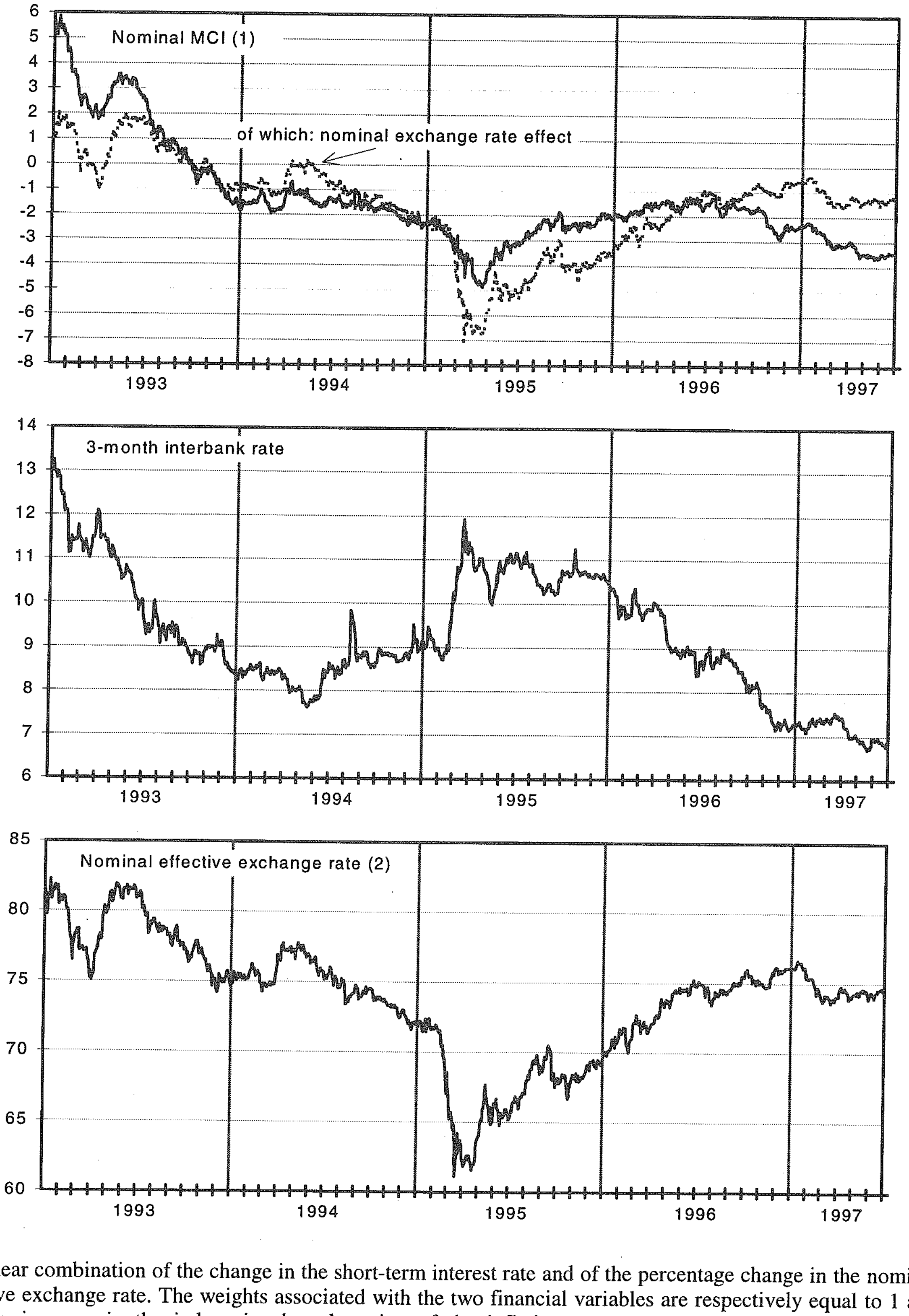
In June 1994 the Bank of Italy used open market operations to achieve an increase in short-term interest rates, which was followed in August by an increase in the official interest rates; the decision sought to bring about a permanent curbing of inflation and inflation expectations. The exchange rate of the lira, which had begun to depreciate in May 1994, followed a marked downward trend throughout the second half of the year. In this period, the nominal MCI fails to signal the turning point of monetary policy because of the exchange rate instability. The episode of the rise of the

[46] The nominal interest rate used is the 3-month interbank rate.

Figure 3

NOMINAL MONETARY CONDITIONS INDEX

(daily data: 2 January 1993-30 June 1997; II semester 1993=0)



(1) Linear combination of the change in the short-term interest rate and of the percentage change in the nominal effective exchange rate. The weights associated with the two financial variables are respectively equal to 1 and 1/3. An increase in the index signals a lowering of the inflationary pressures stemming from these two channels. - (2) Nominal effective exchange rate of the lira vis-à-vis Italy's fourteen main trading partners. An increase in the index means an appreciation of the exchange rate.

discount rate in August is in this sense paradigmatic: the policy decision was partly unexpected; short-term interest rates overreacted, jumping by over 1 percentage point (see the second box of Figure 3); in spite of this, the nominal exchange rate depreciated, in sharp contrast with conventional wisdom. In the days immediately after the policy decision the interest rate effect slightly prevails and the nominal MCI moves upward; the spike of the index however is much less pronounced than that of short-term interest rates and it rapidly dies out. Shortly afterwards the index turns downwards.

Between February and April 1995 the exchange rate of the lira recorded another large drop, and reached an historical minimum. The fall followed the sharp depreciation of the US dollar, prompted by the crisis of the Mexican peso. After August 1994, the Bank of Italy raised the official interest rates again in February and May 1995. The dynamics of the index in this period is still strongly dominated by the instability of the lira. If the contributions of the two components of the index are disentangled (see the upper panel in Figure 3), it emerges clearly that, owing to the strong interest rate restriction, the index moved back to the level before the February-March crisis in August, about six months before the full recovery of the exchange rate component.

From the second half of 1996 onwards, the nominal MCI signals an expansion. This is clearly in contrast with the information provided by the real MCI in the same period. The divergence between the two indices can be attributed to the rapid disinflationary process started in January 1996.[47]

[47] The twelve-month rise in the cost-of-living index fell from 5.9 per cent in December 1995 to 1.5 per cent in June 1997.

6. Conclusions

The MCI is to be properly interpreted as a measure of the overall inflationary effects stemming from two important channels of inflationary pressure in an open economy, the short-term real interest rate and the real effective exchange rate.

The theoretical analysis, although based on a very stylized model, shows that the MCI can give misleading signals, both as an indicator of the stance of monetary policy and as an inflation indicator; its possible role in an anti-inflationary monetary policy strategy needs to be assessed with caution. If monetary policy aims at preventing deviations of inflation from a target value, the ability of the index to signal the stance of monetary policy is jeopardized in environments in which financial and exchange rate shocks predominate; this can also be the case with supply shocks. As an inflation indicator, the index clearly breaks down if a real demand shock takes place and it can also fail in the case of supply shocks.

In practice the information content of the MCI depends on the factors driving the business cycle; in fact, the way the index is related to inflation and monetary policy changes with the nature of the shock affecting the economy, its persistence and circumstances at the time the shock takes place.

The dependence of the index on forward-looking financial variables, highly influenced by agents' expectations, calls for caution in adopting a systematic reaction pattern of monetary policy to index changes, because of the risks of endangering price and financial stability.

The MCI based on *nominal* interest and exchange rates is a good proxy of the real MCI in the very short run. However the two indices are likely to diverge rapidly as the economy begins to adjust to the shock. Moreover, in periods characterized by wide and rapid fluctuations of inflation, the two indices can go in different directions even in the very short run.

The MCI constructed for Italy turns out to have been heavily affected in recent years by the instability that occurred from time to time in the markets for lira-denominated financial assets. The index failed to signal the turning point of monetary policy in the middle of 1994. If the contributions of the two financial variables to index changes are disentangled, the MCI signals that the raising of short-term interest rates that began in the second half of 1994 and continued in the following year was effective in sterilizing the inflationary effects caused by the fall of the lira, which were particularly pronounced in the three months February-April 1995. The real MCI continued to rise until December 1996, and then moved downwards.

APPENDIX

The Buiter and Miller (1983)'s model

A.I *Representation of the model in the space of the state variables*

The dynamic model in Table 3 can be represented as:

(A.1) $$\begin{bmatrix} Dp \\ De \end{bmatrix} = A \begin{bmatrix} p \\ e \end{bmatrix} + B \begin{bmatrix} m \\ f \\ k \\ h \\ p_f \end{bmatrix},$$

where:

$$A \equiv \begin{bmatrix} \dfrac{-c_1\left(a_2 b_2 + b_1 d_1^2\right)}{d} & \dfrac{c_1\left[a_2 b_2 - b_1 d_1 (1-d_1)\right]}{d} \\ \dfrac{-a_1 b_2 + (1 - b_1 c_1 d_1) d_1}{d} & \dfrac{a_1 b_2 + (1-d_1)(1 - b_1 c_1 d_1)}{d} \end{bmatrix}$$

$$B \equiv \begin{bmatrix} \dfrac{b_1 c_1 d_1}{d} & \dfrac{a_2 c_1}{d} & \dfrac{-a_2 b_1 c_1 (1-d_1)}{d} & \dfrac{a_2 + a_1 b_1 d_1}{d} & \dfrac{a_2 b_2 c_1 - b_1 c_1 d_1 (1-d_1)}{d} \\ \dfrac{-1 + b_1 c_1 d_1}{d} & \dfrac{a_1}{d} & \dfrac{-a_1 b_1 - a_2 (1 - b_1 c_1 d_1)}{d} & \dfrac{a_1 b_1 d_1}{d} & \dfrac{a_1 b_2 + (1-d_1)(1 - b_1 c_1 d_1)}{d} \end{bmatrix}$$

$$d \equiv a_2 + a_1 b_1 d_1 - a_2 b_1 c_1 d_1 .$$

The coefficients of the autonomous component of the demand for money (m_0^d) are not shown because they can be easily obtained by putting: $m = -m_0^d$. The effects of the foreign interest rate r_f are identical to those of k ($r_f = k$).

The determinant of A is equal to:

(A.2) $$|A| = \frac{-b_2 c_1}{d} .$$

A necessary and sufficient condition for the equilibrium to be unique and saddle-path stable is that the determinant of A be negative. It is therefore assumed that:

(A.3) $d > 0$.

Buiter e Miller (1982) argue that (A.3) implies that, for a given level of the real exchange rate, an exogenous increase of autonomous demand causes an increase in output.

The income and the interest rate (y,r) can be expressed as a function of the state variables by means of the following equations:

(A.4) $$\begin{bmatrix} y \\ r \end{bmatrix} = A_{y,r}\begin{bmatrix} p \\ e \end{bmatrix} + B_{y,r}\begin{bmatrix} m \\ f \\ k \\ h \\ p_f \end{bmatrix}$$

$$A_{y,r} \equiv \begin{bmatrix} \dfrac{-a_2b_2 - b_1d_1^2}{d} & \dfrac{-b_1d_1 + a_2b_2 + b_1d_1^2}{d} \\ \dfrac{d_1 - a_1b_2 - b_1c_1d_1^2}{d} & \dfrac{a_1b_2 + (1-d_1) - (1-d_1)b_1c_1d_1}{d} \end{bmatrix}$$

$$B_{y,r} \equiv \begin{bmatrix} \dfrac{b_1d_1}{d} & \dfrac{a_2}{d} & -\dfrac{a_2b_1(1-d_1)}{d} & \dfrac{a_2b_1d_1}{d} & \dfrac{a_2b_2 - b_1d_1(1-d_1)}{d} \\ \dfrac{-(1-b_1c_1d_1)}{d} & \dfrac{a_1}{d} & \dfrac{-a_1b_1(1-d_1)}{d} & \dfrac{a_1b_1d_1}{d} & \dfrac{1+a_1b_2 - d_1[1-b_1c_1(1+d_1)]}{d} \end{bmatrix}.$$

Given equations (8), (4), (3) and (5) in the text, the MCI is given by the following formula:

(A.5) $$MCI = -b_1c_1d_1y + b_1d_1r + b_2p - b_2e + b_1(1-d_1)r_f + b_1(1-d_1)k - b_1d_1h - b_2p_f \,.$$

A.II *The long-run multiplier of the MCI*

The long-run multipliers of the state variables can be obtained by setting the left-hand side of (A.1) equal to zero and solving for (p,e). The long-run values of y and r are given by (A.4), after substituting p and e with their stationary values. The long-run multipliers of the endogenous variables and of the MCI are reported in (A.6):

$$(A.6)\quad \begin{pmatrix} d\hat{p} \\ d\hat{e} \\ d\hat{y} \\ d\hat{r} \\ d\hat{c} \\ d\hat{R} \\ dM\hat{C}I \end{pmatrix} = \begin{bmatrix} 1 & \frac{1-d_1}{b_2} & \frac{a_2b_2-b_1(1-d_1)}{b_2} & \frac{a_1b_2+(1-d_1)}{b_2c_1} & 0 \\ 1 & -\frac{d_1}{b_2} & \frac{a_2b_2+b_1d_1}{b_2} & \frac{a_1b_2-d_1}{b_2c_1} & -1 \\ 0 & 0 & 0 & -\frac{1}{c_1} & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & -\frac{1}{b_2} & \frac{b_1}{b_2} & -\frac{1}{b_2c_1} & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & \frac{1}{c_1} & 0 \end{bmatrix} \begin{pmatrix} dm \\ df \\ dk \\ dh \\ dp_f \end{pmatrix},$$

where $\hat{x}$ represents the stationary value of variable x, $c \equiv e + p_f - p$ and $R \equiv r - Dq$.

A.III *The initial jump of the MCI*

As shown in Figure 1, the exogenous shock causes the MCI to jump from point "A" to point "B". The latter can belong either to the expansion area or to the restriction area. To establish which semiplane point "B" belongs to, it is necessary to consider the initial jump of both the exchange rate and the interest rate. In this section, the impact multipliers are derived for the exchange rate, the interest rate and, finally, the nominal and real MCIs.

A.III.1 *Impact multipliers of the exchange rate*

If $x(0)$ is the value of variable x before the shock, the exchange rate (which is the jumping state variable) is given by the following formula (Buiter, 1984; p. 671):

$$(A.7)\quad e(0) = -EVT[p(0) - \hat{p}(0)] + \hat{e}(0),$$

where EVT represents the ratio of the elements of the eigenvector associated with the stable root of A (one of the two elements is normalized to 1).

The six shocks considered in the text are now discussed separately.

(i-ii) *Increase of the supply of money* or *decrease in the demand for money* ($dm = 1$; $dm_0^d = -1$). Since p is predetermined, from (A.7) and (A.6) it follows that:

(A.8) $de(0) = 1 + EVT$.

Equation (A.8) implies that the initial depreciation of the exchange rate is greater (less) than that required by the new steady state (cf. $d\hat{e}/dm$ in (A.6)) if EVT is positive (negative).

Throughout the following analysis it is assumed that the condition for an overshooting of the exchange rate to monetary policy shocks holds:

(A.9) $EVT > 0$.

(iii) *Increase in the domestic currency risk premium* ($dk = 1$). This case requires an additional assumption, since the sign of the long-run change in p is ambiguous (cf. (A.6)):

(A.10) $$\frac{d\hat{p}}{dk} = \frac{a_2 b_2 - b_1(1 - d_1)}{b_2} .$$

It can easily be verified that in (A.10) the numerator involves a comparison between the relative effect of the exchange rate with respect to the interest rate on the product market and the same relative effect computed on the money market. Note that if d_1 (the share of domestic products in consumer goods) is close to unity:

(A.11) $d_1 \cong 1$,

then it is true that:

(A.12) $$\frac{a_2}{1 - d_1} > \frac{b_1}{b_2} .$$

Since p is predetermined, from (A.7) and (A.6) it follows that:

(A.13) $$de(0) = \frac{a_2 b_2 + b_1 d_1}{b_2} + \frac{a_2 b_2 - b_1(1 - d_1)}{b_2} EVT .$$

If condition (A.12) is verified, the initial depreciation of the exchange rate is greater (less) than that required by the new steady state if EVT is positive (negative). Note that (A.11) is sufficient for (A.12) to be true.

(iv) *Autonomous increase in real demand* ($df = 1$). Since p is predetermined, from (A.7) and (A.6) it follows that:

(A.14) $$de(0) = -\frac{d_1}{b_2} + \frac{1-d_1}{b_2} EVT .$$

Therefore, the initial appreciation of the exchange rate is greater (less) than that required by the new steady state if EVT is negative (positive).

(v) *Adverse supply shock* ($dh = 1$). Since p is predetermined, from (A.7) and (A.6) it follows that:

(A.15) $$de(0) = \frac{a_1 b_2 - d_1}{b_2 c_1} + \frac{a_1 b_2 + (1-d_1)}{b_2 c_1} EVT .$$

The first term in (A.15) is the long-run multiplier. In this case its sign is ambiguous (cf. (A.6)):

(A.16) $$\frac{d\hat{e}}{dh} = \frac{a_1 b_2 - d_1}{b_2 c_1} .$$

Indeed, in the new stationary state, the money market is affected by two factors: the fall in output reduces the real demand for money, while the increase in domestic prices reduces the real supply of money. If the first effect prevails, an excess of liquidity is created and the nominal exchange rate depreciates in the long run ($a_1 b_2 - d_1 > 0$); if, on the contrary, the reduction of the money supply is the main factor, there is a shortage of liquidity which can be offset only by an appreciation of the exchange rate. In the following, the hypothesis adopted is the latter: in the long run an adverse supply shock involves a positive excess of the real demand for money; i.e.:

(A.17) $$a_1 b_2 < d_1 .$$

It must be noted that in the alternative hypothesis the MCI certainly fails to anticipate central bank's reaction while it is effective in signalling the inflationary shock. If condition (A.17) holds, the initial appreciation of the exchange rate is greater (less) than that required by the new steady state if EVT is negative (positive).

(vi) *Increase in foreign prices* ($dp_f = 1$). Since p is predetermined, from (A.7) and (A.6) it follows that:

(A.18) $de(0) = -EVT[0-0]-1$.

The instantaneous appreciation of the nominal exchange rate sterilizes the rise in foreign prices, leaving the competitiveness of the country unchanged (and all the other endogenous variables).

A.III.2 *Impact multipliers of the interest rate and of the nominal MCI*

The impact multiplier of the interest rate obeys the following relation (Buiter and Miller, 1980, p. 52):

(A.19) $$e(0) - \hat{e}(0) = -\int_0^{\infty} \left[r(s) - (r_f + k + h)\right] ds = -\int_0^{\infty} [r(s) - \hat{r}(s)] ds =$$

$$= -\int_0^{\infty} [r(0) - \hat{r}(0)] e^{-\lambda_s s} ds = -[r(0) - \hat{r}(0)]/|\lambda_s| \; .$$

Equation (A.19) states that the exchange rate *overshoots* (*undershoots*) its long-run value if the interest differential is *negative* (*positive*) when the domestic currency is *depreciating* and *positive* (*negative*) when it is *appreciating*. (A.19) can be rewritten as follows:

(A.20) $dr(0) = -|\lambda_s|(de(0) - d\hat{e}(0)) + d\hat{r}(0)$.

(i-ii) *Increase of the supply of money or decrease in the demand for money.* From (A.8), (A.6) and (A.20) it follows that:

(A.21) $$\frac{dr(0)}{de(0)} = \frac{-|\lambda_s| EVT}{1 + EVT} < 0 ,$$

which is certainly negative. Therefore, following an expansive monetary policy shock (or a reduction in the demand for money) point B is certainly below and to the right of point A, in the expansion area.

(iii) *Increase in the domestic currency risk premium* ($dk = 1$). Given (A.6) and (A.13), from (A.20) it follows that:

(A.22) $dr(0) - d\hat{r}(0) = -|\lambda_s|(a_2 b_2 - b_1(1-d_1))EVT$.

Given (A.9) and (A.11), (A.22) is certainly negative; therefore, the increase in the risk premium is not incorporated entirely in the initial jump of the interest rate. As regards the position of point B, from (A.13) and (A.22), given (A.6), it follows that:

(A.23) $$\frac{dr(0)}{de(0)} = \frac{-|\lambda_s|(a_2 b_2 - b_1(1-d_1))EVT + b_2}{(a_2 b_2 - b_1(1-d_1))EVT + a_2 b_2 + b_1 d_1} .$$

The sign of (A.23) is ambiguous. In Figure 1 it is assumed that it is positive, but less than b_2/b_1 (the latter in the figure is set equal to 1/3). This means that the expansive effect of the exchange rate depreciation outweighs the restrictive effect of the rise of the interest rate:

(A.24) $$0 < \frac{-|\lambda_s|(a_2 b_2 - b_1(1-d_1))EVT + b_2}{(a_2 b_2 - b_1(1-d_1))EVT + a_2 b_2 + b_1 d_1} < \frac{b_2}{b_1} .$$

It easily turns out that if $d_1 = 1$ (A.24) becomes:

(A.24b) $$\frac{1 - |\lambda_s| a_2 EVT}{b_1 + a_2 b_2 (EVT + 1)} < \frac{1}{b_1} .$$

Given (A.9), this condition is certainly true. Therefore, the result discussed in the text follows from (A.11).

(iv) *Increase in autonomous demand* ($df = 1$). From (A.14) and (A.20), taking account of (A.6), it follows that:

(A.25) $$\frac{dr(0)}{de(0)} = -|\lambda_s| \frac{(1-d_1)EVT}{(-d_1 + (1-d_1)EVT)} .$$

The sign of (A.25) is ambiguous. In Figure 1 it is assumed that it is positive but less than b_2/b_1 . This means that the restrictive effect of the exchange rate appreciation outweighs the expansive effect of the reduction of the interest rate:

(A.26) $$0 < -|\lambda_s| \frac{(1-d_1)EVT}{(-d_1 + (1-d_1)EVT)} < \frac{b_2}{b_1} .$$

Note that if $d_1 = 1$ the derivative is equal to zero ($dr(0)/de(0) = 0$) and the segment $\overline{AB}$ is horizontal, in coherence with the canonical result obtained by Mundell and Fleming. Therefore, the result discussed in the text follows from (A.11).

(v) *Adverse supply shock* ($dh = 1$). Substituting (A.6) and (A.15) into (A.20) gives:

(A.27) $dr(0) - d\hat{r}(0) = -|\lambda_s|(a_1 b_2 + (1 - d_1))EVT$.

Given (A.6) and (A.9), the initial jump of the interest rate is downward. As regards the impact multiplier of the MCI, from (A.15) and (A.27), given also (A.6), it follows that:

(A.28) $$\frac{dr(0)}{de(0)} = \frac{-|\lambda_s|(a_1 b_2 + (1 - d_1))EVT}{(a_1 b_2 - d_1) + [a_1 b_2 + (1 - d_1)]EVT},$$

which, given (A.17), is positive. The derivative can be either higher or lower than b_2/b_1: both cases are considered in the text.

A.III.3 *Impact multipliers of the real MCI*

Since foreign prices are exogenous and domestic prices are predetermined, the initial jump of the real exchange rate always coincides with the jump of the nominal exchange rate. The jumps of the two variables only differ in the case of a shock to foreign prices, as discussed in the text.

The real interest rate R is defined as $R \equiv r - Dq$; from equations (4), (3) and (5) in the text (cf. Table 3) it follows that:

(A.29) $R = d_1(r - c_1 y) - d_1 h + (1 - d_1)(r_f + k)$.

Therefore, apart from the cases of a supply shock or of a risk premium shock, the initial jump of the real interest rate is in the same direction as that of the nominal rate if and only if the following condition holds:

(A.30) $|dr(0) - c_1 dy(0)| > 0$,

i.e. the endogenous impact movement of domestic prices does not outweigh the change in the nominal interest rate. In the other two cases, the positive shock to parameter *h* (*k*) widens the downward (upward) movement of the real interest rate induced by the decrease (increase) of the nominal rate (and vice versa in the case of a negative shock), and condition (A.30) may no longer be necessary.

A.IV *A summary of the hypothesis underlying the results discussed in Section 4*

The hypothesis underlying the multipliers presented in Figure 1 and Table 4 are summarized below in Table A.1. The multipliers do not depend on any assumption on the parameters only in the case of a shock to foreign prices.

Table A.1

SUMMARY OF THE ASSUMPTIONS UNDERLYING THE MCI MULTIPLIERS SHOWN IN FIGURE 1

Condition			Hypothesis	Shock it applies to:					
	Neces-sary	Suffi-cient		Money supply	Money demand	Risk premium	Real demand	Real supply	Foreign prices
A.3	x	x	Saddle-path stability	x	x	x	x	x	
A.9	x	x	Exchange rate overshooting in response to monetary policy shocks	x	x	x	x	x	
A.30		x	Equality of the signs of the impact movements of nominal and real interest rates	x	x	x	x	x	
A.11 (limited quota of foreign products among consumer goods)		x	Predominance of the exchange rate effect in the initial jump of the MCI			x	x		
A.17	x	x	Appreciation of the exchange rate in the case of an adverse supply shock (*)					x	

(*) Two different cases arise, as discussed in the text.

As already mentioned, condition (A.3) is necessary and sufficient for the equilibrium to be unique and saddle-path stable. Condition (A.9) is necessary and sufficient for the nominal exchange rate to overshoot the steady-state value in the case of a monetary policy shock. Finally, condition (A.30) is sufficient for the initial change of the real interest rate to be in the same direction as that of the nominal rate.

These three conditions are behind the cases of a monetary policy shock and a shock to the demand for money.

If there is a currency risk premium shock or a demand shock, condition (A.11) (given also (A.3) and (A.9) and (A.30)) is sufficient for the exchange rate effect to be predominant in the initial jump of the MCI.

In the case of an adverse supply shock, the initial jump of the MCI can be either in the expansion area or in the restriction area. Its position depends on the magnitude of the initial appreciation of the exchange rate compared to the interest rate variation. If it is "small enough", the MCI signals an expansion; this is the case shown as point B in Figure 1; if instead the initial appreciation of the exchange rate is "sufficiently strong", the MCI may initially move into the restriction area (as indicated by point B′ in Figure 1).

References

Bank of Canada (1995), *Monetary Policy Report*, May.

Branson, W. H. and W. H. Buiter (1983), "Monetary and Fiscal Policy with Flexible Exchange Rates", in J. S. Bhandari and B. H. Putnam (eds.), *Economic Interdependence and Flexible Exchange Rates*, Cambridge MA, MIT Press; reprinted in W. H. Buiter, *International Economics*, Oxford, Clarendon Press, 1990.

_______________, A. Fraga and R. A. Johnson (1986), "Expected Fiscal Policy and the Recession of 1982", in M. H. Peston and R. E. Quandt (eds.), *Prices, Competition and Equilibrium*, Oxford, Philip Allan.

Brunner, K. and A. H. Meltzer (1967), "The Meaning of Monetary Indicators", in G. Horwich (ed.), *Monetary Process and Policy*, Homewood ILL, Irwin.

Buiter, W. H. (1984), "Saddlepoint Problems in Continuous Time Rational Expectations Models: A General Method and Some Macroeconomic Examples", *Econometrica*, Vol. 52, No. 3, pp. 665-80.

___________ (1986), "Policy Evaluation and Design for Continuous Time Linear Rational Expectations Models: Some Recent Developments", in M. H. Peston and R. E. Quandt (eds.), *Prices, Competition and Equilibrium*, Oxford, Philip Allan.

___________ and M. Miller (1980), "Monetary Policy and International Competitiveness", Warwick Economic Research Papers, No. 183.

___________________________ (1982), "Real Exchange Rate Overshooting and the Output Cost of Bringing Down Inflation", *European Economic Review*, Vol. 18, No. 1-2, pp. 85-123.

___________________________ (1983), "Real Exchange Rate Overshooting and the Output Cost of Bringing Down Inflation: Some Further Results", in J. A. Frenkel (ed.), *Exchange Rates International Macroeconomics*, Chicago-London, University of Chicago Press.

Ciocca, P. and G. Nardozzi (1996), *The High Price of Money: An Interpretation of World Interest Rates*, Oxford, Clarendon Press.

Corker, R. (1995), "Indicators of Monetary Conditions", IMF, *United Germany: The First Five Years: Performance and Policy Issues*, Washington DC.

Dornbusch, R. (1976), "Expectations and Exchange Rate Dynamics", *Journal of Political Economy*, Vol. 84, No. 6, pp. 1161-76.

______________ (1983), "Flexible Exchange Rates and Interdependence", *Staff Papers*, Vol. 30, No. 1, pp. 4-30.

Duguay, P. (1994), "Empirical Evidence on the Strength of the Monetary Transmission Mechanism in Canada: An Aggregate Approach", *Journal of Monetary Economics*, Vol. 33, No. 1, pp. 39-61.

Eika, K. H., N. R. Ericsson and R. Nymoen (1996), "Hazards in Implementing a Monetary Conditions Index", *Oxford Bulletin of Economics & Statistics*, Vol. 58, No. 4, pp. 765-90.

Freedman, C. (1990), "Comment", in P. Hooper, K. H. Johnson, D. L. Kohn, D. E. Lindsey, R. D. Porter and R. Tryon (eds.), *Financial Sectors in Open Economies: Empirical Analysis and Policy Issues*, Federal Reserve System.

____________ (1994), "The Use of Indicators and of the Monetary Conditions Index in Canada", in T. J. T. Baliño and C. Cottarelli (eds.), *Frameworks for Monetary Stability: Policy Issues and Country Experiences*, Washington DC, IMF.

Fuhrer, J. C. (1993), "Commodity Prices, the Term Structure of Interest Rates: Useful Indicators for Monetary Policy?", FRB Boston, *New England Economic Policy*, Nov.-Dec., pp. 18-32.

____________ and G. Moore (1992), "Monetary Policy Rules and the Indicator Properties of Asset Prices", *Journal of Monetary Economics*, Vol. 29, No. 2, pp. 303-36.

Gavosto, A. and S. Siviero (1995), "Output gap e tasso d'inflazione", Banca d'Italia, Servizio Studi, mimeo.

Gerlach, S. and F. Smets (1995), "The Monetary Transmission Mechanism: Evidence from the G7-Countries", CEPR Discussion Paper, No. 1219.

______________________ (1996), "MCIs and Monetary Policy in Small Open Economies under Floating Rates", paper presented at the Conference on the occasion of the 150th Anniversary of the Banco de Portugal, Lisbon, November 22-23.

Giavazzi, F. and M. Pagano (1996), "Non-Keynesian Effects of Fiscal Policy Changes: International Evidence and the Swedish Experience", *Swedish Economic Policy Review*, Vol. 3, No. 1, pp. 67-103.

Hansson, B. and H. Lindberg (1994), "Monetary Conditions Index: A Monetary Policy Indicator", Sveriges Riksbank, *Quarterly Review*, No. 3, pp. 12-19.

IBJ International (1995), *IBJ Research Bond and Currency Strategy*, London.

Kennedy N. O. and A. G. van Riet (1995), "A Monetary Conditions Index for the Major EU Countries: A Preliminary Investigation", Frankfurt a. M., European Monetary Institute, mimeo.

Lane T. and A. Prati (1994), "Toward a Monetary Framework for Italy", Washington DC, IMF, mimeo.

Longworth, D. and S. Poloz (1995), "The Monetary Transmission Mechanism and Policy Formulation in Canada: An Overview", in BIS, *Financial Structure and the Monetary Policy Transmission Mechanism*, Basle.

McCallum, B. T. (1989), "Targets, Indicators, and Instruments of Monetary Policy", NBER Working Paper, No. 3047.

J. P. Morgan (1995), "Assessing Changes in Monetary Conditions", *Global Data Watch*, 1 September.

Nicoletti Altimari, S., R. Rinaldi, S. Siviero and D. Terlizzese (1995), "Monetary Policy and the Transmission Channels in the Bank of Italy's Quarterly Econometric Model", in BIS, *Financial Structure and the Monetary Policy Transmission Mechanism*, Basle.

Norges Bank (1995), "Inflation Report", *Economic Bulletin*, No. 1, pp. 12-17.

Obstfeld, M. and K. Rogoff (1984), "Exchange Rate Dynamics with Sluggish Prices under Alternative Price-Adjustment Rules", *International Economic Review*, Vol. 25, No. 1, pp. 159-74.

____________ and A. Stockman (1985), "Exchange-Rate Dynamics", in R. W. Jones and P. B. Kenen (eds.), *Handbook of International Economics*, Amsterdam, North-Holland, Vol. II.

Passacantando, F. (1996), "Building an Institutional Framework for Monetary Stability: The Case of Italy (1979-1994)", *BNL Quarterly Review*, Vol. 49, No. 196, pp. 83-132.

Penati, A. (1983), "Expansionary Fiscal Policy and the Exchange Rate: A Review", *Staff Papers*, Vol. 30, No. 1, pp. 542-69.

Pikkarainen, P. and A. Ripatti (1995), "The Role of Monetary Indicators in the Design of Monetary Policy", *Bank of Finland Bulletin*, Vol. 69, No. 8, pp. 3-8.

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.

____________ (1994), "Monetary Aggregates Targeting in a Low-Inflation Economy", in J. C. Fuhrer (ed.), *Goals, Guidelines, and Constraints Facing Monetary Policymakers*, Boston, Federal Reserve Bank of Boston.

Smets, F. (1997), "Measuring Monetary Policy in the G7 Countries: Interest Rates versus Exchange Rates", paper presented at the CEPR Conference on "Model Specification, Identification and Estimation in Empirical Macroeconomics", Perugia, January 9-11.

Whitley, J. (1997), "Economic Models and Policy-Making", Bank of England, *Quarterly Bullettin*, May, pp. 163-73.

Woodford, M. (1994), "Nonstandard Indicators for Monetary Policy: Can Their Usefulness Be Judged from Forecasting Regressions?", in G. Mankiw (ed.), *Monetary Policy*, Chicago-London, University of Chicago Press.

(*) Requests for copies should be sent to:
Banca d'Italia – Servizio Studi – Divisione Biblioteca e pubblicazioni – Via Nazionale, 91 – 00184 Rome
(fax 39 6 47922059)

Printed by the
Printing Office of the Banca d'Italia
Rome, January 1998