

Portfolio Equilibrium and Monetary Policy in Ireland

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Abstract: The introduction of exchange controls in 1978 and the exchange rate uncertainty associated with Ireland's entry into the European Monetary System (EMS) in 1979 gave rise to the possibility of a reduction in the degree of capital mobility between Irish and foreign financial markets and as a consequence a greater autonomy in the conduct of Irish monetary policy. The purpose of this paper is to evaluate Irish monetary policy in terms of a pre- and post-EMS entry framework by estimating an adaptation of Kouri and Porter's (1974) portfolio balance model of an open economy. The principal finding is that the Central Bank has engaged in sterilisation policies since EMS entry but that this policy would prove ineffective if pursued for any indefinite period of time.

I INTRODUCTION

The decision by Ireland to join the European Monetary System (EMS) in 1979 and the non-participation by Britain, led to the termination of the 153 year old, no margins, one for one exchange rate with sterling. This change in the exchange rate regime combined with the almost simultaneous introduction of exchange controls gave rise to the possibility of a degree of autonomy in the conduct of Irish monetary policy. A prerequisite for this was that the new monetary environment should lead to imperfect substitution between domestic and foreign securities in investors' portfolios.

Since EMS entry the Central Bank has introduced a number of instruments to influence liquidity in the system and quantitative and sectoral credit guidelines have been issued to regulate Licensed Bank lending to the private sector. The purpose of this paper is to evaluate the liquidity aspect to monetary policy. The paper is organised into two sections. First, a monetary model of the Irish economy, based on a portfolio equilibrium model suggested by Kouri and Porter (1974), is outlined. This model is used to derive reduced form equations for the

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external reserves and the Central Bank's net domestic assets which in turn facilitate the calculation of offset and sterilisation coefficients. These coefficients show, respectively, the degree to which changes in the Central Bank's domestic assets are offset by changes in the external reserves and the degree to which the Central Bank sterilises the effect of changes in the external reserves on the monetary base. They are essentially summary statistics which can be used to indicate the effectiveness of liquidity policy. An attempt is also made to evaluate the quantitative credit guidelines but the sectoral guidelines are not considered. The analysis is conducted in terms of a pre- and post- EMS entry framework in order to facilitate comparison.

In Section III of the paper the empirical results are presented and discussed. The principal findings are that the Central Bank has engaged in sterilisation policies in the post-EMS period and that the absolute value of the offset coefficient indicates a continuing high degree of integration between Irish and foreign financial markets.

II THE THEORETICAL FRAMEWORK

The Model

A number of models have been developed to explain capital flows, external reserves or exchange rate movements (see Kenan, 1985 for a discussion). The Kouri-Porter model is a portfolio balance approach (see Branson and Henderson, 1985, for an extensive discussion on the theoretical foundations) and is adopted here because of its suitability to the objectives of this paper. The salient feature of the model is that bond and money market disequilibrium will, via substitution in foreign and domestic investors' portfolios, be removed by flows through the capital account of the balance of payments. The model specifies domestic demand functions for money, domestic and foreign bonds, a foreign demand function for domestic bonds and a wealth constraint. It is applicable to a country maintaining fixed exchange rates.

The model is outlined in Table 1 but with a number of modifications designed to either remove possible bias in the empirical results or to capture unique features of the Irish monetary environment. First, a Central Bank reaction function, Equation 4, is included to facilitate an estimation technique designed to remove any simultaneous relationship between the external reserves (NFA) and the Central Bank's domestic assets (NDA). Such a relationship would bias the offset coefficient towards -1, which is complete offset. Also the equation allows for the estimation of the sterilisation coefficient (H_2 in Equation 4). The equation states that output (Y) and NFA are respectively the domestic and external objectives of the Central Bank. There are a number of reasons why this

Table 1: *The model*

1. Y	$= F(G, I, D^{CG})$	$F_1 > 0, F_2, F_3 < 0$	Goods market equilibrium.
2. M^s	$= L(Y, I, I^*, W)$	$L_1, L_4 > 0, L_2, L_3 < 0$	Money market equilibrium.
3. ΔM^s	$= \Delta NFA + \Delta NDA$		Change in the money supply.
4. NDA	$= H(Y, NFA)$	$H_1, H_2 \geq 0$	Central Bank reaction function.
5. ΔNFA	$= CAB + TC$		Change in the external reserves.
6. CAB	$= J_1 \Delta Y + J_2 \Delta E + J_3 \Delta E^* + J_4 \Delta Y^*$	$J_1 < 0, J_2, J_3 \geq 0, J_4 > 0$	Current account function.
7. TC	$= \Delta B_D^* - \Delta BF$		Net Capital inflow.
8. B_S	$= B_D^* + B_D$		Bond market equilibrium.
9. B_D^*	$= K(Y^*, I, I^*, E^*, W^*)$	$K_1, K_5 \geq 0, K_2 > 0, K_3, K_4 < 0$	Foreign demand for domestic bonds.
10. B_D	$= Q(Y, I, I^*, E^*, W)$	$Q_1 \geq 0, Q_2, Q_4, Q_5 > 0, Q_3 < 0$	Domestic demand for domestic bonds.
11. B_F	$= G(Y, I, I^*, E^*, W)$	$G_1 \geq 0, G_2 < 0, G_3, G_4, G_5 > 0$	Domestic demand for foreign bonds.
12. $L(\) + Q(\) + G(\) = \dot{W}$			Wealth constraint.
<i>Exogenous Variables</i>		<i>Endogenous Variables</i>	
E	= Exchange rate	Y	= Domestic nominal output.
E^*	= Expected exchange rate	I	= Domestic interest rate.
Y^*	= Foreign nominal output	M^s	= Money supply
I^*	= Foreign Interest Rate	NFA	= External Reserves
G	= Government expenditure	NDA	= Domestic assets of the Central Bank
D^{CG}	= Quantitative credit guidelines dummy variable		
W	= Domestic Wealth		
W^*	= Foreign Wealth		
		CAB	= Current account.
		TC	= Capital account.
		B_D^*	= Foreign demand for domestic bonds.
		B_F	= Domestic demand for foreign bonds.
		B_S	= Supply of bonds.
		B_D	= Domestic demand for domestic bonds.

might be considered a simplification. First, we do not know what the "desired" objectives of the Central Bank are; the equation only shows how the Central Bank reacts to changes in the explanatory variables. (Cargill and Meyer (1981) outline a method of detecting the "desired" objectives). Second, if the Central Bank's policy response is asymmetrical the equation cannot capture this possibility (a reaction function is not necessary if the policy response is discretionary). Third, borrowing by the Licensed Banks in response to, say, higher foreign interest rates means that not all changes in NDA are Central Bank policy reactions. Fourth, foreign borrowing by both the Government and the Licensed Banks is problematic in that it underlies the equation by temporarily resolving the Central Bank's dilemma of maintaining reserve adequacy while avoiding introducing deflationary effects into the economy. An example is the 1980 credit policy year when a restrictive quantitative credit guideline combined with a foreign currency based lending exemption encouraged the Licensed Banks to borrow abroad. Despite these potential difficulties, however, the specified reaction function might be expected to perform reasonably well. The Central Bank has emphasised on a number of occasions the importance of liquidity management and as a consequence sterilisation should be detected.

The second modification to the model is that output and the current account of the balance of payments (CAB) are not assumed to be exogenous. This variation is reflected in the inclusion of Equations 1 and 6. There are two reasons for making this change. First, as McGee (1976) has pointed out, if a simultaneous relationship exists between money and output the offset coefficient will be biased towards unity. Second, Equation 1 facilitates the insertion of a variable intended to reflect the effects of the quantitative credit guideline on output. Ideally, this variable should reflect the extent of credit rationing but such a measure is fraught with difficulties and is not attempted here. Instead a dummy variable based on Central Bank enforcement (as indicated by communications to the Licensed Bank requesting curtailment of lending) is used to detect the existence of credit rationing. It takes the value of 1 for the following quarters: 1979IV, 1982II and 1983IV. (These quarters are chosen on the basis of a discussion in Leddin (1983)).

Because Y and CAB are now endogenous to the model, changes in NDA can be offset by both current and capital account flows and as a consequence changes in the external reserves is used as the dependant variable rather than just capital account flows as in the Kouri-Porter paper. The reduced form equations and the estimation procedure are outlined below.

Two further changes relate to particular features of the Irish economy. First, because of the smallness of the bond market in Ireland, open market operations are not used as a policy instrument. It is therefore assumed that the supply of Government stock is demand determined. To reveal the principal liquidity instruments, the NDA variable is partitioned into Central Bank lending to the

Licensed Banks (CCB)¹ and the Government (CCG), induced changes in the primary and secondary reserved requirements (CRR) and the Central Bank lending rate (RCB)². Separate offset coefficients can be estimated for these variables thus facilitating comparison. This procedure has been adopted by a number of authors but in particular Kouri (1975) and Neumann (1978).

The second change relates to the inclusion by Kouri-Porter of official capital flows in the current account of the balance of payments. Since the emphasis in this paper is on the external reserves and because of the significance of such flows in Ireland, particularly since EMS entry, separate estimates are obtained for the external reserves equation inclusive and exclusive of foreign borrowing.³ With regards to the reaction function the results presented relate only to the external reserves inclusive of foreign borrowing as this is the relevant concept in liquidity management.

Most of the explanatory variables cited in the model are familiar (the inclusion of a foreign interest rate in the demand for money function allows for a direct link between money and foreign securities) but there are a number of features that should be noted. For simplicity, the variables are measured in nominal terms and the analysis is conducted in terms of base money (this assumes a money multiplier equal to 1). The domestic assets of foreign Central Banks are omitted. As De Grauwe (1975) has pointed out, this can bias the offset coefficients towards zero. The inclusion of a foreign interest rate in the reduced form equations may however remove this bias. Finally, it is assumed that stock adjustment in the model accords with the use of quarterly data.

The sources and definitions of the variables are given in Appendix I. The pre-EMS period is defined as 1972I to 1978III and the post-EMS entry period as 1978IV to 1984I. The upper and lower bounds are dictated by the availability of data and 1978III is the quarter immediately preceding the introduction of exchange controls. Entry into the EMS occurred in 1979I.

Regression Equations

The first step in the empirical analysis is to obtain the following reduced form equation for output (Y);

$$Y = b_0 + b_1Y^* + b_2I^* + b_3G + b_4E + b_5E^* + b_6D^{CG} + b_7W + b_8W^*. \quad 13$$

1. CCB comprises exchequer bills rediscounted for banks plus agricultural commodity intervention bills (ACIB) plus secured advances plus sale and repurchase agreements. The latter commenced in May 1983 and foreign currency swaps are not included due to the non-availability of data.

2. The Licensed Banks' short-term credit facility and the Government's overdraft facility are not included in CCB and CCG, respectively, since they could be considered endogenous to the system. They are replaced by the RCB variable which is lagged one quarter. See Barry (1983) for a discussion on the liquidity instruments.

3. Official foreign borrowing is defined as net Government foreign borrowing plus foreign currency based lending by the Licensed Bank. Net foreign borrowing by the Semi-State Bodies is excluded due to the non-availability of quarterly data.

where the variables are defined in Table 1. To simplify the exposition, the breakdown of these regression coefficients (and those in Equation 14 below) in terms of the structural parameters are given in Appendix 2. The signs on the coefficients will depend on the various elasticities in the structural model but in general it is expected that the coefficients b_1, b_3, b_5, b_7 and b_8 will be positive and the remaining coefficients negative (an increase in E^* indicates an expected appreciation of the exchange rate which, through leads and lags in trade account receipts and payments, should result in an increase in Y).

Equation 13 is obtained by first totally differentiating the model and then substituting into Equation 3 the equations underlying NFA and NDA. This expression for the money supply is then combined with Equations 1 and 2 to form a 3×3 matrix of the type $Ax = d$. This matrix contains three endogenous variables Y, I and M^s and the six exogenous variables given in Equation 13. The matrix is then solved for Y and the resulting equation is integrated to obtain Equation 13 above.

By using a similar procedure the following equation for the external reserves can also be derived;

$$NFA = a_0 + a_1Y + a_2Y^* + a_3I^* + a_4E + a_5E^* + a_6NDA + a_7W + a_8W^*. \quad 14$$

Here, Keynesian and Monetary approaches to the balance of payments differ on what sign the coefficients will take. The latter theory (see for example Johnson 1976) would predict, because of the variables' influence on either the domestic or foreign, supply or demand for money, that a_1, a_3, a_5 and a_7 will be positive and the remaining coefficients will be negative.

Following Kouri-Porter, the variables W and W^* are omitted in the empirical analysis due to the non-availability of data. Since these variables tend to have opposing influences and because a constant term is included the bias should be small. The Y^* variable is however included and is proxied by the UK's gross domestic product.

The estimation procedure is that suggested by Millar and Askin (1976). First Equation 13 is estimated and the predicted values of output (\hat{Y}) are obtained. This variable is then used in estimating Equation 14 and the predicted values of the external reserves (\hat{NFA}) are derived. Finally, both \hat{Y} and \hat{NFA} are used to estimate Equation 4. The coefficients a_6 in Equation 14 and H_2 in Equation 4 are, respectively, the offset and sterilisation coefficients.

Exchange Rate Expectations

Speculation relating to exchange rate movements can arise on either the capital or current account of the balance of payments. In the latter account it tends to arise primarily through leads and lags in payments and receipts in the trade account. In this paper two variables are used to reflect exchange rate

expectations. One of those relates to sterling (since it is not a participant in the EMS) and the other to realignments in the EMS. With regard to the expected sterling exchange rate, the following adaptive expectations measure was used⁴;

$${}_t E_{t+1}^* = E_t + \psi (E_t - {}_{t-1} E_t^*) \quad 15$$

This states that the expected exchange rate in time $t + 1$, which is formulated in time t , is equal to the current exchange rate plus an adjustment based on the previous error in predicting the exchange rate.

This measure was chosen in preference to three other approaches on the basis of higher R^2 in both the output and the external reserves equations. The other methods examined were the sterling forward premium or discount (which reflects the difference between foreign and domestic interest rates), rational (perfect foresight) expectations and a rational expectations measure based on an instrumental variables technique (see Barro, 1977).⁵ For the pre-EMS period, because of the fixed exchange rate with sterling, the adaptive expectations measure was applied to the Irish (sterling) deutschemark exchange rate.

With regard to the EMS currencies, exchange rate movements within the band were not considered and instead a dummy variable, D^{EMS} , was used to capture flows associated with realignments. This variable takes the value of 1 for the following quarters: 1979III, IV, 1981I, IV, 1982I, II and 1983I.

III. EMPIRICAL RESULTS

The empirical results relating to the pre-EMS period are given in Table 2. The principal result is that the output and sterilisation coefficients in the reaction function and the offset coefficient in regressions 2 and 3 are insignificant. The absolute value of the offset coefficient indicates that if a sterilisation policy has been implemented it would have been entirely ineffective due to complete offset through the external reserves. These results are consistent with the findings of Browne and O'Connell (1978) and Browne (1982) and they concur with the generally held view that the Central Bank's monetary powers were severely limited by the fixed exchange rate with sterling.

Other interesting aspects of the results are the insignificant E and E^* variables in both the output and the external reserves equations and the significant but incorrectly signed I^* and G variables in the output equation. The significantly

4. This measure was suggested by Beenstock, Budd and Warburton (1981). After a limited amount of experimentation the coefficient ψ was assumed to take a value of .5.

5. The Irish pound/sterling exchange rate was regressed on the Irish money supply, the retail sales index, exports and the current differential between the Irish and British interbank interest rates. The predicted values one quarter forward was then used as the current expected exchange rate.

Table 2: *Pre-EMS Results*

Regression Number	Dependent Variable	(A) Output equation										
		Constant	γ^*	I^*	G	E	E^*	D_1	D_2	D_3	DW	R^2
1.	Y	103 (2.6)	2.5 (3.8)	1.5 (3.6)	-0.08 (3.2)	-0.53 (1.2)	1.3 (0.6)	-6.9 (3.7)	-0.9 (0.4)	-8.1 (3.7)	1.8	0.93
		(B) External reserves equations										
		Constant	\hat{Y}	γ^*	I^*	E	E^*	NDA	DW	R^2		
2.	NFA	-1,886 (1.4)	10.7 (1.9)	30.8 (3.2)	-22.6 (1.9)	10.6 (0.9)	-2.0 (0.05)	-0.93 (0.13)	1.15	0.94		
3.	NFA -GFB	-1,472 (1.2)	5.7 (1.1)	3.9 (0.4)	-11.6 (1.1)	16.4 (1.6)	-19.9 (0.5)	-1.1 (1.7)	1.6	0.65		
		(C) Reaction function										
		Constant	$\Delta \hat{Y}$	$\Delta \hat{Y}_{-1}$	ΔNFA	D_1	D_2	D_3	DW	R^2		
4.	ANDA	30.2 (0.2)	2.1 (0.9)	-1.1 (1.4)	0.01 (0.2)	-20 (1.3)	-11 (1.6)	-26 (1.7)	1.6	0.32		

Notes:

1. t-statistics in parentheses.

2. E^* is the expected Sterling, Deutschemark exchange rate, GFB is Government Foreign Borrowing and $D_{1,2,3}$ are seasonal dummy variables. All other variables are defined in the text. The reaction function was estimated using first differences to remove positive serial correlation in the residuals and a lagged output variable was introduced to allow for the possibility that the Authorities may not have contemporaneous information on output.

positive coefficient on Y^* in regression 2 does not accord with the predictions of the monetary approach to the balance of payments (MAB) theory.

Table 3 presents the results for the post-EMS period. The offset coefficient is now significant and is estimated to be $-.79$ (this is the case for whichever definition of the external reserves is used) and the sterilisation coefficient is estimated to be $-.75$ and is highly significant. Using conventional statistical tests of significance, it is not possible to say if the estimated offset coefficient favours the monetarist or income/absorption theories of the balance of payments. This is because the point estimate is not significantly different from a wide range of values, including -1 (the monetarist prediction). Kreinin and Officer (1978) suggest that the absolute size of the offset coefficient should be a factor in assessing the validity of the different theories. While stressing that their criterion is necessarily arbitrary, they consider an absolute parameter size of less than $.9$ (but negatively signed and statistically different from zero) to favour the income/absorption theory. If this criterion is adopted, then the results here are not supportive of the monetarist prediction.

Similar considerations apply in commenting on the effectiveness of the Central Bank's sterilisation policy. Again the standard statistical tests cannot say if the offset through the external reserves is complete or partial. If, however, the point estimate is accepted, then there is less than complete offset and a sterilisation policy may be feasible. Such a policy, however, would prove costly if there was any prolonged fall in the external reserves. If for example, NFA decreased by £100m, the Central Bank would react by injecting £75m into the market and of this approximately £58m will be offset within the next quarter. This in turn would lead to further sterilisation and offsets which, *ceteribus paribus*, would entail total injections of approximately £179m over a two-year period. Other aspects of the results are the insignificance of the output coefficient in the reaction function which suggests that sterilisation was the principal policy pursued by the Central Bank. Also the insignificant, but correctly signed, D^{CG} variable indicates that the quantitative credit guidelines did not affect output.

In regression 6, the E^* and the D^{EMS} variables are respectively significant and insignificant and this tends to emphasise the importance of current account speculation. The negatively signed and significant E variable (the effective exchange rate index) suggests that depreciation, in the short run, increases the external reserves. When NFA is defined to exclude official foreign borrowing (regression 7) both E and E^* become insignificant and Y and Y^* significant. The signs on the latter two variables support the MAB theory. Increases in foreign (domestic) output, increase the foreign (domestic) demand for money which in turn causes capital outflows (inflows).

With regard to the reaction function, regression 9, it could be argued that the equation is a policy rule in which the coefficients can be varied at the Central Bank's discretion. If this is the case, the regression coefficients in the output equa-

Table 3: *Post-EMS results*

Regression Number	Dependent Variable	(A) Output equation												DW	R ²
		Constant	γ^*	I^*	G	E	E^*	D^{EMS}	D^{CG}	D_1	D_2	D_3			
5.	Y	145 (2.4)	1.4 (2.4)	0.6 (1.3)	-0.03 (2.3)	-1.9 (2.0)	95 (2.3)	-0.39 (0.2)	-4.0 (1.2)	-5.4 (1.7)	8.0 (2.5)	-7.8 (2.3)	1.75	0.83	
(B) External reserves equations															
		Constant	\hat{Y}	γ^*	I^*	E	E^*	D^{EMS}	NDA				DW	R ²	
6.	NFA	4,142 (2.1)	1.9 (1.5)	7.9 (0.9)	1.9 (0.01)	-80 (2.8)	2,868 (2.3)	-14.5 (0.2)	-0.79 (3.0)				1.75	0.85	
7.	NFA -GFB-FCBL	3,021 (1.0)	4.0 (2.3)	-103 (6.9)	8.8 (0.4)	45.6 (1.1)	-2,094 (1.1)	82.6 (0.7)	-0.79 (2.1)				1.99	0.98	
8.	NFA -GFB-FCBL	4,519 (0.9)	3.1 (1.4)	-113 (3.7)	10.6 (0.3)	27.9 (0.4)	-1,963 (0.6)	13.3 (0.1)	-0.3 (0.4)	-0.9 (0.9)	-0.7 (0.5)	16.1 (0.4)	1.87	0.98	
(C) Reaction functions															
		Constant	$\Delta \hat{Y}$	$\Delta \hat{Y}_1$	ΔNFA	D_1	D_2	D_3	DW	R ²					
9.	ΔNDA	72.5 (1.6)	0.84 (0.9)	-0.5 (0.6)	-0.75 (5.3)	-48.5 (0.7)	14.8 (0.2)	-91 (1.3)	2.3	0.69					
10.	$\Delta (CCB + CRR)$	-423 (1.3)	14.6 (1.9)	0.57 (0.4)	-0.39 (2.4)	-18.0 (0.2)	-163 (1.7)	197 (1.5)	2.2	0.39					

Notes:

- t-statistics in parentheses.
- GFB and FCBL are Government Foreign Borrowing and Licensed Banks' foreign currency based lending respectively. E* is the expected Irish pound, sterling exchange rate and $D_{1,2,3}$ are seasonal dummy variables. All other variables are defined in the text. The reaction functions were again estimated using first differences to remove serial correlation in the residuals.

tion would also vary and the empirical results are undermined. In other words, the results would exhibit a structural break. To explore this possibility, the post-EMS data were split into two equal sub-periods and a Chow test for stability was calculated. An F statistic of 0.66 was obtained and since this is less than the critical F of 3.29, the hypothesis that the equation is unstable in the post-EMS period is rejected.

As outlined in Section II, the variable NDA can be partitioned into its component parts to reveal the principal monetary instruments used in Ireland. The results for the external reserves equation (exclusive of official foreign borrowing) are given in regression 8. It will be observed that the individual components of NDA are statistically insignificant and as a consequence no definite conclusions can be drawn. The variables are, however, correctly signed and the values show considerable differences between the instruments. In particular the CCB variable is unexpectedly different from CRR. The offset coefficient for CCG is -0.7 and this suggests Central Bank financing of the Government's borrowing requirement can have serious implications for the external reserves.

Finally, in regression 10, the reaction function is re-estimated using (CCB + CRR) as the dependent variable. It will be observed that the sterilisation coefficient continues to be significant but its absolute value is reduced to 0.39. This would seem to suggest that CCG should be viewed as a sterilisation instrument.

IV CONCLUSION

The results in this paper suggest that the Central Bank has engaged in sterilisation policies since EMS entry and that an output objective was not pursued. The absolute size of the associated offset coefficient was found to be less than unity (although not significantly so according to conventional statistical criteria). This indicates a reduction in the degree of monetary integration relative to the pre-EMS period. There is still, however, a high cost associated with sterilising any prolonged fall in the external reserves. In general, the results suggest that the comparative advantage of monetary policy in Ireland continues to lie in maintaining external reserves adequacy and that policies geared towards domestic objectives are likely to prove ineffective.

REFERENCES

- BARRO, R. J., 1977. "Unanticipated Money Growth and Unemployment in the United States," *American Economic Review*, March.
- BARRY, K., 1983. "The Central Bank's Management of the Aggregate Liquidity of Licensed Banks," Annual Report, Central Bank of Ireland.
- BEENSTOCK, M., M. BUDD and P. WARBURTON, 1981. "Monetary Policy, Expectations and the Real Exchange Rate," in W. A. Eltis and P. J. N. Sinclair, editors, *The Money Supply and the Exchange Rate*, Oxford: Oxford University Press.

- BRANSON, W. H. and D. W. HENDERSON, 1985. "The Specification and Influence of Asset Markets," in R. W. Jones and P. B. Kenen, editors, *Handbook of International Economics*, Vol. II, North Holland.
- BROWNE, F. X., 1982. "Monetary Control, the Transmission Mechanism of Monetary Policy and Exchange Market Pressure — the Case of Ireland, Before and After the Introduction of the EMS," Dublin: Central Bank of Ireland Technical Paper No. 1/RT/82, January.
- BROWNE, F. X. and T. O'CONNELL, 1978. "A Quantitative Analysis of the Degree of Integration between Irish and UK Financial Markets," *The Economic and Social Review*, Vol. 9, No. 4.
- CARGILL, T. F. and R. A. MEYER, 1981. "Revealed Preferences in Macroeconomic Policy Decisions," *Journal of Macroeconomics*, Spring.
- De GRAUWE, P., 1975. "International Capital Flows and Portfolio Equilibrium, Comment," *Journal of Political Economy*, Vol. 83, No. 5.
- JOHNSON, H. G., 1976. "The Monetary Approach to the Balance of Payments," in J. Frenkel and H. G. Johnson, editors, *The Monetary Approach to the Balance of Payments*, London: Allen and Unwin.
- KENEN, P. B., 1985. "Macroeconomic Theory and Policy: How the Closed Economy was Opened," in R. W. Jones, and P. B. Kenen, editors, *Handbook of International Economics*, Vol. II, North Holland.
- KOURI, P. J. K., 1975. "The Hypothesis of Offsetting Capital Flows: A Case Study of Germany," *Journal of Monetary Economics*, 1.
- KOURI, P. J. K., and M. G. PORTER, 1974. "Portfolio Equilibrium and International Capital Flows," *Journal of Political Economy*, 82, May/June.
- LEDDIN, A., 1983. "Private Sector Credit: Policy and Enforcement," *Quarterly Economic Commentary*, May.
- KREININ, M. E. and L. H. OFFICER, 1978. *The Monetary Approach to the Balance of Payments: A Survey*, Princeton Studies in International Finance, No. 43, Princeton University Press.
- MAGEE, S. P., 1976. "The Empirical Evidence on the Monetary Approach to the Balance of Payments and Exchange Rates," *American Economic Review*, May.
- MILLAR, N. C. and S. S. ASKIN, 1976. "Monetary Policy and the Balance of Payments in Brazil and Chile," *Journal of Money, Credit and Banking*, May.
- NEUMANN, M. J., 1978. "Offsetting Capital Flows: A Reexamination of the German Case", *Journal of Monetary Economics*, No. 4, January.

APPENDIX I

Data: Definitions and Sources

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- E : Trade Weighted Exchange Rate Index. 1971 = 100. Various *Central Bank Quarterly Eulletins* (CBQB)
- E* : Irish pound, sterling exchange rate various CBQBs. Sterling, Deutsche-mark exchange rate, *Bank of England Quarterly Bulletins*.
- FCBL : Foreign Currency Based Lending. £m. Various CBQBs.
- G : Government Expenditure. £m. Folder of Irish Economic Statistics.

- GFB : Government Foreign Borrowing. £m. Various CBQBs.
 I : Interest rate. Inter Bank Market. 3 month fixed. Various CBQBs.
 I* : Euro \$ Deposits in London. Various *Bank of England Quarterly Bulletins*.
 NDA : Domestic Assets of the Central Bank. (Exclusive of Central Bank "other" assets). £m. Various CBQBs.
 NFA : External Reserves. £m. Various CBQBs.
 Y* : GDP in the UK. £Billion. *Bank of England Quarterly Bulletin*.
 Y : Index of Production, 1975 = 100, Transportable Goods. Folder of Irish Economic Statistics.

The variables CCB, CCG and RGB are defined in the text and were obtained from various CBQBs.

APPENDIX II

A. Output Equation

$$\begin{aligned}
 Y = & \left[\frac{(1 + H_2)(-F_2(J_4 + K_1))}{\Delta} \right] Y^* \\
 & + \left[\frac{(1 + H_2)(F_2(G_3 - K_3))}{\Delta} + F_2L_3 \right] I^* \\
 & + \left[\frac{(1 + H_2)(F_1(K_2 - G_2)) - F_1L_2}{\Delta} \right] G \\
 & + \left[\frac{(1 + H_2)(-F_2J_2)}{\Delta} \right] E \\
 & + \left[\frac{(1 + H_2)(F_2(G_4 - J_3 - K_4))}{\Delta} \right] E^* \\
 & + \left[\frac{(1 + H_2)(F_3(K_2 - G_2)) - F_3L_2}{\Delta} \right] D^{CG}
 \end{aligned}$$

$$+ \left[\frac{(1 + H_2)(F_2(G_5 + L_4))}{\Delta} \right] W$$

$$+ \left[\frac{-F_2 K_5 (1 + H_2)}{\Delta} \right] W^*$$

where $\Delta = ((1 + H_2)(F_2(J_1 - G_1) + K_2 - G_2) + F_2 H_1 - L_2 (1 + F_2))$

(B) *External Reserves Equation*

$$\begin{aligned} \text{NFA} = & \frac{1}{L_2 - K_2 + G_2} [((J_1 - G_1) L_2 + (G_2 - K_2) L_1) Y \\ & + L_2 (J_4 + K_1) Y^* \\ & + ((K_3 - G_3) L_2 + (G_2 - K_2) L_3) I^* \\ & + L_2 J_2 E \\ & + ((J_3 + K_4 - G_4) L_2) E^* \\ & + (K_2 - G_2) \text{NDA} \\ & + ((G_2 - K_2) L_4 - L_2 G_5) W \\ & + L_2 K_5 W^*] \end{aligned}$$