

Inflation and Uncertainty: Does the EMS Participation Play Any Role?

Nicholas Apergis
University of Macedonia

Abstract

This paper examines whether European Monetary System (EMS) membership has affected the link between inflation and inflation uncertainty. ARCH measures of conditional inflation volatility and Granger-causality tests for nine OECD countries over the period 1980-1994 indicate that in non-EMS countries - in these countries a monetary target seems to have been closely followed - inflation seems to determine the behaviour of inflation uncertainty. By contrast, in EMS countries – these countries have geared their monetary policies to an exchange rate target – inflation seems to have no impact on inflation uncertainty. This finding is probably due first, to the absence of any institutional restriction that characterises non-EMS membership, on the manner the monetary policy is pursued, and second, to the fact that under a monetary rule, any institutional or regulatory changes in the monetary sector are expected to fall more adversely upon inflation as well as inflation uncertainty. (JEL Classification: E31)

I. Introduction

Inflation has been criticised, among other reasons, for creating uncertainty about future inflation. Such uncertainty about inflation, in turn, affects both business decisions and consumer saving decisions, implying that inflation uncertainty tends to have negative effects on economic activity Ogun [1971]; Friedman [1977]; Golob [1993] .

According to Ball [1990], inflation is due to the propensity of a central bank to accommodate an economic disturbance resulting in high inflation rates. Once the economy experiences such inflation rates, the central bank does not react accordingly because any drastic movements that could cut inflation they might lead the economy into a recessionary phase. Therefore, under high inflationary conditions, the public is uncertain about future inflation, since the public does not know how the monetary authorities will cope with inflation. Sauer and Bohara [1995] have shown that differentiation in the manner that monetary policy is implemented as an anti-inflation tool leads to differences in the behaviour of uncertainty. Empirical attempts in the relevant literature have shown that a positive link exists between inflation and inflation uncertainty across countries Froyen and Waud [1987]; Ball and Cecchetti [1990]; Evans [1991]; Evans and Wachtel [1993]; Brunner and Hess [1993] . It is crucial for economists and policy makers to know whether inflation causes or not inflation uncertainty in order to incorporate inflation uncertainty to costs associated with inflation. Only a study, however, by Holland [1995], for the case of the US, has shown that inflation contains an information content for inflation uncertainty.

Branson [1981] and Williamson [1985] argued that a fixed exchange rate system, such as the European Monetary System (EMS), lessens uncertainty originated from monetary disturbances. The goal of this study as well as

while in the latter on money stock targeting which under certain conditions a money rule could be unsuccessful, such as in the case of Canada, Racette and Raynauld [1992]. Sauer and Bohara [1995] have argued that the association between inflation and inflation uncertainty differs sharply in cases of a different monetary policy targeting. The rest of the paper is organised as follows. The next section presents the empirical analysis, while section 3 provides some concluding remarks.

II. Empirical Analysis

A. Data

The empirical analysis is carried out using monthly data on prices (P) measured by the consumer price index, money supply (M) defined as M1, productivity (PROD) defined as the ratio of industrial production index to labour, where labour is measured as hours worked, foreign prices (POECD) measured by the OECD price index, and wages (W) defined as monthly earnings for five EMS countries, namely, Germany, France, Ireland, the UK, Italy, and 4 non-EMS countries, namely, Switzerland, Japan, Canada, and Greece over the period 1980-1994. According to Argy [1982], Japan and Canada geared monetary policy to exchange rate targets only during the 1970's, while since then a monetary rule seems to have been closely followed. Germany, France, Ireland and Italy have been continuously EMS members, while the UK joined the system on October 8, 1990. Data were obtained from the OECD Main Economic Indicators, while both the MicroFit and the R.A.T.S. software assisted with the empirical analysis. Finally, lower case letters indicate variables expressed in logarithms.

$$p = a + \sum_{i=1}^{q_1} b_{1i} p(-i) + \sum_{i=1}^{q_2} b_{2i} w(-i) + \sum_{i=1}^{q_3} b_{3i} poecd(-i) + \sum_{i=1}^{q_4} b_{4i} prod(-i) \\ + \sum_{i=1}^{q_5} b_{5i} m(-i) + fEC(-1) + \sum_{j=1}^q b_{6j} DUM(j) + u$$

where EC is the residuals from the cointegrating vector (with f being negative) and $DUM(j)$ being a set of dummy variables for the j country (where applicable). The estimation of the EC model without dummies – defined below – demonstrated the presence of certain structural breaks around specific dates. Therefore, in order to capture the correct statistical framework and, in particular, the impact of certain changes in exchange rates on inflation, certain dummies were included in the EC model.² Having estimated the (unconditional) variance of the residuals from the EC processes, next the presence of ARCH effects was formally tested Engle [1982]. The results indicated the presence of ARCH effects in all ten cases. Maximum-likelihood estimates of inflation uncertainty are reported in Table 1. The sum of the ARCH coefficients is less than one, which implies the stationarity of the h processes.³

nal wages are stationary only in their first differences in all cases under examination. In addition, cointegration tests by Johansen and Juselius [1990] showed that a cointegrating relationship among the variables concerned was present in all cases. The results for both the unit root and the cointegration tests are available upon request.

2. For France 6 dummies corresponding to 5 exchange rate realignments (October 1981, June 1982, March 1983, July, 1985, April 1986) and the 1992 EMS crisis were involved. For Ireland 5 dummies corresponding to 4 exchange rate realignments (March 1983, July 1985, August 1986, January 1993) and the 1992 crisis were involved. For the UK 2 dummies corresponding to the EMS participation (October 1990) and the 1992 crisis were involved. For Italy 7 dummies corresponding to 6 exchange rate realignments (March 1981, October 1981, June 1982, March 1983, July 1985, January 1993) and the 1992 crisis were involved. For Germany 1 dummy

Table 1
ARCH Estimates (Maximum Likelihood Estimates)

Germany

$$\Delta p = 0.127 \Delta p(-5) + 0.381 \Delta poecd(-4) + 0.285 \Delta m(-1) + 0.102 \Delta m(-5)$$

(5.43)* (10.4)* (6.13)* (5.77)*

$$+ 0.082 \Delta w(-3) - 0.232 EC(-1) + 0.142 DUM$$

(5.03)* (-4.52)* (3.29)*

$$h = 0.000321 + 0.489 \varepsilon^2(-1)$$

(10.4)* (4.49)*

France

$$\Delta p = 0.523 \Delta p(-1) + 0.239 \Delta p(-2) + 0.153 \Delta m(-1) + 0.352 \Delta w(-1)$$

(16.4)* (5.92)* (2.34)* (2.34)*

$$- 0.097 \Delta prod(-4) + 0.259 \Delta poecd(-1) - 0.101 EC(-1) -$$

(-2.74)* (13.6)* (-2.24)*

$$0.0072 DUM2 - 0.0067 DUM4 - 0.002 DUM6$$

(-2.04)* (-3.27)* (-9.96)*

$$h = 0.000428 + 0.234 \varepsilon^2(-1)$$

(11.7)* (4.12)*

Ireland

$$\Delta p = 0.371 - 0.113 \Delta p(-1) - 0.274 \Delta p(-2) + 0.43 \Delta p(-3) - 0.171 \Delta p(-4)$$

(2.13)* (-2.2)* (-2.96)* (4.09)* (-2.17)*

$$+ 0.301 \Delta poecd(-2) + 0.164 \Delta m(-1) + 0.45 \Delta w(-1) - 0.122 EC(-1)$$

(5.79)* (2.28)* (8.78)* (-3.28)*

$$- 0.219 DUM7 - 0.069 DUM8$$

(-8.42)* (-8.2)*

$$h = 0.0234 + 0.246 \varepsilon^2(-1)$$

(2.75)* (14.3)*

Table 1 (continued)

Italy

$$\begin{aligned} \Delta p = & 0.025 + 0.469 \Delta p(-1) + 0.255 \Delta p(-2) + 0.312 \Delta m(-2) + 0.127 \Delta w(-3) \\ & (11.6)^* \quad (4.80)^* \quad (2.82)^* \quad (19.9)^* \quad (19.4)^* \\ & + 0.091 \Delta poecd(-4) - 0.249 \Delta prod(-1) - 0.273 EC(-1) - 0.0021 DUM14 \\ & (2.07)^* \quad (-20.1)^* \quad (-19.6)^* \quad (-2.84)^* \\ & -0.0043 DUM15 - 0.0075 DUM17 - 0.0065 DUM18 \\ & (-7.38)^* \quad (-11.6)^* \quad (-7.97)^* \\ h = & 0.000407 + 0.245 \varepsilon^2(-1) \\ & (9.77)^* \quad (27.6)^* \end{aligned}$$

Switzerland

$$\begin{aligned} \Delta p = & 0.236 \Delta p(-1) + 0.568 \Delta m(-1) + 0.139 \Delta m(-2) + 0.142 \Delta poecd(-4) \\ & (7.55)^* \quad (4.46)^* \quad (6.03)^* \quad (5.41)^* \\ & + 0.197 \Delta poecd(-5) - 0.337 EC(-1) + 0.128 DUMS \\ & (11.5)^* \quad (-5.04)^* \quad (3.06)^* \\ h = & 0.000421 + 0.361 \varepsilon^2(-1) \\ & (3.21)^* \quad (3.25)^* \end{aligned}$$

Japan

$$\begin{aligned} \Delta p = & 0.62 \Delta p(-1) + 0.012 \Delta poecd(-2) + 0.228 \Delta m(-3) + 0.099 \Delta w(-2) - 0.51 EC(-1) \\ & (2.33)^* \quad (7.14)^* \quad (3.63)^* \quad (8.61)^* \quad (-3.77)^* \\ h = & 0.001 + 0.33 \varepsilon^2(-1) \\ & (7.51)^* \quad (4.95)^* \end{aligned}$$

Canada

$$\begin{aligned} \Delta p = & 0.503 \Delta p(-2) + 0.015 \Delta poecd(-1) + 0.095 \Delta m(-1) + 0.041 \Delta w(-2) \\ & (2.14)^* \quad (2.84)^* \quad (3.28)^* \quad (3.13)^* \\ & -0.14 EC(-1) + 0.236 DUMC \\ & (-3.34)^* \quad (3.94)^* \\ h = & 0.0031 + 0.205 \varepsilon^2(-1) \\ & (4.78)^* \quad (14.9)^* \end{aligned}$$

Greece

D. Short-Run (Granger) Causality Tests

In this step of the empirical analysis, the Granger causality approach will examine whether lagged values of inflation help to explain the current value of conditional inflation uncertainty over and above the explanation provided by lagged values of inflation itself Holland [1995] .⁴ The Granger methodology involves testing jointly for the significance of the lags of the relevant explanatory variable. The fitted values of the ARCH estimates (h) and their corresponding inflation rates (Δp) are employed to test whether inflation Granger causes inflation uncertainty if, in the equation of h , the null hypothesis of zero lagged coefficients of Δp is rejected, while in the equation of Δp the null hypothesis of zero lagged coefficients of h is not rejected. Likelihood-ratio (LR) tests, proposed by Sims [1980], determined the optimal lag length for each Vector Autoregressive (VAR) model. Table 2 reports the significance levels of the F-statistic in three VAR systems with three alternative measures of lag lengths.

The results indicate that in the cases of Germany, France, Ireland, and Italy low F-test significance implies the lack of causality from inflation to inflation uncertainty. Lagged values of inflation do not have a significant effect on inflation uncertainty. In addition, the sum of the coefficients turns out to be positive, but insignificant. By contrast, in the cases of the UK (a current EMS country), Switzerland, Japan, Canada, and Greece unidirectional causality running from inflation to inflation uncertainty is detected. In addition, the sum of the coefficients of inflation, in the h equation, turns out to be positive and statistically significant. Moreover, in all cases, causality running from inflation uncertainty to inflation is not detected since the sum of lagged values of inflation uncertainty generates insignificant F-values. The sum of the coefficients remains positive, but statistically insignificant.

Table 2
Short-Run Dynamics (Granger-Causality Tests)

Dependent Variable	Tested Restrictions	F-Tests	p-values
Germany (Lags = 6)			
h $R^2 = 0.20$ SEE = 0.000063 SUM(Δp) = 0.0131	$\Delta p \nrightarrow h$ LM = 1.02[0.28] t-statistic = 1.05[0.29]	1.07	0.20
Δp $R^2 = 0.54$ SEE = 0.000036 SUM(h) = 0.264	$h \nrightarrow \Delta p$ LM = 4.55[0.97] t-statistic = 2.87[0.004]	1.23	0.29
(Lags = 8)			
h $R^2 = 0.24$ SEE = 0.000018 SUM(Δp) = 0.00907	$\Delta p \nrightarrow h$ LM = 1.61[0.10] t-statistic = 0.66[0.51]	0.35	0.74
Δp $R^2 = 0.11$ SEE = 0.0028 SUM(h) = 0.0803	$h \nrightarrow \Delta p$ LM = 7.74[0.81] t-statistic = 2.35[0.02]	1.71	0.11
(Lags = 4)			
h $R^2 = 0.18$ SEE = 0.000017 SUM(Δp) = 0.00849	$\Delta p \nrightarrow h$ LM = 0.74[0.71] t-statistic = 0.79[0.43]	1.63	0.20
Δp $R^2 = 0.50$ SEE = 0.0027 SUM(h) = 0.0613	$h \nrightarrow \Delta p$ LM = 1.74[0.64] t-statistic = 3.43[0.00]	2.06	0.10
France (Lags = 5)			
h $R^2 = 0.22$ SEE = 0.000042 SUM(Δp) = 0.0031	$\Delta p \nrightarrow h$ LM = 2.03[0.87] t-statistic = 1.19[0.23]	1.78	0.295

Table 2 (continued)

Dependent Variable	Tested Restrictions	F-Tests	p-values
Δp $R^2 = 0.21$ SEE = 0.0019 SUM(h) = 0.0758 (Lags = 3)	$h \nrightarrow \Delta p$ LM = 17.9[0.12] t-statistic = 2.38[0.02]	0.61	0.64
h $R^2 = 0.23$ SEE = 0.000017 SUM(Δp) = 0.022	$\Delta p \nrightarrow h$ LM = 1.25[0.59] t-statistic = 1.73[0.08]	2.15	0.18
Δp $R^2 = 0.19$ SEE = 0.000019 SUM(h) = 0.0777	$h \nrightarrow \Delta p$ LM = 15.8[0.20] t-statistic = 4.36[0.00]	1.56	0.37
Ireland (Lags = 6)			
h $R^2 = 0.29$ SEE = 0.000058 SUM(Δp) = 0.0039	$\Delta p \nrightarrow h$ LM = 0.89[0.99] t-statistic = 0.81[0.42]	0.88	0.56
Δp $R^2 = 0.99$ SEE = 0.000006 SUM(h) = 0.0793 (Lags = 8)	$h \nrightarrow \Delta p$ LM = 2.33[0.65] t-statistic = 2.66[0.008]	0.38	0.95
h $R^2 = 0.40$ SEE = 0.000006 SUM(Δp) = 0.0029	$\Delta p \nrightarrow h$ LM = 18.9[0.06] t-statistic = 0.56[0.58]	1.48	0.47
Δp $R^2 = 0.60$ SEE = 0.000031 SUM(h) = 0.0991 (Lags = 4)	$h \nrightarrow \Delta p$ LM = 2.79[0.85] t-statistic = 3.20[0.001]	0.49	0.89
h $R^2 = 0.31$ SEE = 0.000061 SUM(Δp) = 0.0028	$\Delta p \nrightarrow h$ LM = 17.8[0.12] t-statistic = 0.96[0.34]	2.30	0.21

Table 2 (continued)

Dependent Variable	Tested Restrictions	F- Tests	p- values
UK (Lags = 5) h $R^2 = 0.37$ SEE = 0.000066	$\Delta p \rightarrow h$ LM = 4.34[0.72]	2.48*	0.02
SUM(Δp) = 0.012 Δp $R^2 = 0.23$ SEE = 0.000149 SUM(h) = 0.0069	t-statistic = 6.26[0.00] $h \nrightarrow \Delta p$ LM = 5.31[0.62] t-statistic = 1.04[0.22]	0.93	0.50
(Lags = 8) h $R^2 = 0.26$ SEE = 0.000012 SUM(Δp) = 0.0322	$\Delta p \rightarrow h$ LM = 18.8[0.06] t-statistic = 4.43[0.00]	7.78*	0.00
Δp $R^2 = 0.26$ SEE = 0.0048 SUM(h) = 0.0564	$h \nrightarrow \Delta p$ LM = 5.29[0.64] t-statistic = 1.64[0.10]	1.24	0.26
(Lags = 3) h $R^2 = 0.22$ SEE = 0.000013 SUM(Δp) = 0.0242	$\Delta p \rightarrow h$ LM = 3.87[0.79] t-statistic = 5.17[0.00]	17.04*	0.00
Δp $R^2 = 0.15$ SEE = 0.000048 SUM(h) = 0.0047	$h \nrightarrow \Delta p$ LM = 5.85[0.59] t-statistic = 1.01[0.39]	1.18	0.31
Italy (Lags = 7) h $R^2 = 0.95$ SEE = 0.000022 SUM(Δp) = 0.00611	$\Delta p \nrightarrow h$ LM = 1.69[0.94] t-statistic = 0.87[0.41]	0.58	0.81

Table 2 (continued)

Dependent Variable	Tested Restrictions	F-Tests	p-values
Δp $R^2 = 0.39$ SEE = 0.000074 SUM(h) = 0.0943 (Lags = 4)	$h \nrightarrow \Delta p$ LM = 16.6[0.17] t-statistic = 0.57[0.57]	0.85	0.61
h $R^2 = 0.90$ SEE = 0.000029 SUM(Δp) = 0.00757	$\Delta p \nrightarrow h$ LM = 2.63[0.90] t-statistic = 1.18[0.28]	1.23	0.34
Δp $R^2 = 0.31$ SEE = 0.00074 SUM(h) = 0.0567	$h \nrightarrow \Delta p$ LM = 13.1[0.36] t-statistic = 1.38[0.17]	1.42	0.28
Switzerland (Lags = 5)			
h $R^2 = 0.81$ SEE = 0.000034 SUM(Δp) = 0.0565	$\Delta p \rightarrow h$ LM = 2.95[0.23] t-statistic = 4.16[0.00]	3.17*	0.01
Δp $R^2 = 0.78$ SEE = 0.000044 SUM(h) = 0.0094 (Lags = 8)	$h \nrightarrow \Delta p$ LM = 2.88[0.29] t-statistic = 1.21[0.24]	0.32	0.87
h $R^2 = 0.62$ SEE = 0.000044 SUM(Δp) = 0.0024	$\Delta p \rightarrow h$ LM = 3.25[0.10] t-statistic = 4.59[0.00]	18.85*	0.00
Δp $R^2 = 0.15$ SEE = 0.000033 SUM(h) = 0.0946 (Lags = 3)	$h \nrightarrow \Delta p$ LM = 3.60[0.09] t-statistic = 1.47[0.14]	1.58	0.14
h $R^2 = 0.38$ SEE = 0.000047 SUM(Δp) = 0.057	$\Delta p \rightarrow h$ LM = 3.71[0.08] t-statistic = 2.94[0.01]	16.84*	0.00

Table 2 (continued)

Dependent Variable	Tested Restrictions	F-Tests	p-values
Japan (Lags = 4)			
h	$\Delta p \rightarrow h$	9.17*	0.00
$R^2 = 0.41$ SEE = 0.000005	LM = 1.16[0.49]		
SUM(Δp) = 0.0078	t-statistic = 3.03[0.00]		
Δp	$h \nrightarrow \Delta p$	0.009	0.92
$R^2 = 0.34$ SEE = 0.003087	LM = 2.14[0.29]		
SUM(h) = 0.0948	t-statistic = 0.09[0.92]		
(Lags = 8)			
h	$\Delta p \rightarrow h$	21.96*	0.00
$R^2 = 0.53$ SEE = 0.000005	LM = 0.27[0.81]		
SUM(Δp) = 0.0104	t-statistic = 2.68[0.00]		
Δp	$h \nrightarrow \Delta p$	0.63	0.43
$R^2 = 0.39$ SEE = 0.002982	LM = 1.67[0.59]		
SUM(h) = 0.0231	t-statistic = 1.18[0.24]		
(Lags = 2)			
h	$\Delta p \rightarrow h$	12.37*	0.00
$R^2 = 0.83$ SEE = 0.000004	LM = 2.55[0.10]		
SUM(Δp) = 0.059	t-statistic = 3.36[0.00]		
Δp	$h \nrightarrow \Delta p$	0.09	0.76
$R^2 = 0.37$ SEE = 0.003062	LM = 1.85[0.42]		
SUM(h) = 0.0245	t-statistic = 0.31[0.71]		
Canada (Lags = 5)			
h	$\Delta p \rightarrow h$	5.05*	0.00
$R^2 = 0.48$ SEE = 0.000006	LM = 0.95[0.79]		
SUM(Δp) = 0.0771	t-statistic = 2.22[0.03]		
Δp	$h \nrightarrow \Delta p$	1.19	0.28
$R^2 = 0.62$ SEE = 0.002793	LM = 1.06[0.47]		

Table 2 (continued)

Dependent Variable	Tested Restrictions	F - Tests	p - values
Δp $R^2 = 0.28$ SEE = 0.002769 SUM(h) = 0.0022 (Lags = 2)	$h \nrightarrow \Delta p$ LM = 0.89[0.73] t-statistic = 1.02[0.27]	1.54	0.22
h $R^2 = 0.26$ SEE = 0.000006 SUM(Δp) = 0.079	$\Delta p \rightarrow h$ LM = 0.96[0.55] t-statistic = 3.01[0.00]	9.06*	0.00
Δp $R^2 = 0.61$ SEE = 0.00283 SUM(h) = 0.0356	$h \nrightarrow \Delta p$ LM = 1.11[0.42] t-statistic = 0.73[0.46]	0.53	0.47
Greece (Lags = 5)			
h $R^2 = 0.63$ SEE = 0.000067 SUM(Δp) = 0.1103	$\Delta p \rightarrow h$ LM = 0.89[0.61] t-statistic = 3.75[0.00]	11.8*	0.00
Δp $R^2 = 0.44$ SEE = 0.010896 SUM(h) = 0.0017 (Lags = 8)	$h \nrightarrow \Delta p$ LM = 1.28[0.37] t-statistic = 1.25[0.21]	0.24	0.63
h $R^2 = 0.31$ SEE = 0.000067 SUM(Δp) = 0.2651	$\Delta p \rightarrow h$ LM = 0.74[0.69] t-statistic = 5.46[0.00]	26.71*	0.00
Δp $R^2 = 0.58$ SEE = 0.009632 SUM(h) = 0.0012 (Lags = 2)	$h \nrightarrow \Delta p$ LM = 1.05[0.44] t-statistic = 1.09[0.33]	0.93	0.38
h $R^2 = 0.65$ SEE = 0.000071 SUM(Δp) = 0.025	$\Delta p \rightarrow h$ LM = 2.02[0.14] t-statistic = 4.11[0.00]	10.05*	0.00

robustness of the finding that inflation uncertainty does not cause inflation, ARCH-M models were estimated where lagged conditional variance terms (h) have been explicitly included in the inflation equation.⁵ The results are shown in Table 3. In all nine cases examined, lagged h terms appear to be statistically insignificant, implying the empirical findings found in Table 2 about the impotency of inflation uncertainty to cause inflation.

The unidirectional causality running from inflation to inflation uncertainty observed only in the cases of the UK, Switzerland, Japan, Canada, and Greece implies that greater uncertainty is part of inflation costs Holland [1995] only in these countries. The fact that the UK joined the system in 1990 does not expiate the case from the results that hold for non-EMS countries.

Why do the causality results differ between EMS and non-EMS countries? Regrettably, no a satisfactory explanation could be given at this point, apart from that agents in these countries feel anxious that monetary policy activities are expected to create higher inflation and, thus, lower unemployment, implying higher inflation uncertainty. It is commonly accepted that non-EMS countries are not restricted to pursue a monetary policy tightly associated with an exchange rate target. Therefore, in case, say, of an adverse economic shock, monetary activities are expected to lead to more frequent monetary surprises to support output levels and, thus, to create higher uncertainty about the future path of inflation. Racette and Raynauld [1992] and Serletis and King [1993] have also argued that monetary targeting in Canada appears to be problematic due to the failure of the reserve requirements system.

Moreover, as a referee raised this issue, despite the fact that central banks in Germany as well as in Switzerland are counted among the most independent in the industrialised world, the fact is that the two central

Table 3 (continued)

<p>UK</p> $\Delta p = 0.289 \Delta p(-3) + 0.06 \Delta w(-1) + 0.177 \Delta w(-2) + 0.01 \Delta m(-1) + 0.014 \Delta poecd(-3)$ <p style="text-align: center;">(3.27)* (2.69)* (6.29)* (3.43)* (17.6)*</p> $-0.086 \Delta prod(-1) - 0.047 EC(-1) - 0.0066 DUM12 - 0.102 DUM13 + 0.077 h(-1)$ <p style="text-align: center;">(-13.4)* (-4.84)* (-2.98)* (-3.67)* (0.83)</p> $+ 0.226 h(-2) - 0.01 h(-3) - 0.117 h(-4)$ <p style="text-align: center;">(1.27) (-0.09) (-1.05)</p> $h = 0.000071 + 0.154 \varepsilon^2(-1)$ <p style="text-align: center;">(3.35)* (3.78)*</p>
<p>Italy</p> $\Delta p = 0.132 + 0.127 \Delta p(-1) + 0.117 \Delta p(-2) + 0.085 \Delta m(-2) + 0.259 \Delta w(-3)$ <p style="text-align: center;">(2.77)* (2.25)* (2.33)* (3.49)* (4.01)*</p> $+ 0.079 \Delta poecd(-4) - 0.057 \Delta pr(-1) - 0.369 EC(-1) - 0.0109 DUM14$ <p style="text-align: center;">(3.06)* (-21.6)* (-7.94)* (-3.41)*</p> $- 0.0085 DUM15 - 0.0036 DUM17 - 0.0061 DUM18 - 0.234 h(-1)$ <p style="text-align: center;">(-4.05)* (-3.26)* (-3.81)* (0.09)</p> $+ 0.101 h(-2) + 0.358 h(-3) + 0.104 h(-4) - 0.088 h(-5) + 0.155 h(-6)$ <p style="text-align: center;">(0.16) (0.14) (0.15) (-0.03) (0.17)</p> $+ 0.126 h(-7)$ <p style="text-align: center;">(0.18)</p> $h = 0.000023 + 0.093 \varepsilon^2(-1)$ <p style="text-align: center;">(9.01)* (17.1)*</p>
<p>Switzerland</p> $\Delta p = 0.164 \Delta p(-1) + 0.119 \Delta m(-1) + 0.339 \Delta m(-2) + 0.152 \Delta poecd(-4)$ <p style="text-align: center;">(2.51)* (3.01)* (2.53)* (2.39)*</p>

Table 3 (continued)

<p>Japan</p> $\Delta p = 0.36 \Delta p(-1) + 0.011 \Delta poecd(-2) + 0.057 \Delta m(-3) + 0.021 \Delta w(-2) - 0.475 EC(-1)$ <p style="text-align: center;">(2.96)* (6.02)* (2.37)* (4.33)* (-3.33)*</p> $+ 0.114 h(-1) + 0.03 h(-2) + 0.157 h(-3) + 0.488 h(-4)$ <p style="text-align: center;">(0.19) (0.54) (0.31) (0.74)</p> $h = 0.00086 + 0.125 \varepsilon^2(-1)$ <p style="text-align: center;">(7.74)* (4.36)*</p>
<p>Canada</p> $\Delta p = 0.661 \Delta p(-2) + 0.047 \Delta poecd(-1) + 0.073 \Delta m(-1) + 0.151 \Delta w(-2) - 0.15 EC(-1)$ <p style="text-align: center;">(2.71)* (2.91)* (3.11)* (7.33)* (-4.50)*</p> $+ 0.239 DUMC + 0.087 h(-1) + 0.456 h(-2) + 0.361 h(-3) + 0.036 h(-4)$ <p style="text-align: center;">(2.75)* (0.12) (0.71) (0.05) (0.04)</p> $h = 0.000308 + 0.263 \varepsilon^2(-1)$ <p style="text-align: center;">(2.56)* (4.21)*</p>
<p>Greece</p> $\Delta p = 0.27 \Delta p(-2) + 0.026 \Delta poecd(-1) + 0.081 \Delta m(-1) + 0.092 \Delta m(-2)$ <p style="text-align: center;">(2.88)* (8.31)* (3.99)* (3.60)*</p> $- 0.229 EC(-1) + 0.181 DUMG + 0.321 h(-1) + 0.251 h(-2) + 0.069 h(-3)$ <p style="text-align: center;">(-2.93)* (2.19)* (1.25) (0.52) (0.05)</p> $h = 0.00012 + 0.453 \varepsilon^2(-1)$ <p style="text-align: center;">(7.13)* (8.33)*</p>

Notes: The number of lags for the h terms was determined through the Akaike FPE criterion.

* significant at 5%

tary control and therefore to higher inflation and inflation uncertainty. Finally, for the case of Japan, Hutchison and Judd [1992] argue that the information -relative to the maintenance of the monetary rule-provided by the central bank has been virtually ineffective in reducing money surprises. This limited capability by the Japanese monetary authorities to control money surprises could have contributed to higher inflation uncertainty and preventing individuals and firms from reaching the appropriate economic decisions in terms of efficiency.

III. Concluding Remarks

This study has attempted to examine the link between inflation and inflation uncertainty in five EMS countries and five non-EMS country over the period 1980 to 1994. The empirical findings indicated that for Germany, France, Ireland, and Italy, the EMS country sub-sample, inflation does not seem to determine the behaviour of inflation uncertainty, while this is not the case for the UK, Switzerland, Japan, Canada, and Greece, the non-EMS country sub-sample.

A possible explanation for the reported differentiation in the empirical findings is that for EMS countries inflation rates do not seem to contribute to inflation uncertainty because the public is not so uncertain about the course of future monetary policy, since the monetary authorities are expected to remain closely to the maintenance of an exchange rate target, i.e., thus, gaining higher credibility. This is not, however, the case for the non-EMS countries. In these cases the public feels that the central bank will not bear the cost of bringing the inflation down by creating recessionary conditions. The presence of recessionary conditions could tempt policy makers to use the exchange rate in the wrong way, for example, by depreciating the

References

- Amoako-Adu, B. and Smith, B. F., [1995], "The Wealth Effects of Deregulation of Canadian Financial Institutions," *Journal of Banking and Finance* 19; pp. 1211-1236.
- Apergis, N., [1997], "Inflation Uncertainty, Money Demand, and Monetary Deregulation: Evidence from a Univariate ARCH Model and Cointegration Tests," *Journal of Policy Modeling* 19; pp. 279-293.
- Apergis, N., Papanastasiou, J., and Velentzas, K., [1997], "The Credibility of Policy Announcements: Greek Evidence," *Applied Economics* 29; pp. 699-705.
- Argy, V., [1982], "Exchange-Rate Management in Theory and Practice," *Princeton Studies in International Finance*, No. 50.
- Ball, L., [1992], "Why Does High Inflation Raise Inflation Uncertainty?," *Journal of Monetary Economics* 29; pp. 371-388.
- Ball, L. and Cecchetti, S.G., [1990], "Inflation and Uncertainty at Short and Long Horizons," *Brookings Papers on Economic Activity* 1; pp. 215-254.
- Branson, W. H., [1981], *Leaning Against the Wind as Exchange Rate Policy*, Graduate Institute of International Studies.
- Brunner, A. D. and Hess, G. D. [1993], "Are Higher Levels of Inflation Less predictable? A State-Dependent Conditional Heteroskedasticity Approach," *Journal of Business and Economic Statistics* 11; pp. 187-198.
- Christiano, L. J. and Ljungqvist, L. [1988], "Money does Granger-cause Output in the Bivariate Money-Output Relation," *Journal of Monetary Economics* 22; pp. 217-235.
- Dueker, M. And Fischer, A. M. [1996], "Inflation Targeting in a Small Open Economy: Empirical Results for Switzerland," *Journal of Monetary Economics* 37; pp. 89-103.

- Inflation Uncertainty," *Journal of Money, Credit, and Banking* 25; pp. 475-511.
- Friedman, M. [1977], "Nobel Lecture: Inflation and Unemployment," *Journal of Political Economy* 85; pp. 451-472.
- Froyen, R. and Waud, R. N. [1987], "An Examination of Aggregate Price Uncertainty in Four Countries and Some Implications for Real Output," *International Economic Review* 28; pp. 353-373.
- Golob, J.E. [1993], "Inflation, Inflation Uncertainty, and Relative Price Variability: A Survey," *Federal Reserve Bank of Kansas City, Working Paper*; pp. 93-15.
- Holland, S. A. [1995], "Inflation and Uncertainty: Tests for Temporal Ordering," *Journal of Money, Credit, and Banking* 27; pp. 827-837.
- Hutchison, M. And Judd, J.P. [1992], "Central Bank Secrecy and Money Surprises: International Evidence," *The Review of Economics and Statistics*; pp. 135-145.
- Johansen, S. and Juselius, K. [1990], "Maximum Likelihood Estimation and Inference on Cointegration-With Applications to the Demand for Money," *Oxford Bulletin of Economics and Statistics* 52; pp. 169-210.
- Okun, A. M. [1971], "The Mirage of Steady Inflation," *Brookings Papers on Economic Activity* 2; pp. 486-498.
- Racette, D. and Raynauld, J. [1992], "Canadian Monetary Policy: Will the Checklist Approach Ever Get US to Price Stability?," *Canadian Journal of Economics* 25; pp. 819-838.
- Sauer, C. and Bohara, A.K. [1995], "Monetary Policy and Inflation Uncertainty in the United States and Germany," *Southern Economic Journal* 62; pp. 139-163.
- Serletis, A. And King, M. [1993], "The Role of Money in Canada," *Journal of Macroeconomics* 15; pp. 91-107.