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A Monetary Approach to the Analysis of Inflation in Ireland

by

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1. Introduction

The main objective of the Central Bank of Ireland is to maintain low and stable inflation in Ireland. While the desirability of low inflation is rarely subject to dispute, there is less agreement concerning the exact manner in which inflation takes hold and is propagated through the economic system. In Ireland, although there was widespread agreement among economists concerning the inflationary process in the 1970s, when the pound was pegged to sterling, this has been followed by a large degree of uncertainty since Ireland joined the European Monetary System (EMS) in 1979. In the former period it was agreed that Irish inflation was more or less fully determined by external (i.e. UK) price developments, at least in the medium term. Since EMS entry, however, there has been much less consensus on the issue. In particular, there has been widespread disagreement in regard to the influence of foreign as opposed to domestic factors and the role of the exchange rate[1].

In previous papers, Kenny and McGettigan (1996a and 1996b) attempted to provide answers to a number of questions surrounding the determination of Irish prices. The roles of the exchange rate and foreign prices in the inflationary process since joining the EMS were examined, as was the interaction between wages and prices. Furthermore, the aggregate consumer price index was divided into its traded and non-traded components and the different influences on prices in each sector were analysed separately. However, one important issue which was left aside in these previous studies was the role of monetary aggregates in the inflationary process and, accordingly, the present paper concentrates on this topic. It does so by first outlining a simple two sector monetary model of inflation in section 2. This is followed in section 3 by an econometric investigation into the role of a measure of monetary disequilibrium, based upon this model. Finally, section 4 summarises and concludes.

2. A Two Sector Model of Prices with Money

As discussed above, Ireland's participation in the ERM since 1979 has given rise to a good deal of uncertainty in relation to how the domestic rate of inflation is

[1] See the reviews in Kenny and McGettigan (1996a) and Leddin (1995) for separate accounts of the diversity of opinion in regard to the determinants of Irish inflation.

determined. In order to further clarify some of the issues, a simple two sector model of price determination in a small open economy (SOE) is outlined below. The model contains only a single period and hence many of the conclusions reached are short-run in nature. A separate subsection points out the basic predictions of the model under the standard assumption of long-run monetary neutrality. By drawing out the implications of a few basic assumptions, the model highlights the potential role of domestic monetary conditions in an environment where the exchange rate regime falls somewhere in between the two textbook extremes of completely fixed and freely floating[2]. In particular, the model illustrates a) the implications of the distinction between traded and non-traded prices b) the relevance of exchange rate policy in a small open economy and c) the potential for monetary disequilibrium to affect the domestic rate of inflation.

2.1 A Two Sector SOE

Equation (1) below defines the domestic rate of inflation (ΔP) as a weighted average of the rates of inflation in the traded (ΔP^T) and non-traded sectors (ΔP^{NT}) of the economy[3]. The weight λ is assumed to be constant over time and is set equal to the share of traded goods in total expenditure.

$$\Delta P = l \Delta P^T + (1 - l) \Delta P^{NT} \qquad (1)$$

Since all goods are either traded or non-traded, equation (1) holds by definition[4]. To proceed with an analysis of the fundamental determinants of inflation it is necessary to specify how price changes are determined in each of the two sectors. Traded price inflation, as described in equation (2) below, is modelled under the assumption of instantaneous relative purchasing power parity, i.e. it is assumed to be fully

[2] In essence the model used is due to Blejer (1979). Blejer and Leiderman (1981) subsequently employ an extended version of the original Blejer model in order to analyse the behaviour of prices, the exchange rate and the balance of payments under a crawling peg regime.
[3] All variables are in logs and therefore the first difference is equivalent to the proportional rate of change in the variable. For convenience, time subscripts have been omitted.
[4] This abstracts, of course, from the assumption of fixed traded and non-traded weights.

determined by the world rate of inflation (ΔP^W) and the percentage change in the nominal effective exchange rate (Δe) within each period[5]:

$$\Delta P^T = \Delta P^W + \Delta e \tag{2}$$

In contrast to the above, the specification for non-traded inflation (see equation (3) below) allows some deviation - at least in the short-run - from the exchange-rate-adjusted rate of world inflation. Following Blejer and Leiderman (1981), the inflation differential between the traded and non-traded sectors of the economy is assumed to be affected by a measure of imbalance in the money market (Ω). A productivity term, Δq, is also appended in order to take into account the predictions of the Scandinavian approach to inflation[6,7]. Following Blejer and Leiderman, monetary imbalance, Ω, can be represented as the differential between the rate of growth in the domestic component of the nominal money supply (ΔD) and nominal money demand (ΔM^D), i.e. $\Omega = [\Delta D - \Delta M^D]$[8]. This yields the following short-run specification for inflation in the non-traded sector.

$$\Delta P^{NT} = \Delta P^T + q\left[\Omega\right] + \Delta q \tag{3}$$

The equation provides two distinct explanations for a possible differential between the rate of inflation in the traded and non-traded sectors of the economy. The first of these

[5] It should be pointed out that this is a very strong assumption if the period in question is relatively short. As we make use of quarterly data in the empirical section, this point should be borne in mind.
[6] See, for example, Aukrust (1977) and Lindbeck (1979).
[7] Δq is equal to the difference between the rate of productivity growth in the traded sector, Δq^T, and in the non-traded sector, Δq^N.
[8] The monetary disequilibrium or gap is derived in the following way: A basic relationship in the monetary sector is $M^S \equiv R + D$, where R represents the foreign exchange reserves held by the central bank (for simplicity it is assumed that private banks hold no such reserves) and D represents the net domestic assets of the consolidated banking system. Blejer and Leiderman argue that the most appropriate measure of the monetary gap in an open economy concentrates on the domestic component of the money supply, D, and should exclude the endogenous reaction of the foreign component, R. Accordingly, the monetary gap following this approach takes the form $\Delta D - \Delta M^D$.

is associated with monetary imbalance in the economy. Whenever the domestic component of the nominal money supply grows at a rate which is greater than the demand for nominal balances, this has a tendency to push inflation in the non-traded sector above that in the traded sector of the economy[9]. In a small open economy with liberalised capital markets this effect, captured by the parameter θ, would only be expected to persist for a short period of time[10]. Another explanation for a positive differential between non-traded and traded inflation is captured by the productivity term Δq. It is important to note that, in contrast to the monetary approach, this productivity differential effect is generally thought to persist in the long tun. This is due to the well known Balassa-Samuelson mechanism whereby differences in productivity in both sectors give rise to inflation differentials in the presence of similar wage developments throughout the economy. The monetary approach can justly be criticised for ignoring this potentially important influence on inflation[11]. Substituting (2) into (3) and placing the resulting expression into (1) we obtain, after some manipulation, the following equation for aggregate prices:

$$\Delta P = e\left(\Delta P^{W} + \Delta e\right) + (1-e)[\Omega'] + e(1-l)\Delta q \qquad (4)$$

where $\varepsilon = [1+(1-\lambda)\theta]^{-1}$, $\Omega' = [\Delta D - \Delta m^{D}]$ and Δm^{D} is the proportional increase in the *real* demand for money. Equation (4) is the *fundamental structural equation* of this simplified model. From (4) it can be seen that the domestic rate of inflation is related to foreign inflation and the change in the nominal effective exchange rate with a coefficient ε which may differ from unity. As a result, if some goods are non-traded (i.e. $1-\lambda \neq 0$) and non-traded goods are sensitive to monetary disequilibrium ($\theta \neq 0$),

[9] This model employs the assumption of Blejer and Leiderman that flow equilibrium holds ex post in the money market *in each period*. It must be recognised, however, that this may be an overly stringent assumption and that some disequilibrium may remain after a single period.
[10] See section 2.4 for a more complete discussion of this.
[11] For simplicity our model concentrates on the long-run impact of relative productivity differentials on the relative price of non-traded to traded goods, i.e. the internal terms of trade. There are, of course, other possible real factors which could also have such an influence, such as consumer preferences, commodity price shocks, resource discoveries, etc.

the short-run pass-through from a change in the exchange rate or world inflation will not be complete. The second term in (4) captures the short-run impact of monetary disequilibrium (or the monetary gap) on domestic inflation[12]. Again, this depends on i) the share of the non-traded sector in total expenditure ($1-\lambda$) and ii) the sensitivity of non-traded prices to monetary imbalance (θ). It should be stressed that this monetary imbalance term is measured as the proportional change in *nominal* money supply less the proportional change in *real* money demand. This should be contrasted with the differential between the nominal demand and supply of money in equation (3) above. Finally, the equation also illustrates that higher productivity in the traded sector of the economy raises the aggregate rate of inflation and the size of this effect depends on the same two factors described above.

2.2 Endogenous Exchange Rates

Equation (4) does not, however, constitute a reduced form equation which can be estimated. This is because not all the variables on the right hand side of the equation are exogenous. In particular, one would expect that the change in the exchange rate will depend on monetary imbalance in the domestic economy (relative to world inflationary developments). For example, excess money creation would be expected to result in increased purchases of imports and a pick-up in capital outflows. Both of these factors would tend to exert downward pressure on the exchange rate. In this context, the authorities will have to decide the extent to which they are willing to allow monetary imbalance influence the exchange rate (and, therefore, domestic prices). Alternatively, the monetary authority may attempt to maintain the existing exchange rate by changing the foreign component of the monetary base (i.e. by intervening to support the domestic currency using foreign exchange reserves). Such a situation can, of course, only prevail as long as such reserves exist.

[12] It does so by abstracting from the effect of the gap on the nominal exchange rate. Where monetary disequilibria affect the nominal exchange rate they have a long-run influence on the domestic inflation rate, as shall be seen shortly below.

In the Irish case it is clearly evident that the exchange rate is not fixed. Nevertheless, participation in the exchange rate mechanism has required a commitment to maintaining a nominal peg with several of our major trading partners. The Irish exchange rate has thus not been as free to float as it otherwise would have been. In this setting, it would seem appropriate to model the exchange rate as depending on the extent to which policy makers are willing to allow inflationary pressure (i.e. monetary imbalance) to be reflected in the exchange rate (as opposed to a change in the reserves). Equation (6) below posits that the change in the nominal effective exchange rate depends positively on the difference between the monetary imbalance in the economy and the world rate of inflation (ΔP^W):

$$\Delta e = b\left[\Omega' - \Delta P^W\right] \tag{5}$$

where $0 \leq \beta \leq 1$. Under this specification, the exchange rate will tend to depreciate whenever the growth in the monetary gap exceeds the rate of foreign inflation. It is interesting to note that, as long as there is a positive rate of inflation abroad, a stable exchange rate is consistent with monetary disequilibrium. The parameter β is, however, a policy choice variable[13] and the authorities can permit exchange market pressure to be completely reflected in the exchange rate (β =1) or alternatively, maintain a fixed rate (β = 0). Finally, there is the more realistic case in which there is some - though not complete - exchange rate accommodation of exchange market pressure. Substituting (5) into (4) yields a reduced form for aggregate inflation in the domestic economy:

$$\Delta P = j_1 \Delta P^W + j_2\left[\Omega'\right] + e\left(1 - l\right)\Delta q \tag{6}$$

[13] Obviously the authorities must pursue appropriate policies in order to maintain β = 0, and, accordingly, the choice of β cannot be made unconditionally.

where $\varphi_1 = [\varepsilon(1-\beta)]$ and $\varphi_2 = [\varepsilon\beta+(1-\varepsilon)]$. Equation (6) is the *fundamental reduced form* of this simplified model. It describes the short-run behaviour of inflation in a small open economy when the monetary authority allows some exchange rate accommodation of domestic monetary disequilibrium. It can be clearly seen that when the exchange rate is held fixed, i.e. $\beta = 0$, equation (6) reduces to (4) with Δe set equal to zero. In contrast, any positive value for β has the effect of reducing the impact of world inflation on domestic inflation. In the limit, as β approaches unity - where there is complete exchange rate accommodation of monetary imbalance - the domestic economy is completely insulated from the effects of foreign inflation. Furthermore, it can be seen that under these circumstances the coefficient on Ω' collapses to unity and thus, the domestic rate of inflation is completely determined by the excess of the nominal money supply over the real demand for money (abstracting from the productivity effect). From an empirical point of view (6) is also an estimable reduced form since it describes the domestic rate of inflation solely in terms of three exogenous variables. One problem, however, is that the structural parameters of the model (θ, λ, ε, β) are not identified by the estimation of such a reduced form.

2.3 Some Simplifying Assumptions

For analytical and explanatory purposes it is worth pointing out the key characteristics of the model and its reduced form under some simplifying assumptions. It is, in particular, interesting to examine the implied short-run coefficients on the foreign inflation and exchange rate terms. These special cases are outlined under Case 1 to Case 4 below. Under each scenario, the implications for the fundamental structural equation of the model (equation (4)) and the reduced form specification (equation (6)) are outlined clearly and are summarised in Table 1 above. The structural and reduced forms for each case are contained in rows 2 to 5 of the table. These can be contrasted with the general model equations which are presented in the first row.

Table 1: Model specification under alternative assumptions

	Structural Equation	*Reduced Form*
General Model	$\Delta P = e\left(\Delta P^W + \Delta e\right) + (1-e)[\Omega'] + e(1-l)\Delta q$	$\Delta P = j_1 \Delta P^W + j_2[\Omega'] + e(1-l)\Delta q$
Case 1: No Exchange Rate Accommodation, $\beta = 0$	$\Delta P = e\Delta P^W + (1-e)\,\Omega' + e(1-l)\Delta q$	$\Delta P = e\Delta P^W + (1-e)\,\Omega' + e(1-l)\Delta q$
Case 2: No productivity differential, $\Delta q = 0$	$\Delta P = e\left(\Delta P^W + \Delta e\right) + (1-e)\Omega'$	$\Delta P = j_1 \Delta P^W + j_2 \Omega'$
Case 3: No effect of monetary imbalance on ΔP^N, $\theta=0$	$\Delta P = \Delta P^W + \Delta e + (1-l)\Delta q$	$\Delta P = (1-b)\Delta P^W + b\Omega' + (1-l)\Delta q$
Case 4: All goods are traded, $\lambda = 1$.	$\Delta P = \Delta P^W + \Delta e$	$\Delta P = (1-b)\Delta P^W + b\Omega'$

Case 1: No exchange rate accommodation

When we assume the monetary authority permits no feed through from domestic monetary imbalance into the exchange rate it implies a value of zero for the policy choice parameter ($\beta = 0$) or, equivalently, completely fixed exchange rates (i.e. $\Delta e=0$). Under this scenario, monetary equilibrium is restored via a change in the reserves and the structural equation takes a more simplified form. Interestingly, in this case the simplified version of (4) is an estimable reduced form which describes prices in terms of exogenous variables only. It provides a rationalisation for deviations in the rate of inflation in a small open economy from the world rate of inflation even under a fixed exchange rate. As captured by the parameter ε, fixed exchange rates do not by themselves imply full short-run pass-through from foreign inflation into domestic inflation. This is the same as the degree of short-run pass-through implied by the general model. Accordingly, in this case, the extent of pass-through is determined by

the components of ε, which comprise the share of non-traded goods in total expenditure and the sensitivity of non-traded inflation to monetary imbalance.

Case 2: No differential productivity growth

Similarly, in case 2, coefficients of unity are not expected on the foreign inflation and exchange rate terms in the structural equation of the model and this is also due to the presence of non-traded goods. Accordingly, once more, the extent of short-run pass-through will depend on the weight of non-traded goods in total expenditure and the sensitivity of non-traded inflation to monetary disequilibrium. The interpretation of the reduced form equation is similar to the discussion in section 2.2 except the productivity differential term drops out.

Case 3: No effect of monetary imbalance on non-traded inflation

If the price of all non-traded goods (relative to the price of traded goods) is independent of monetary conditions, θ is equal to zero in equation (3) and hence ε takes on a value of unity. In the context of the model, from (4), it can be seen that this implies complete pass-through from changes in the exchange rate or world traded prices *within each period*. There is, however, an additional effect of differential productivity growth on the domestic rate of inflation and, hence, full PPP does not necessarily hold[14]. Moreover, under the reduced form equation of the model, the domestic rate of inflation depends on the world rate of inflation and monetary disequilibrium with coefficients of (1-β) and β respectively. Interestingly, therefore, the above model does not predict a coefficient of unity on the foreign price variable in econometric estimates of the above reduced form. The overall impact of foreign prices will be determined by the policy choice parameter β which measures the extent to which the monetary authority is willing to permit monetary imbalance to affect the

[14] ΔP^W, strictly speaking, represents foreign *traded* price inflation, rather than overall foreign inflation. There will, of course, be Balassa-Samuelson-type effects in operation in foreign countries also, thus driving a wedge between foreign traded and non-traded price increases. If such productivity effects are the same, both domestically and abroad, PPP will then hold. Conversely, if the Balassa-Samuelson effect differs between countries, PPP will not hold, even in the long run.

exchange rate. An independent or flexible exchange rate policy (a high value for β) will imply a low estimate of the foreign price coefficient[15].

Case 4: All goods are traded

Under the extreme assumption that all goods are traded, it can be seen that both λ and, hence, ε equal unity. As in Case 3 above, this implies complete pass-through from changes in the exchange rate or world traded prices *within each period*. Under the reduced form equation of the model, the domestic rate of inflation depends once more on the world rate of inflation and monetary disequilibrium with coefficients of $(1-\beta)$ and β respectively. Since all goods are traded, there is no productivity effect on domestic inflation.

2.4 Some Long-Run Predictions

Under reasonably realistic assumptions, less than full pass-through from foreign inflation and the exchange rate emerged as a distinct feature of both the structural and reduced form specifications of the above model[16]. The model, however, contains only a single period and has no dynamics. As a result, it has been noted that the conclusion of incomplete pass-through is only short-run in nature. It is interesting to ask whether the incomplete pass-through property is likely to remain in the long run. Below, it is argued that if monetary neutrality is accepted as a valid long-run hypothesis, the model should reduce in a manner similar to case 3 above. Hence, one would expect complete pass-through from foreign inflation and the exchange rate under the reasonable assumption that money is neutral in the long run.[17]

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[15] Even though foreign inflation, ΔP^W, does not have a coefficient of unity in the reduced form equation, this does *not* mean that full purchasing power parity (PPP) does not hold. The reduced form equation merely states that domestic inflation will not be equal to foreign inflation as long as there is some independence in exchange rate policy. Abstracting from such exchange rate effects, foreign prices will feed through *fully* to domestic prices, as the structural equation informs us.

[16] Case 3 and 4 imply complete pass-through from both the exchange rate and foreign prices in the structural equation but the assumptions underlying these special cases are not realistic.

[17] Broadly speaking monetary neutrality refers to the idea that a change in a monetary variable has no permanent effect on real variables. In the particular case of the model under consideration, it can be remarked that the price of non-traded goods relative to traded goods is a "real" price.

Under the general model, i.e. equation (4), the pass-through coefficient emerged as ε. Recall that ε is defined as $[1+(1-\lambda)\theta]^{-1}$ and that θ represents the effect of monetary disequilibrium on the difference between the non-traded and traded inflation rates, i.e. the change in the internal terms of trade. Consider, what would happen as a result of an increase in the internal terms of trade resulting from an ex ante monetary shock. Under such circumstances, there are several self-equilibrating mechanisms at work in

the economy which would, over time, bring the relative price of non-traded goods back toward its pre-shock level. As a particular example, the increase in the internal terms of trade should induce substitution away from non-traded goods in consumption and towards non-traded goods in production. Both of these effects would tend to drive the price of non-traded goods back into equilibrium with that of traded goods (see, for example, Dornbusch, 1980). In other words, an overvalued real exchange rate should result in automatic equilibrating responses in the medium to long run. Accordingly, it would seem reasonable to set θ equal to zero as the long-run condition of the model. As a result, ε reverts to unity, and the property of full pass-through emerges. It can be seen from the structural equation that a value of unity for ε implies that Irish inflation is determined solely by foreign traded inflation, the exchange rate and the productivity term[18]. In order for domestic monetary policy to have a long-run effect on domestic inflation there must, therefore, be a corresponding accommodation of the exchange rate.

3. Empirical Evidence

In order to examine the extent to which monetary disequilibrium has impacted on Irish inflation, this section tests the above model using Irish data over the period 1979:1 - 1996:3. Before presenting the econometric results for both aggregate and traded/non-traded price systems, however, we briefly describe below the economic rationale behind the empirical measure of monetary disequilibrium which we employ.

[18] A more restricted definition of the long-run might also set the productivity differential term to zero. The Scandinavian model, however, argues that such differential rates of productivity growth are likely to persist even in the long-run.

3.1 Measuring Excess Money

Strictly speaking ex ante excess money should be assessed relative to an underlying measure of money demand. This approach requires the estimation of a stable money demand function. Using the Johansen technique we attempted to estimate a stable money demand function for Ireland over the 1979:1 to 1996:3 period. Unsurprisingly, given the radical changes which have occurred in the financial environment - in particular since the late 1980s - no such stable money demand function could be uncovered[19].

One approach to overcoming the problems associated with this widely-observed instability in estimated money demand functions is simply to assume that within each period, the proportional change in the money supply (i.e. ΔM3) equates exactly with the proportional change in money demand. In other words, by the end of each period economic agents are able to rid themselves of any excess nominal balances that they are holding. Such a *flow equilibrium* assumption allows us to bypass the issue of estimating a money demand function. In a small open economy, where the domestic money supply is very much endogenous, this assumption is not entirely unjustifiable. An empirical counterpart to the theoretical concept of an ex ante monetary gap can then be formulated as follows:

$$\Omega' = [\Delta D - (\Delta M3 - \Delta P)]$$

where ΔM3 and ΔP refer to the proportional growth rates of the broad money stock (used to proxy money demand) and the domestic consumer price level respectively. ΔD, which measures the proportional change in the domestic component of the money supply, includes both bank lending to the private sector as well as monetary financing of the Exchequer[20]. This measure of the ex ante gap (G), together with the quarterly

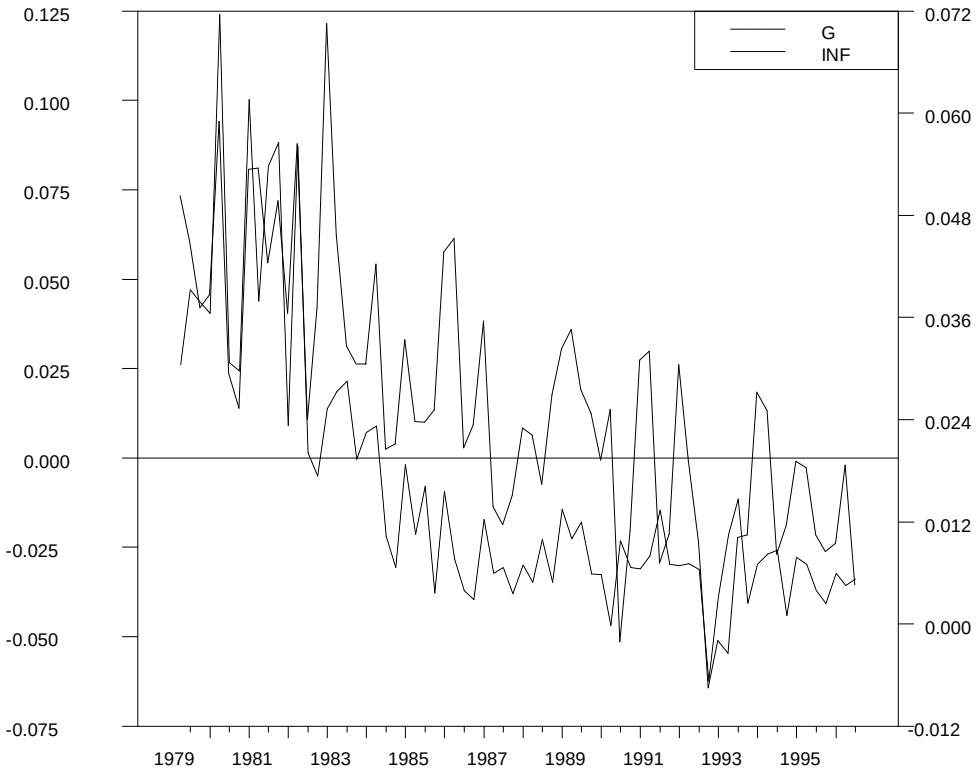
[19] While this finding is certainly a set back to the monetary approach, it must be pointed out that it is not the last word and there have been some other more sucessfult attempts to model a stable money demand function for Ireland, e.g. Browne (1985). Our analysis, like previous studies, was particularly hampered by the lack of any suitable quarterly measure of output. Should such a measure become available, attempts to construct a quarterly money demand model for Ireland may prove to be more successful.

[20] A complete desciption of the components of D, together with a description of the other data employed in the study, is given in Appendix 1.

change in the consumer price level (INF) , is graphed in Figure 1. From the graph, it is quite clear that there are two distinct monetary "regimes" over the period since Ireland joined the EMS. In the earlier half of the sample, between 1979:1 and 1986:1, the growth in ex ante money creation persistently exceeded the growth in the demand for money (as proxied by the growth in real money balances). As discussed in Kenny

Figure 1

Ex Ante Monetary Gap and Inflation: Ireland 1979:1 - 1996:3



and McGettigan (1996), this corresponds to a period in which Irish inflation (right hand side axis) was significantly higher than that in our main trading partners. In the second half of the sample, from 1986:1 to 1996:3, the inflation rate has been much lower and the ex ante monetary gap - while displaying significant short-term fluctuations - has been much closer to zero on average.

3.2 Aggregate Prices

Below we present the parameter estimates of the reduced form equation for aggregate prices (equation (6) in section 2). In order to allow for some time lags in the pass-through from foreign inflation into domestic inflation a distributed lag specification for the foreign price regressor is employed. In addition, given the lack of a reliable empirical measure of productivity growth in Ireland, the impact of differential productivity growth between the traded and non-traded sectors is subsumed into the constant term. In the estimates reported below, only the contemporaneous measure of the monetary gap term is included in the reduced form regression. This is because, it is not clear what interpretation could be put on lagged values of an *ex ante* measure of monetary disequilibrium[21].

The estimated reduced form parameter values are given in the first row of Table 2 below. Interestingly, the coefficient on the monetary gap is positive and highly statistically significant. This suggests that *on average* over the period being considered excess money creation has indeed contributed to a significant positive differential between Irish and foreign inflation. As noted in the previous discussion of the reduced form parameters, however, this effect combines a host of different structural channels. These include a weakening of the exchange rate and/also possible

Table 2

Reduced Form Parameter Estimates: $\Delta P_t = j_0 + \sum_{i=1}^{4} j_i \Delta P_{t-i}^{W} + j_5 [\Omega']_t$

	φ_o	φ_1	φ_2	φ_3	φ_4	φ_5	DW	Adj. R^2
ΔP_t	0.020	0.866	-0.110	0.488	-0.137	0.172	1.65	0.75
	(1.82)	(4.93)	(-0.59)	(2.70)	(-0.75)	(5.10)		

[21] When lagged values of the gap were included in the regression they were, in general, found to be not significantly different from zero. To some extent, this finding is consistent with the assumption of flow equilibrium under a fixed exchange rate regime where the ex ante monetary pressure is completely dissipated ex post due to the endogenous reaction of the foreign component of the money stock (i.e. reserves). Of course, when the exchange rate is not completely fixed, ex post monetary equilibrium may be restored via concomitant movements in the exchange rate and the domestic price level. In a pegged exchange rate regime like the EMS, the restoration of monetary equilibrium is likely to have occured via a mixture of both the above channels.

short-term increases in the relative price of non-traded goods[22]. It is noteworthy that the size of the response of inflation to the monetary gap is significantly greater than previous estimates have suggested. O'Connell and Frain (1989), found only a weak effect (the coefficient estimates were between 0.07 and 0.05).[23] It is also interesting to note that - as was hypothesised in the discussion of the long-run predictions of the model in section 2.4 - the sum of the coefficients on the foreign price term in the estimated reduced form is close to unity (1.107). Not all of the lagged terms are, however, significantly different from zero. The fact that they sum approximately to unity is suggestive of full pass-through from foreign prices into Irish prices *on average*. However, it is difficult to rationalise why a negative (although insignificant) relationship appears at lags two and four.

Given the way in which the theoretical model was formulated in section 2, the estimation thus far has employed equations in which all of the variables have been differenced once. It is also interesting, however, to proceed beyond the terms of the original model and assess whether the incorporation of long-run cointegrating relationships would be fruitful. Kenny and McGettigan (1996b) - in a recent study of Irish inflation - argued that the full long-run effect of foreign prices on Irish prices is best assessed using such a cointegration framework. The authors present evidence that there exists i) a stationary PPP relationship and ii) a trend stationary real wage relationship in Ireland. These are represented as ECM1 and ECM2 below:

ECM1: $\mathbf{P + e - P^W}$

ECM2 $\mathbf{W - P - 0.005t}$

[22] The next section, which estimates separate equations for both traded and non-traded inflation, explicitly tests for the effect which occurs via the relative price of non-traded goods.
[23] A possible explanation behind this is that their equation included the exchange rate channel explicitly. As such, their equation does not represent a reduced form.

In their study, the authors show that domestic inflation, domestic wages and the exchange rate all adjusts in a manner which ensures that both of these relationships are restored gradually over time. For example, when the real exchange rate is overvalued (i.e when domestic prices are above their stable equilibrium with foreign prices and the exchange rate), there is a tendency for prices to adjust downwards. The second long-run relationship is also shown to explain the variation in Irish inflation. The authors show that excessive growth in real wages can give rise to upward pressure on inflation and, hence, downward pressure on the exchange rate. It is interesting to examine whether or not the monetary gap, as measured here, contributes anything over and above these long-run relations in explaining Irish inflation.

Table 3

Reduced Form Parameter Estimates: ECM Specification

	φ_o	φ_1	φ_2	φ_3	φ_4	φ_5	$ECM1_{t-1}$	$ECM2_{t-1}$	DW	Adj. R^2
ΔP_t	0.010 (4.67)	0.620 (3.86)	-0.340 (-1.99)	0.337 (2.12)	-0.077 (-0.48)	0.075 (2.04)	-0.066 (-3.08)	0.075 (2.58)	1.85	0.82

Table 3 accordingly examines whether or not the monetary gap retains any explanatory power in a reduced form equation which includes both of the above error correction terms as explanatory variables[24]. In essence this can be viewed as testing the hypothesis that the monetary gap has incremental information over and above the analysis of inflation in Kenny and McGettigan (1996). As expected, both ECMs enter significantly into the equation for consumer price inflation. Most importantly, the negative adjustment to the strict PPP relationship (ECM1) implies a complete one-for-one response of the domestic price level to a permanent change in the exchange rate. The positive sign on ECM2 confirms the inflationary consequences of excessive wage growth[25]. Interestingly, the inclusion of both ECMs also leads to a moderate increase

[24] In estimating the equations, in order to preserve the interpretation on the constant term, each of the error correction terms were centered about a mean of zero.

[25] The implied speed of adjustment is almost identical to that in Kenny and McGettigan (1996) who provide a full discussion and graphical analysis of the dynamics associated with these adjustment coefficients.

in the measure of goodness of fit and an improvement in the DW statistic. Furthermore, the estimated coefficient on the monetary gap term remains significant in the equation. This suggest that on average there has been incremental explanatory power in the measure of excess money over and above the PPP and real wage equilibria. However, the size of the effect is significantly reduced.

3.3 Traded-Non Traded Prices

The estimation of the reduced form equation confirms the impact of monetary disequilibrium on Irish inflation over the sample period. As was emphasised in the discussion, however, this effect possibly includes a short-term impact on the rate of inflation in the non-traded sector relative to that in the traded sector - as implied by equation (3) in section 2. In order to examine this hypothesis, dynamic versions of equations (2) and (3) can be estimated using the Zellner's (1962) seemingly unrelated regressions (SUR) systems estimation technique. The estimated equation for traded prices includes only lagged foreign inflation and lagged changes in the nominal effective exchange rate. In contrast, non-traded inflation is related to traded inflation and the monetary gap measure. This results in the two equation system for traded and non-traded inflation given below:

Traded Prices: $$\Delta P^T = b_0 + \sum_{i=1}^{4} b_i \, \Delta P^W_{t-i} + \sum_{i=1}^{4} l_i \, \Delta e_{t-i}$$

Non-Traded Prices: $$\Delta P^{NT} = a_0 + \sum_{i=1}^{4} a_i \, \Delta P^T_{t-i} + q \, \Omega_t$$

The estimated parameters are given in Table 4 below. In the equation for traded price inflation both the lagged exchange rate and foreign price terms accord well with economic intuition. Consistent with the small open economy price-taking hypothesis., there is a strong and highly significant effect of last period's foreign inflation on inflation in the traded sector in Ireland. In addition, there is a net negative impact of lagged changes in the nominal effective exchange rate, i.e. an appreciation of the

exchange rate exerts disinflationary pressure on prices. This effect is, however, much weaker than the impact of lagged changes in foreign prices and contrasts with the full short-run pass-through hypothesised in the original model. Such short-run asymmetries are, however, consistent with previous findings (e.g. Callan and Fitzgerald,1989). They can be rationalised insofar as exchange rate changes which are not perceived as being permanent may not be reflected in prices. Such findings, however, do not undermine the validity of purchasing power parity as a long-run hypothesis (see the analysis of the ECM specification below).

Table 4

Systems Estimates: Traded and Non-Traded Inflation

	β_o	β_1	β_2	β_3	β_4	λ_1	λ_2	λ_3	λ_4	DW	Adj. R^2
ΔP_t^T	0.001	0.856	-0.294	0.298	0.403	-0.240	0.021	-0.138	-0.036	1.94	0.64
	(0.87)	(3.76)	(-1.22)	(1.25)	(1.90)	(-3.41)	(0.29)	(-1.92)	(-0.53)		

	α_o	α_1	α_2	α_3	α_4	θ	-	-	-	DW	Adj. R^2
ΔP_t^N	0.003	0.295	0.244	0.266	0.020	0.038	-	-	-	1.31	0.70
	(2.33)	(3.50)	(3.30)	(3.08)	(0.32)	(1.04)					

The second equation underlines the strong influence of foreign prices and the exchange rate, acting via the traded sector, on non-traded inflation. The coefficients on the lagged terms for traded inflation are highly significant and sum to approximately 0.80. The intercept term is also significant, however, confirming the wedge between traded and non-traded inflation which probably arises from the large productivity differentials which have existed between the two sectors. Lastly, the response of prices in the non-traded sector to the measure of monetary disequilibrium is, although correctly signed, very weak and not significantly different from zero. This contradicts the predictions of Blejer (1979) that ex ante monetary pressure can *directly* gives rise to a temporary increase in the internal terms of trade.

The impact of monetary disequilibrium on the internal terms of traded may, however, have occurred *indirectly* via the labour market. Excess money creation may have

created an environment in which workers achieved unrealistic and uncompetitive wage increases. This may in turn have given rise to a positive differential between the rates of inflation in the traded and non-traded sectors of the economy. In order to examine the impact of excessive wage pressure, an error correction specification which includes the equilibrium real wage relationship (ECM2) can be estimated. The adjustment of traded prices to the strict purchasing power parity relationship (ECM3) identified in Kenny and McGettigan (1996) is also examined[26]. The estimated system of equations is reported in Table 5 below. As in the previous ECM specification of the aggregate price reduced form, the inclusion of the error correction terms results in a moderate increase in the explanatory power of the regressions. Confining our commentary to the estimated adjustment coefficients (the lagged first difference terms are virtually unchanged), it can be seen that the adjustment of traded price inflation is such that both the PPP and the real wage equilibrium are restored. It is also interesting to note that, in the equation for non-traded inflation, the impact of excessive wage pressure completely dominates the monetary gap measure in terms of significance and explanatory power.

Table 5

Systems Estimates: Traded and Non-Traded Inflation - ECM Specification

	β_o	β_1	β_2	β_3	β_4	λ_1	λ_2	λ_3	λ_4	$ECM3_{t-1}$	$ECM2_{t-1}$	DW	Adj. R^2
ΔP_t^T	0.011 (4.41)	0.670 (3.39)	-0.45 (-2.21)	0.113 (0.55)	0.104 (0.54)	-0.117 (-1.79)	0.099 (1.55)	-0.06 (-1.0)	-.005 (-.08)	-0.101 (-3.37)	0.092 (2.78)	2.03	0.74

	α_o	α_1	α_2	α_3	α_4	θ	-	-	-	$ECM2_{t-1}$	DW	Adj. R^2
ΔP_t^N	0.005 (3.99)	0.199 (2.51)	0.200 (2.97)	0.249 (3.20)	0.087 (1.13)	0.009 (0.27)	-	-	-	0.121 (4.17)	1.34	0.75

[26] ECM3 is given by $[P^T+E-P^W]$.

3.4 Sub-Sample Regressions

As noted in the introduction to this section, a glance at the data in Figure 1 suggests that there have been two distinct monetary regimes over the period 1979 - 1996. In the earlier half of the sample, ex ante money creation persistently exceeded the growth in demand for real money balances whereas excess money has been much closer to zero (on average) in the more past. The macroeconomic equations which have been estimated above do indicate that excess money creation generated an increase in Irish inflation over and above that in our main trading partners. However, given that these results represent average effects over the entire sample period, it is interesting to examine the same regressions over the two sub-samples 1979:1-1986:4 and 1986:4-1996:3. This allows us assess the possibility that the impact of excess money was stronger during the earlier period[27].

The results from these sub-sample estimates, which are reported in Table 6 below, support the contention that monetary disequilibrium had a much stronger effect on Irish inflation during the early years of Ireland's participation in the EMS. In the reduced form equation for aggregate prices the estimated coefficient on the monetary gap term rises significantly to 0.29 with a t-statistic of 3.61 when it is estimated over the period 1979:1 - 1986:4. In addition, when the PPP and real wage relationships are incorporated into the equation, the monetary disequilibrium term tends to dominate. This may not be surprising, however, given the relatively slow adjustment to each equilibrium and the brevity of the time period under consideration. In contrast, when the reduced form is estimated over the 1986:4 - 1996:3 sample period, the coefficient on the monetary gap term is reduced substantially. Somewhat surprisingly (given the short sample periods), there is also evidence of significant adjustment to PPP. The impact of excessive wage pressure is, however, much stronger in the earlier period.

[27] There are good reasons to expect that the reduced form parameters will be unstable over time. In particular, as discussed in Cecchetti (1995), if monetary policy makers alter the weight which they attach to various inflation indicators then this will fundamentally effect the estimated reduced form parameters.

Table 6

Aggregate Price Reduced Form Estimates: 1979:1 - 1986:4

	φ_o	φ_1	φ_2	φ_3	φ_4	φ_5	$ECM1_{t-1}$	$ECM2_{t-1}$	DW	Adj. R^2
ΔP_t	0.000	0.792	0.028	0.621	-0.415	0.286	-	-	2.08	0.75
	(0.22)	(3.01)	(0.10)	(2.45)	(-1.44)	(3.61)				
ΔP_t	0.006	0.256	-0.170	0.343	-0.441	0.252	-0.115	0.101	2.06	0.82
	(1.65)	(0.74)	(-0.65)	(1.39)	(-1.79)	(3.65)	(-1.51)	(2.10)		

Aggregate Price Reduced Form Estimates: 1986:4 - 1996:3

	φ_o	φ_1	φ_2	φ_3	φ_4	φ_5	$ECM1_{t-1}$	$ECM2_{t-1}$	DW	Adj. R^2
ΔP_t	0.005	0.510	-0.239	-0.100	0.005	0.043	-	-	2.13	0.20
	(6.15)	(3.13)	(-1.44)	(-0.60)	(0.03)	(1.95)				
ΔP_t	0.010	0.417	-0.265	-0.063	0.130	0.003	-0.059	0.0236	2.29	0.28
	(4.45)	(2.62)	(-1.66)	(-0.40)	(0.85)	(0.11)	(-1.94)	(0.935)		

Sub-sample estimates (not reported) for the traded/non-traded price systems were also undertaken[28]. In general, the results again support the belief that monetary disequilibrium had a much stronger impact on Irish inflation between 1979 and 1986.

4. Conclusions

In order to enhance our understanding of the determinants of Irish inflation, this paper builds on previous work by Kenny and McGettigan (1996a and 1996b) by focusing on monetary aspects of the price determination process. In section 2, drawing on previous work by Blejer (1979) and Blejer and Leiderman (1981), we develop a simple two-sector model of prices with money. This model emphasised two possible channels through which monetary disequilibrium can impact on Irish prices. Firstly, the model implies a long-run effect whereby excess money creation in Ireland is reflected in the exchange rate and, hence, gives rise to persistent deviations between Irish and foreign inflation. In addition, the model predicts that monetary disequilibrium may also have a transitory positive impact on Irish inflation by raising the rate of inflation in the non-traded sector relative to that in the traded sector of the economy. Aside from these

[28] Coefficient estimates are available from the authors upon request.

monetary effects, the theory also predicts that real factors such as differential rates of productivity growth in the traded and non-traded sectors of the economy, can lead to persistent deviations in the rate of inflation in Ireland from that in our main trading partners.

Section 3 of the paper attempted to assess the empirical predictions of this model. Firstly, we presented estimates of a reduced form aggregate price equation which supports the proposition that on average over the period 1979 - 1996 monetary disequilibrium did feed through positively into the rate of consumer price inflation in Ireland. The estimated reduced form parameters suggest that this purely monetary effect resulted in a rate of inflation in Ireland significantly higher than it otherwise would have been. Furthermore, monetary disequilibrium retains its significance even when error correction mechanisms for purchasing power parity and the real wage are incorporated into the reduced form regression. Not surprisingly, however, the size of the effect is substantially reduced.

There is however, no reason to expect that such reduced form parameters will be constant over time. Indeed, a casual glance at the data reveals that there have been two distinct monetary regimes since 1979. In order to examine this hypothesis more clearly, the aggregate price equation was estimated over the two sub-sample 1979:1 - 1986:4 and 1986:4 - 1996:3. The results of these separate regressions confirm the prior belief that monetary disequilibrium was feeding through positively to Irish inflation to a much greater extent during the early years of our EMS membership. During the more recent past, the effect of monetary disequilibrium has been much more subdued. Indeed, when past deviations from purchasing power parity and a real wage relation are included as error correction terms, the effect of monetary disequilibrium is completely negligible in the latter period while remaining highly significant in the first period. This finding is consistent with the view that - in assessing the amount of inflationary pressure in the economy - there may currently be little or no incremental information in monetary aggregates over and above the change in the nominal effective exchange rate.

The empirical section also investigated the evidence relating to a short-term impact of monetary disequilibrium on the relative price of non-traded goods. In order to do this we estimated a two equation system for the rate of inflation in the traded and non-traded sectors of the economy. The results confirmed the strong and direct impact of changes in the exchange rate and world traded prices on the rate of inflation in the traded sector of the Irish economy. In addition, inflation in the non-traded sector was shown to be exposed to international influences via the traded sector. Somewhat surprisingly, however, the results did not support the contention that monetary disequlibrium *directly* gave rise to higher inflation in the non-traded sector. This may have occurred indirectly, however, via the labour market whereby monetary disequilibrium resulted in excessive growth in the real wage which then gave rise to higher inflation in the non-traded sector.

References

Aukrust, D. (1977): "Inflation in the open economy: A Norwegian model" in L. B. Krause and W. S. Salant (eds.), Worldwide Inflation , (Washington D.C.: Brookings Institution).

Blejer, M.I. (1979): "On causality and the monetary approach to the balance of payments: The European experience", *European Economic Review*, Vol. 12, pp. 289-296, July.

Blejer, M.I. and L. Leiderman (1981): "A monetary approach to the crawling-peg system: Theory and evidence", *Journal of Political Economy*, Vol. 89, No. 1, pp. 132-151, February.

Browne, F. X. (1985): "Multilatteral Currency Substitution and Capital Flows as Sources of Instability in the SOE Money Demand Function - A Case Study", Central Bank of Ireland, Technical Paper 2/RT/85, February.

Cecchetti, S. G. (1995): "Inflation indicators and inflation Policy", NBER *Macroeconomics Annual* 1995, The MIT Press, Cambridge, MA, pp. 189 - 219.

Callan T. and J. FitzGerald (1989): "Price determination in Ireland: Effects of changes in exchange rates and exchange rate regimes", *The Economic and Social Review*, Vol. 20, No. 2, pp. 165-188, January.

Dornbusch, R. (1980): Open Economy Macroeconomics, (New York: Basic Books).

Kenny, G. and D. McGettigan (1996a): "Non-traded, traded and aggregate inflation in Ireland", Central Bank of Ireland Technical Paper 3/RT/96, June.

Kenny, G. and D. McGettigan (1996b): "Non-Traded, Traded and aggregate inflation in Ireland: Further Evidence", Central Bank of Ireland, Technical Paper 5/RT/96, December.

Leddin A. (1995): "The causes of Irish inflation: A survey", Paper presented to the Irish Economic Association, Ninth Annual Conference.

Lindbeck, A. (1979): "Imported and structural inflation and aggregate demand: The Scandinavian model reconstructed", in A. Lindbeck (ed.), Inflation and Employment in Open Economies - Studies in International Economics, Volume 5., pp. 13-40, (Amsterdam: North-Holland).

O'Connell, T. and J. Frain (1989): "Inflation and exchange rates: A further empirical analysis", Central Bank of Ireland Technical Paper 1/RT/89, April.

Zellner, A. (1962): "An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias", *Journal of the American Statistical Association*, Vol. 57, pp. 348-368.

Appendix 1: Data Description and Sources

Description of Data:

Aggregate Prices: Underlying Consumer Price Index, i.e. headline CPI net of the impact of the mortgage interest component. The relevant weights, the headline CPI and the Mortgage Interest component were obtained from the CSO.

Traded Prices: See **Construction of Disaggregated Price Indices** below.

Non-Traded Prices: See **Construction of Disaggregate Price Indices** below.

Construction of Disaggregated Price Indices:
The data series employed in the construction of the traded/non-traded price series were obtained from the CSO.

The construction of separate indices for traded and non-traded prices reflects economic intuition concerning certain goods (e.g. highly perishable commodities and some "public goods") which may fall into the non-traded category. Equally, it takes account of some items which are classified under Services but which could reasonably be deemed to be traded (e.g. Expenditure Abroad). The series were built up from individual sub-indices of the CPI. The classification of these sub-indices in terms of the traded and non-traded categories is outlined in the Table below. The Table also provides the relevant weights for traded and non-traded sectors based on their shares in the underlying consumer price series. In the actual aggregation of individual sub-indices into traded and non-traded components, the weights were allowed to vary according to the changes introduces by the CSO in 1975, 1982 and 1989. For example, the weight attributed to the non-traded sector rose steadily over the sample period from 27.8% in 1975 to 29.6% in 1982 and to 33.6% in 1989. In part, this reflects the growing weight attached to non-traded services and non- traded transportation goods and services. To avoid the problem of compounding a base effect with a significant change in the weight, the individual sub-indices were broken down into the three sub-periods, i.e. 1975:Q4 - 1982:Q4, 1982:Q4 - 1989:Q4 and 1989:Q4 - 1996:Q3. Each series was then rebased to equal a 100 at the beginning of each sub-period and the appropriate weights were applied to each series. Whole sample traded and non-traded price series could then be calculated by linking the weighted series for each sub-period. Lastly, the resulting traded and non-traded price indices were then rebased to equal 100 in 1989 Q4.

Disaggregated Price Series	Weight(%)		
	1975	1982	1989
Non-Traded Prices			
- Non-Traded Food (Bread, Fresh Milk, Eggs, Meals Out)	7.9	6.8	7.9
- Fuel and Light	6.0	6.3	6.1
- Housing net of Local Authority Charges, Mortgage Interest, Repairs and Decorations	1.7	1.5	2.2
- Non-Traded Transport (Motor Tax and Registration, Motor Insurance, Repairs and Maintenance, Other Vehicle Costs, Bus Fares, Train Fares, Other Travel)	4.0	4.7	4.7
- Services net of the Expenditure Abroad	8.1	10.3	12.7
	27.8%	29.6%	33.6%
Traded Prices			
- Food net of Bread, Fresh Milk, Eggs, Meals Out	23.1	18.8	18.8
- Alcoholic Drink	11.7	12.6	12.2
- Tobacco	4.5	3.5	3.5
- Clothing and Footwear	11.0	8.3	7.0
- Repairs and Decorations	2.0	1.7	1.5
- Household Durables	4.9	5.2	4.9
- Other Goods	5.3	5.8	6.1
- Traded Transport(Motor Cycles, Motor Cars, Other Vehicles, Motor Fuel, Motor Oil, Spare Parts)	9.5	12.4	9.6
- Expenditure Abroad	0.03	2.00	3.0
	72.2%	70.4%	66.4%

World Traded Prices: Computed as the weighted average of the UK and German Wholesale Prices. Source: IFS databank. In aggregating the two series, the UK WPI received a weight equivalent to the share of the UK in Irish trade and the German WPI received a weight equal to one minus the UK share. The share of the UK in Irish trade was obtained from the CSO trade statistics.

Exchange Rate: The nominal Effective Exchange Rate Index. Source: Central Bank of Ireland.

Domestic Credit Creation:

Blejer and Leiderman (1981) make use of the money multiplier and the narrow concept of the monetary base when calculating their measure of the monetary gap. This follows naturally from their definition of the money supply where $M_s \equiv a(R + D)$, where M_s is the money supply, a is the money multiplier, R is foreign exchange reserves held by the central bank and D is the domestic credit component of the monetary base.

In our approach we do not make use of the concept of the money multiplier. As a result we employ a broader concept of domestic credit expansion which derives from the banking system's consolidated balance sheet. Domestic credit expansion comprises the increase in bank lending to the private sector plus monetary financing of the exchequer. This latter term is made up of the change in banks' (including Central Bank) lending to the government and government external borrowing.

More precisely, domestic credit expansion is made up of the following components:

(1) Banks' lending to the non-government sector. Our measure does not include other credit institutions' private sector credit, given that this has only been incorporated into the consolidated balance sheet since Autumn 1994. Source: Central Bank Quarterly Bulletin: Table C2 (i.e. banks' consolidated balance sheet)/Table A2.

(2) Banks' lending to the exchequer. Our measure does not include banks' "revolving credit facilities" and "other foreign currency" lending. These are, however, included in the government credit figures in the consolidated balance sheet. Source: As above.

(3) Net direct external government borrowing. The initial government stock of foreign borrowing in 1979 was obtained from the Central Bank Quarterly Bulletin, Quarter 1 1979 and an allowance was made for the interest component which does not contribute to domestic liquidity. Annual government borrowing from 1979 until 1982 was obtained from various editions of the Bulletin and was linearly interpolated to obtain quarterly figures. Thereafter quarterly government borrowing figures were taken from Table A2 of the Bulletin. Note that the figures are reported in cumulative form up to December of each year.

(4) Non-resident uptake of government securities. The initial stock figure for Q1 1982 was obtained from internal Bank records. The flow figures prior to this date were obtained from various editions of the Bulletin and brought back to 1979 in order to obtain an initial stock figure. These were also in annual form and were linearly interpolated to obtain quarterly figures. From 1982 onwards the figures were obtained from Table A2 of the Bulletin. Note that these are also reported in cumulative form up until December of each year.

(5) Central Bank lending to the exchequer. Source: Tables C2 and A2 of the Bulletin.

(6) Change in government deposits at the central bank. Source: Tables C2 and A2 of the Bulletin. An increase in government deposits is regarded as a withdrawal of liquidity, while a reduction in such deposits is treated as an addition to liquidity.