The MCI as a monetary policy guide in a small, open and emerging market economy

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Abstract
In the last decade several central banks started to use the Monetary Conditions Index (MCI) as an indicator of monetary conditions within their countries. Some central banks also define a quantified target for their MCI, which is then pursued through the application of the monetary policy instruments at their disposal. This paper indicates how the MCI can be used to specify an optimal interest rate and exchange rate that would ensure both internal and external equilibrium in a small open and emerging market economy. In addition, the paper considers how shocks and inertia in the adjustment process of the economy affects the MCI and the MCI target of a central bank. It also considers practical issues that may limit the use of the MCI. Lastly, because the MCI is a weighted average of the exchange rate and the interest rate, its use as a policy guide suggests that a central bank uses both the interest rate and exchange rate as instruments to ensure optimal monetary conditions. To do this, the paper proposes the use of a system of managed floating where the central bank uses both the interest rate and the exchange rate to influence monetary conditions.

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In the last decade several central banks started to use the Monetary Conditions Index (MCI), which in essence is a weighted average of the exchange rate and the interest rate, as an indicator of monetary conditions within their countries. These include the Bank of Canada, the Reserve Bank of New Zealand, and the central banks of Norway and Sweden (De Wet 2002: 80-82, Guender 2001: 15). Some central banks also define a quantified target for their MCI, which is then pursued through the application of monetary policy instruments. Such an intermediate target is used by the central banks of Canada and New Zealand. Given its recent vintage, there still are several questions about the application of the MCI, not least of which concerns its application in a small open economy such as an emerging market economy.

This paper considers theoretical issues that should be well understood before the MCI can be used as a guide to monetary policy in a small open and emerging economy. In particular, the paper indicates how the MCI can be used to specify an optimal interest rate and exchange rate that would ensure both internal and external equilibrium. In addition, the paper considers theoretical issues that relate to the relationship between the use of the MCI as a summative information tool on monetary conditions and its use as a guiding indicator of the policy steps needed to improve monetary conditions. More specifically, the paper considers how shocks and inertia in the adjustment process of the economy affects the MCI and the MCI target of a central bank. It also considers some practical issues that may limit the use of the MCI. Lastly, because the MCI is a weighted average of the exchange rate and the interest rate, its use as a policy guide suggests that a central bank uses both the interest rate and exchange rate as instruments to ensure optimal monetary conditions. To do this, the last section, which considering directions for policy, proposes the use of a system of managed floating (first proposed for countries in general by Bofinger and Wollmershäuser 2001) where the central bank uses both the interest rate and the exchange rate to influence monetary conditions.

The discussion commences with a definition of the MCI. Thereafter the paper introduces a model that uses the MCI to set an optimal interest rate and exchange rate policy that will ensure internal and external equilibrium in a small open economy characterised by shocks and inertia in the adjustment process of the economy back to equilibrium. This is followed by a discussion of some practical limitations to the use of the MCI. The paper concludes with a section that considers directions for policy.

1. Defining the MCI

De Wet (2002:81) defines the MCI as "…a combination of changes in the short-term interest rate and the multilateral exchange rate from some arbitrary base point. In other words, it is a weighted index of the real interest rate and the real effective exchange rate, with the weights determined by the relative influence that the real interest rate and the real exchange rate have on the inflation." The MCI that De Wet (2002:87) uses is represented in equation (1):

$$MCI_t = b_1\Delta r_t - b_2\Delta e_t \quad (1)$$

where Δr_t is the percentage point change in the real interest rate and Δe_t the percentage point change in the real effective exchange rate (where a negative value for $-b_2\Delta e_t$ indicates a depreciation of the domestic currency) that took place from some base period. The base period usually is selected for the proximity of the economy in that period to its long-run equilibrium level. Note that Δr_t and Δe_t denote the accumulated change that took place over several periods, starting from the base period, and not just one period. When a central bank uses an MCI target, the basic idea is to keep the MCI constant (De Wet 2002:82). In essence the MCI is an index, which means there is no intrinsic meaning to any specific number that the index or target takes. Nevertheless, whatever MCI value serves as target, the value should be close to the value that the MCI has when the economy is close to its long-run equilibrium. For reasons of simplicity, the constant value can be defined as zero, a conventions also followed in this paper.

According to equation (1) an increase in the interest rate and an appreciation of the domestic currency give rise to a higher MCI, thus indicating tighter monetary conditions, with the converse being true for a reduction in the real interest rate and a depreciation of the domestic currency.

Some authors (cf. Bofinger and Wollmershäuser 2001: 32, and Gerlach and Smets 2000: 1683) define an MCI where the level of the interest rate, instead of the percentage point change in the interest rate is used. However, given that the rest of the analysis is conducted in terms of the deviations from long-run values, De Wet's version (equation (1)) is preferred. In the literature there is also a distinction between the use of real or nominal values of interest rates and exchange rates in the expression of the MCI. Some authors like De Wet (2002: 87), Gerlach and Smets (2000: 1683), and Bofinger and Wollmershäuser (2001: 32) use the real values of the variables, while Gottschalk (2001: 5) and Peeters (1999: 186) use the nominal values of the variables. From a theoretical point of view the use of real terms may be preferred. However, if short-term variables are analysed and a relative stable inflation rate is assumed, then nominal and real interest rates and exchange rates are strongly correlated (EZB 2002: 27-29). For the theoretical purpose of this paper we stay with the real expression.

2. The model

As noted above, the basic idea behind a target for the MCI, is to keep the MCI constant (at zero) with a base period that corresponds to a period when the economy was close to long-run equilibrium. However, this section indicates that such a policy might be too simplistic, particularly when the economy experiences supply and demand shocks and suffers from inertia in its adjustment process back to its long-run position (assuming that such an adjustment tendency exists at all). To demonstrate this, the section starts off with an exposition of the use of the MCI as a summative information tool (section 2.1) and a policy guide (section 2.2) in a relatively stable economy that, nevertheless, may suffer from supply and demand shocks. A stable economy is defined here as an economy that after a disturbance, returns relatively quickly to its long-run equilibrium level. This is an economy where its variables do not suffer from serial correlation. Section 2.3 then considers an economy where inertia is present and variables, therefore, suffer from serial correlation. A model with inertia effects may be descriptively more accurate and, therefore, represent a better guide to policy than models without it (cf. Gordon 1997 [1990]; Greenwald and Stiglitz 1997 [1993]).

2.1 The MCI as a summative information tool in a stable economy

To define a stable economy we follow Bofinger and Wollmershäuser (2001:30-31) who defined the demand side of the economy in such a way that it resembles the MCI. To do so one starts from the usual national accounts identity as represented in equation (2):

$$Y_t = C_t + I_t + G_t + NX_t \qquad (2)$$

Where Y: Real GDP
C: Consumption
I: Investment
G: Government consumption
NX: Net exports

Where $C_t = f(Y_t)$; $I_t = f(r_t; Y_t)$; $NX_t = f(E_t; Y_t; Y^f{}_t)$; $G_t = G_t$

Thus, the reduced form model (in terms of natural logs, except for the real interest rate) of equation (2) is:

$$y_t = b_3 - b_4 r_t + b_5 e_t + u_1 \qquad (3)$$

Equation (3) defines equilibrium from the demand side.

At the potential output level, equilibrium, as defined from the demand side, is:

$$y^*{}_t = b_3 - b_4 r^*{}_t + b_5 e^*{}_t \qquad (4)$$

To define the output gap, as defined from the demand side, subtract equation (3) from (4):

$$y^*_t - y_t = b_3 - b_4r^*_t + b_5e^*_t - (b_3 - b_4r_t + b_5e_t + u_1)$$
$$= (b_4r_t - b_4r^*_t) - (b_5e_t - b_5e^*_t) - u_1$$
$$= y_{gt} = b_4r_{gt} - b_5e_{gt} - u_1 \qquad (5)$$

where y_{gt} = the output gap (where a positive output gap indicates that the actual output is below potential output and *vice versa*.[1]); r_{gt} = the deviation of the real interest rate from its value at potential output and e_{gt} = the deviation of the real effective exchange rate from its potential output value.

This means that:

$$y_{gt} = b_4r_{gt} - b_5e_{gt} - u_1 = b_1\Delta r_t - b_2\Delta e_t - u_1 = MCI_t - u_1 \qquad (6.1)$$

or

$$y_{gt} + u_1 = b_4r_{gt} - b_5e_{gt} = b_1\Delta r_t - b_2\Delta e_t = MCI_t \qquad (6.2)$$

Therefore, according to equation (6.2) the MCI, as defined from the demand side, becomes an indicator of the changes in the output gap due to changes in the interest rate and the exchange rate, but excluding the effect of demand shocks. Thus, in the absence of a demand shock a positive output gap indicates a higher MCI, which corresponds with standard theory that associates tighter monetary conditions with tighter economic conditions (e.g. recessions). From equation (6.2) it also is clear that $b_1 = b_4$ and $b_2 = b_5$.

The supply side definition of the output gap is a simple augmented Phillips-curve definition (Bofinger and Wollmershäuser 2001:34):

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[1] Some sources (cf. Bannock *et al.* 1998:308) define a positive output gap the other way round, namely when actual output exceeds potential output.

$$y_{gt} = - b_6(\pi_t - E(\pi_t)) - u_2 \qquad (7)$$

With a credible monetary policy $E(\pi_t) = \pi^*_t$ where π^*_t is the long-run inflation rate and also the target inflation rate of the central bank.

In equilibrium:

$$y_{gt} = - b_6(\pi_t - \pi^*_t) - u_2 = b_4r_{gt} - b_5e_{gt} - u_1 = MCI_t - u_1 \qquad (8)$$

Following the logic of equation (6.2):

$$y_{gt} + u_1 = - b_6(\pi_t - \pi^*_t) - u_2 + u_1 = b_4r_{gt} - b_5e_{gt} = b_1\Delta r_t - b_2\Delta e_t = MCI_t \qquad (9)$$

From equation (9) it can be seen that a positive supply shock (negative ($- u_2$), e.g. a real wage rate decline), a negative demand shock (negative (u_1), e.g. a government that decreases its expenditure) eases monetary conditions as measured by the MCI (i.e. a negative ($- u_2$) and (u_1), causes the MCI to move lower). In addition, unexpected inflation causes a decrease in the MCI, meaning that monetary conditions were relaxed, thereby causing a negative output gap. Hence, the MCI reflects the impact of supply side shocks and unexpected inflation on the output gap.

2.2 The MCI as a policy guide in a stable economy

To pursue a consistent policy, the central bank must have some social welfare function to pursue. Suppose the social welfare function is maximised if the economy operates at potential output (because at that level there is no unanticipated inflation that reduces the welfare of some agents unexpectedly and there also is no unemployment). The central bank then maximises the social welfare function if it minimises the output gap, which, in its normal run of affairs is done through keeping the actual inflation rate as close as possible to the expected, target inflation rate. The central bank may also decide not to react to output gaps caused by demand and supply shock, but only to those caused by a price level that exceeds the expected price level. A central bank may decide not to react because of the long and variable lags that may affect negatively the pursuit of a social welfare function that aims at minimising the output gap. In addition, the model used above assumes that shocks are transitory and random events. Thus, the economy is defined as stable, so that the effect of the demand shock does not linger around for very long – the economy returns to equilibrium within one period (while government might only be able to react to shocks in the next period, precisely because these shocks are unpredictable). In addition, if demand shocks are stochastic or unpredictable, then it might be just as difficult to counter them as supply shocks. The next subsection considers the case where the effects do linger and where government reacts to the lingering effects of the supply and demand shocks.

If the central bank decides to react only to output gaps caused by a price level that exceeds the expected price level, then the policy to use an MCI and a policy of inflation targeting is one and the same policy and is in line with the use of the MCI as described above by De Wet where the MCI is interpreted as "…a weighted index of the real interest rate and the real effective exchange rate, with the weights determined by the relative influence that the real interest rate and the real exchange rate have on *inflation*." [emphasis added]. A policy of inflation targeting is then in line with a welfare maximising policy that aims at the minimisation of the output gap, if such a gap is caused by deviations of the actual inflation rate from the expected inflation rate. Equation (9) is then rewritten as:

$$y_{gt} + u_1 + u_2 = -b_6(\pi_t - \pi^*_t) + u_1 = b_1\Delta r_t - b_2\Delta e_t + u_2 = MCI_t + u_2 \qquad (10)$$

Social welfare is then maximised if $y_{gt} + u_1 + u_2$ is close to zero:

$$\min L = \min(y_{gt} + u_1 + u_2)^2 \qquad (11)$$

Where L denotes the loss function of the central bank.

Using equation (10), it can be seen that should $y_{gt} + u_1 + u_2$ have a non-zero value, $- b_6(\pi_t - \pi^*_t) + u_1$ also will have a non-zero value. This might reflect the possibility that the output gap was caused by a lax (or too tight) monetary policy causing the price level to increase beyond (or decrease below) the expected level. To rectify this situation, the central bank might decide to offset the output gap by what we may denote as an 'anti-output gap'. This is done through changing the interest rate or the exchange rate in the desired direction. Consider the case where $y_{gt} + u_1 + u_2$ and $- b_6(\pi_t - \pi^*_t) + u_1$ in equation (10) are both negative, meaning there is a negative output gap and actual inflation exceeds expected inflation. This means that Δr_t in equation (10) reflects the decrease in the interest rate from its long-run equilibrium level at r^*_t, or Δet in equation (10) reflects the increase in the exchange rate from its long-run equilibrium level at e^*_t. The change in either the interest rate or the exchange rate or both, in turn, causes the MCI to decrease below zero, indicating a lax monetary policy. The 'anti-output gap' reverses the lax monetary policy stance. This is demonstrated in equation (12), where its difference with equation (10) is indicated in italics:

$$y_{gt} + u_1 + u_2 + \mathit{y_{agt+1}} = - b_6(\pi_t - \pi^*_t) + u_1 + \mathit{y_{agt+1}} = b_1(\Delta r_t + \Delta \mathit{r_{at+1}}) - b_2(\Delta e_t + \Delta \mathit{e_{at+1}}) + u_2$$
$$= MCI_t + u_2 + \mathit{b_1 \Delta r_{at+1}} - \mathit{b_2 \Delta e_{at+1}} \qquad (12)$$

where y_{gt} = the output gap before the rectifying policy is put in place and Δr_t and Δe_t respectively indicates the change in the real interest rate and the percent point change in real exchange rate before the rectifying policy is put in place. In addition, $y_{gt} + u_1 + u_2 \neq 0$; $y_{gt} + u_1 + u_2 = - y_{agt+1}$; so that y_{agt+1} denotes the 'anti-output gap' and Δr_{at+1} and Δe_{at+1} denotes the change in the interest rate and exchange rate to create the 'anti-output gap'. Note that the creation of the anti-output gap occurs in period t+1 to indicate that in terms of temporal occurrence the policy reaction occurs after the disturbance.

Equation (12) means that the interest rate and exchange rate should be managed to reach $MCI_t + u_2 + b_1 \Delta r_{at+1} - b_2 \Delta e_{at+1} = 0$ and a target MCI equals to:

$$MCI_{t+1}^{target} = -MCI_t - u_2 = b_1\Delta r_{at+1} - b_2\Delta e_{at+1} \qquad (13)$$

Equation (13) shows that the target MCI of period t+1 has to correct for the MCI deviations from zero in period t, while also ignoring shocks. From equation (13) it is also simple to derive the target values for the instrument use of the central bank:

$$\Delta r_{at+1}^{target} = \frac{-MCI_t - u_2 + b_2\Delta e_{at+1}^{target}}{b_1} \qquad (14a),$$

$$\Delta e_{at+1}^{target} = \frac{MCI_t + u_2 + b_1\Delta r_{at+1}^{target}}{b_2} \qquad (14b).$$

Equations (14a) and (14b) indicate that the use of instruments is interdependent just as the concept of the MCI states. To target a specific MCI the central bank could choose a combination of changes in interest rates and exchange rates. However, theory and practical experience (e.g. during the East Asian Crisis 1997) show that in open economies the central bank is not able to target interest rates and exchange rates simultaneous without taking foreign developments into consideration. Interest rate parity theory states that nominal domestic interest rates have to equal foreign nominal interest rates (i^f in equation 15) plus the percentage change in nominal exchange rates (ΔS in equation 15) and a risk premium (ρ in equation 15):

$$i_t = i_t^f + \Delta s_t + \rho_t \qquad (15)$$

For our purpose it is necessary to transform the interest rate parity into its real counterpart, where r and r^f represent the real risk free interest rate.[2] This is done in appendix I and yields for the target interest and exchange rates the following:

$$\Delta e_{at+1}^{target} = r_{at+1}^{target} - r_{t+1}^f \qquad (16).$$

[2] This also means that the r appearing in the MCI is the real risk free interest rate.

Inserting equation (16) into equations (14a) and (14b) while considering that:

$\Delta r_{at+1}^{target} = r_{at+1}^{target} - r_t$ so that $r_{at+1}^{target} = \Delta r_{at+1}^{target} + r_t$

yields:

$$\Delta r_{at+1}^{target} = \frac{-MCI_t - u_2 + b_2(r_t - r_{t+1}^f)}{(b_1 - b_2)} \quad (17a),$$

$$\Delta e_{at+1}^{target} = \frac{MCI_t + u_2 + b_1(r_{t+1}^f - r_t)}{(b_2 - b_1)} \quad (17b).$$

The changes in the interest rate and the exchange rate ensure that $- b_6(\pi_t - \pi^*_t) + u_1 + y_{agt+1} = 0$, while the policy simultaneously accommodate shocks. To see this, recall that a positive supply shock lowered the MCI, so that by adding it again (as is done in equation (13)), its effect on the target MCI is neutralised. This, in turn, means that the change required in the actual MCI to reach the target MCI, equals $b_1\Delta r_{at+1} - b_2\Delta e_{at+1}$, where the values of Δr_{at+1} and Δe_{at+1} are determined by equations 17a and17b. The target MCI will then be lower than zero. When there is no supply shock present, the change required in the actual MCI (brought about by $b_1\Delta r_{at+1} - b_2\Delta e_{at+1}$) equals the negative of the non-zero value of the MCI, so as to ensure that the MCI returns to zero. This corresponds to the simple policy rule of keeping the MCI constant at zero, so that $MCI_t^{target} = 0$.

Furthermore note that if exchange rate parity exists and if the real risk free interest rates across countries are spatially and intertemporally equal (thus: $r_t = r^f_{t+1}$),[3] then equations 17a and 17b reduce to:

[3] The required intertemporal equality results from the one period lag that the model allows for policy to react to output gaps. If the model was so structured that policy reaction took place within the same period as the one in which the output gap occurs, then only the spatial and not the intertemporal equality of interest rates would be required. However, this would mean that in theoretical time the occurrence of the output gap and the policy to address it (i.e. the change in the interest rate and the exchange rate to create the required anti-output gap), occurs simultaneously, that is in period t. Thus, as already argued above, to indicate that in terms of temporal occurrence the policy reaction occurs after the disturbance, the analysis assumed that the creation of the anti-output gap occurs in period t+1.

$$\Delta r_{at+1}^{target} = \frac{-MCI_t - u_2}{(b_1 - b_2)} \qquad (17aa),$$

$$\Delta e_{at+1}^{target} = \frac{MCI_t + u_2}{(b_2 - b_1)} \qquad (17bb).$$

Unlike equations 17a and 17b, the right-hand sides of equations 17aa and 17bb are the same, which makes sense since the change in the exchange rate should compensate for the change in the interest rate to ensure international parity. However, equations 17aa and 17bb represent a special case where the real risk free interest rates are spatially and intertemporally equal because of arbitrage in capital flows. This assumption is too strong for real world situations, which means that equations 17a and 17b, rather than 17aa and 17bb, represent a better description of what is needed in practice.

Lastly, because a supply shock (whether it is positive or negative), implies $MCI_t^{target} \neq 0$, it means that a policy to target the MCI at a constant level may not only be simple, but also simplistic, particularly in an economy such as an emerging market economy that may experience frequent supply shocks. This becomes even more apparent in the next section when the model is refined to include inertia effects.

2.3 An economy that suffers from inertia

In equations (8) and (9) the economy returns to its long-run equilibrium level after one period. However, should an economy suffer from inertia, so that an output gap returns to zero only after several periods, or not at all, then equation (8) must be rewritten as equation (18) (where the difference with equation (8) is shown in italics):

$$y_{git} = -b_6(\pi_t - \pi_t^*) + b_7 y_{gt-1} - u_2 = b_4 r_{gt} - b_5 e_{gt} + b_7 y_{gt-1} - u_1 = b_1 \Delta r_t - b_2 \Delta e_t + b_7 y_{gt-1} - u_1 = MCI_t + b_7 y_{gt-1} - u_1 \qquad (18)$$

where y_{git} equals y_{gt}, which is what the output gap would have been without the inertia, *plus* the inertia effect, + b_7y_{gt-1}. Thus, $y_{git} = y_{gt} + b_7y_{gt-1}$. Note that b_7 equals one or zero or take a value between zero and one. If it is zero, equation (18) reduces to equation (8). If it is between zero and one, the economy returns to its long-run equilibrium value at a slower speed than in equation (8), i.e. it takes more than one period to return. If it takes a value of one, the economy never returns to its long-run value, so that the effect of a disturbance is permanent. Rearranging equation (18) in analogy to equation (9) isolates the MCI and gives:

$$y_{git} – b_7y_{gt-1} + u_1 = – b_6(\pi_t – \pi_t^*) + b_7y_{gt-1} – u_2 – b_7y_{gt-1} + u_1 = b_4r_{gt} – b_5e_{gt} + b_7y_{gt-1} – u_1 – b_7y_{gt-1} + u_1 = b_1\Delta r_t – b_2\Delta e_t + b_7y_{gt-1} – u_1 – b_7y_{gt-1} + u_1 = MCI_t$$

which simplifies to:

$$y_{git} – b_7y_{gt-1} + u_1 = – b_6(\pi_t – \pi_t^*) – u_2 + u_1 = b_4r_{gt} – b_5e_{gt} – u_1 + u_1 = b_1\Delta r_t – b_2\Delta e_t – u_1 + u_1 = MCI_t \qquad (19)$$

Given that $y_{git} = y_{gt} + b_7y_{gt-1}$, it means that $y_{git} – b_7y_{gt-1} + u_1 = y_{gt} + u_1$, which, in turn, means that the MCI reflects the output gap to a much smaller extent, the larger the inertia effect is (i.e. the larger b_7 is). To be more precise, the MCI will understate the output gap, whether it is a positive or negative gap. In terms of policy it means that the MCI understates the extent of policy action needed to minimise the loss function of the central bank. Thus, in the case of a negative output gap, it understates the extent to which interest rates have to decrease to eliminate the output gap. Stated differently, the 'anti-output gap' will be too small.

Therefore, the target MCI of the central bank has to be adjusted to take into consideration the inertia effect. The value that must then be set equal to zero is $MCI_t + u_2 + b_7y_{gt-1} + b_1\Delta r_{at+1} – b_2\Delta e_{at+1}$, as can be seen from equation (20):

$y_{git} + u_1 + u_2 + y_{agt+1} = - b_6(\pi_t - \pi^*_t) + u_1 + b_7y_{gt-1} + y_{agt+1} = b_1(\Delta r_t + \Delta r_{at+1}) - b_2(\Delta e_t + \Delta e_{at+1}) + b_7y_{gt-1} + u_2 = MCI_t + u_2 + b_7y_{gt-1} + b_1\Delta r_{at} - b_2\Delta e_{at+1}$ (20)

Equation (20) means that the interest rate and the real exchange rate should be managed to reach $MCI_t + u_2 + b_7y_{gt-1} + b_1\Delta r_{at+1} - b_2\Delta e_{at+1} = 0$ and a target MCI equals to:

$$MCI_t^{target} = - MCI_t - u_2 - b_7y_{gt-1} = b_1\Delta r_{at+1} - b_2\Delta e_{at+1} \quad (21)$$

Where the required change in the interest rate and exchange rate is:

$$\Delta r_{at+1}^{target} = \frac{-MCI_t - u_2 - b_7 y_{gt-1} + b_2 \Delta e_{at+1}^{target}}{b_1} \quad (22a)$$

$$\Delta e_{at+1}^{target} = \frac{MCI_t + u_2 + b_7 y_{gt+1} + b_1 \Delta r_{at+1}^{target}}{b_2} \quad (22b).$$

In analogy to equations (17a) and (17b) equations (22a) and (22b) can be transformed by inserting equation (10) into:

$$\Delta r_{at+1}^{target} = \frac{-MCI_t - u_2 - b_7 y_{gt-1} + b_2 (r_t - r_{t+1}^f)}{(b_1 - b_2)} \quad (23a)$$

$$\Delta e_{at+1}^{target} = \frac{MCI_t + u_2 + b_7 y_{gt-1} + b_1 (r_{t+1}^f - r_t)}{(b_2 - b_1)} \quad (23b)$$

This target ensures that $- b_6(\pi_t - \pi^*_t) + b_7y_{gt-1} + u_1 + y_{agt} = 0$, while simultaneously accommodating shocks and countering the inertia effect. To demonstrate the effect that the inertia may have on the target MCI, consider the case where a positive output gap persists, so that b_7y_{gt-1} in equation (21) and (23b) has a positive value and $- b_7y_{gt-1}$ in equation (23a) has a negative value. To counter this inertia effect the interest rate must be decreased and exchange rates must be increased (devaluation). The larger b_7 is, the more the interest rate must be decreased and the more the exchange rate has to devaluate, and the lower MCI_t^{target} in equation (21) will go. This demonstrates again that a policy to target the MCI at constant level may not only be simple, but also simplistic.

3. Limitations on the use of the MCI

As mentioned in the introduction, there are some practical issues that may limit the use of the MCI as a policy guide in an emerging market economy. The first practical issue concerns the ability of the central bank to obtain the information needed to calculate the MCI. To calculate an MCI that reaches its target value when the economy reaches long-run equilibrium, means that the economy must have been at its long-run equilibrium value in the base period used to calculate the MCI. Only then can the values of the interest rate, exchange rate and output be taken to represent their long-run values. However, emerging market economies may frequently experience instability caused by supply and demand shocks. These economies may also experience persistent and large inertia effects so that it may be quite difficult to determine when and if such an economy was at a level that approximates its long-run equilibrium position. This complicates the selection of a base period. In addition, emerging market economies are also subject to more structural changes than industrialised economies, so that what constituted a reliable base period and thus, a long-run equilibrium position in the past may lose its reliability, with no information existing as to what constitutes a new reliable base period. These are substantive issues that may inhibit the use of the MCI, even in industrialised economies,[4] but that are exacerbated by the more changing and volatile nature of emerging market economies. Thus, the lack of information may be no small problem.

A second practical issue concerns the exchange rate. Emerging market countries usually lack sufficient foreign currency reserves to defend their currency against speculators. This is further aggravated if exchange rates do not adjust to ensure interest and purchasing power parity relations, but the reverse occurs, i.e. where nominal interest and purchasing power parity relations adjust to changes in the nominal exchange rate. In this

[4] For instance, in the latter half of the 1990s there was significant uncertainty as to what the potential output level of the US was, given that the US was able to reduce its unemployment rate, without causing inflation, to levels that previously were thought to be inflationary.

manner, a depreciation of the domestic currency gives rise to higher imported prices, which, in turn, spurs domestic inflation and thereby vindicates the depreciation. One way around this problem would be for an international organisation such as the IMF to act as an international lender of last resort. Countries would then be able to peg their currencies, not at arbitrary unchanging levels, but at a level consistent with interest rate parity, where domestic interest rates are determined by the type of monetary policy needed to pursue the social welfare function of the central bank as set out in section 2.2 above (for more on this, see section 4).

A third practical problem also relates to the relationship between the interest rate level and the exchange rate. As shown in the appendix, the domestic nominal interest rate should equal the foreign nominal interest rate plus the nominal depreciation in the currency plus the risk premium associated with the domestic economy:

$$i_t = i^f_t + \Delta S_t + \rho_t \qquad (24)$$

Equation (24) shows that should the risk premium, ρ_t in equation (24), change, the nominal interest rate should change to reflect the change in the risk premium. The risk premium may change if the risk assessment of an emerging market – done on a regular basis by credit rating agencies, large investors and financial markets in general – changes. Should the interest rate not change in response to the change in the risk premium, the exchange rate will change. For instance, if the risk premium increases, but the interest rate remains constant, the domestic currency will depreciate. Should the risk premium be volatile because of regular revisions of a country's risk assessment, either the nominal interest rate or the nominal exchange rate or both will be volatile. The volatility itself may create 'noise' that makes it difficult to determine the real risk free interest rate and, hence, the real exchange rate. This, in turn, makes it difficult to measure the MCI.

4. Directions for policy

This paper considered some theoretical issues that should be well understood before the MCI can be used as a guide to monetary policy in a small open and emerging economy. In particular, the paper showed that a policy to pursue a constant MCI is not only simple, but also simplistic. Shocks and persistent inertia problems may exist that require a more refined rule. For instance, a constant-MCI policy-rule will not accommodate supply shocks and may not allow a central bank to maximise its social welfare function if the economy suffers from persistent inertia. The paper shows how the MCI target should be adjusted to address these shortcomings. The adjusted target will accommodate shocks and counter persistent inertia effects.

Once these theoretical shortcomings are understood, a central bank should establish the extent to which it can overcome the practical problems inhibiting the use of the MCI as a policy guide. Several issues were highlighted, including the lack of information on the long-run equilibrium position of the economy, particularly if the economy experiences instability, persistent inertia effects and structural changes. The paper also highlighted the exchange rate difficulties of emerging market countries in a world where these countries are subjected to erratic speculative capital flows.

The framework set out in section 2 above also indicates that both the interest rate and the exchange rate should be set at their optimal levels for the economy to be in external and internal equilibrium. If the volatility of international financial markets of the last decade is taken into consideration, it becomes clear that free floating exchange rates lead to optimal domestic monetary conditions only by chance. Therefore, the common inflation targeting concepts of central banks in small, open and emerging economies should be expanded by the use of the effective exchange rate as a second operating target. This means that the exchange rate should be adjusted continuously to domestic requirements and foreign conditions, just like interest rates. Thus, the exchange rate target is not an announced nominal anchor for the economy (the nominal anchor is still the inflation target), but an operating target which remains unannounced since the conditions may change and so too the exchange rate. Such a system is a system of *managed floating*, where the exchange rate is set in accordance with economic conditions (as described by equations 17b and 23b above) and is therefore neither left to float freely nor is it fixed at some arbitrary fixed exchange rate.

In addition, the exchange rate should be targeted directly by an instrument of intervention in currency markets to keep the interest rates free as a separate operating target, which is then, in turn, targeted by the repo-rate. This allows the central banks to target internal and external equilibrium at the same time. Internal equilibrium means that the domestic requirements for monetary conditions are met so that an internal equilibrium target is compatible with an inflation target that allows for deviations in the case of shocks. That, in turn, is compatible with a medium term inflation target band that is usually announced by inflation targeting central banks. Additional to the inflation target, the monetary authorities would be able to target external equilibrium. The strategy of managed floating allows the central banks to target internal equilibrium without neglecting foreign capital markets. Indeed, the strategy ensures that speculative capital flows are avoided by ensuring interest rate parity permanently.

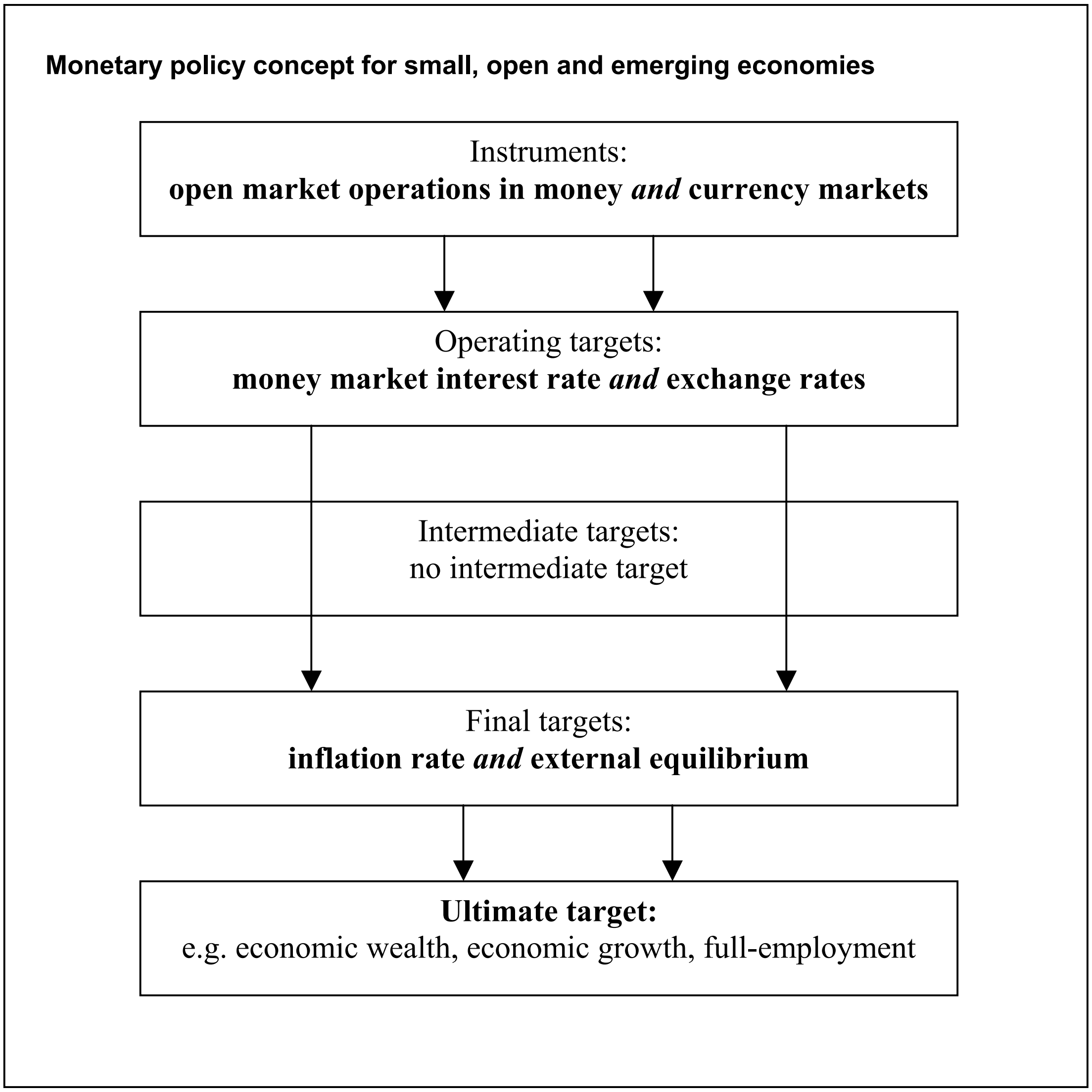

Figure I: A monetary policy concept for small, open and emerging economies

In the current discussion it is often seen as impossible to ensure internal and external equilibrium without capital controls. Nevertheless, the managed floating strategy (see Figure I) posits that it is possible to target internal and external equilibrium simultaneously.

However, problems occur for the managed floating approach (as for any one of the other described unilateral monetary policy concepts) in crisis situations where herd behaviour causes foreign investor withdrawal. Therefore, an international lender of last resort is required to equip the central banks with sufficient funds of foreign currency to target the necessary appreciation. The political authorities of small, open and emerging economies should, therefore, use its international influence to remind the international community of the basic objectives of the IMF: “To promote international monetary cooperation through a permanent institution which provides the machinery for consultation and collaboration on international monetary problems” and “to meet the long-term global need, as and when it arises, to supplement existing reserve assets”.[5] Therefore, the IMF is probably the best institution to provide the required funds to enable small, open and emerging countries to guarantee internal and external equilibrium at all time. The international lender of last resort would not only stabilise conditions in the supported economies, but it would also stabilise the world economy and world trade, which is in the interest of the entire world community.

For the monetary authorities in small, open and emerging economies there is no reason to wait for this international arrangement. With or without international lender of last resort, the strategy of managed floating, integrated in the concept of inflation targeting, provides the best available strategy. This strategy is not a crisis intervention strategy, but a strategy that makes crises less likely because it attends to capital inflows as well as to outflows and not only to the latter in times of crisis. If speculative capital inflows are avoided in normal situations, a crisis due to speculative capital outflows is less likely and probably avoided. Therefore, a managed floating exchange rate strategy is the best strategy to ensure optimal domestic monetary conditions and protect small, open and emerging economies from volatile foreign exchange markets.

Appendix - Deriving equation (16)

Equation (16) can be trivially derived from three standard assumptions, the definition of the real exchange rate, the interest rate parity theory and the Fisher equation.

The real exchange rate is defined as:

[5] Articles I(i) and XVIII of the Articles of Agreement of the IMF which remained unchanged since 1944, as quoted in Fischer (1999).

$\Delta e_t = \Delta s_t + \pi_t^f - \pi_t$ (i).

Where Δe_t is the expression for the a percentage change in real exchange rates, which equals the percentage change in the nominal exchange rates (Δs_t) plus the foreign inflation rate (π_t^f) and minus the domestic inflation rate (π_t).

Interest parity is defined as:

$i_t = i_t^f + \Delta s_t + \rho_t$, or:

$\Delta s_t = i_t - i_t^f - \rho_t$ (ii).

Where i_t^f and i_t are foreign and domestic nominal interest rate respectively and ρ_t denotes a risk premium.

The Fisher equation, which states that the nominal interest rates can be expressed as the sum of the real risk free interest rate plus the inflation rate and plus a risk premium is:

$i_t = r_t + \pi_t + \rho_t$ (iii).

Neglecting the risk premium on foreign interest rates the Fisher equation for foreign nominal interest rates is:

$i_t^f = r_t^f + \pi_t^f$ (iv).

Inserting equations (iii) and (iv) into equation (ii) yields:

$\Delta s_t = r_t + \pi_t + \rho_t - r_t^f - \pi_t^f - \rho_t = r_t + \pi_t - r_t^f - \pi_t^f$ (v).

Inserting equation (v) into equation (i) yields:

$$\Delta e_t = r_t + \pi_t - r_t^f - \pi_t^f + \pi_t^f - \pi_t = r_t - r_t^f \qquad \text{(vi)}$$

Equation (vi) becomes equation 16 in the text if one substitute the target levels of the interest rate and the exchange rate for period t+1 into equation (vi):

$$\Delta e_{at+1}^{target} = r_{at+1}^{target} - r_{t+1}^f \qquad (16)$$

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