The 'Walters Critique' of the EMS - A Case of Inconsistent Expectations*

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October 1990

No. 363

Abstract

Alan Walters has suggested that the European Monetary System will prove dynamically unstable when capital controls are removed. The argument is analysed within a model which includes overlapping contracts. It is found that the short run effects predicted by Walters only arise when the credibility of the peg differs as between the labour and financial markets: but even if such a difference exists the system is stable in the long run.

*This paper has been produced as part of the ESRC Research Project on "The International Monetary System: An Analysis of Alternative Regimes" and we are grateful for the resources provided under grant No. R000231417. It has developed from previous work done jointly with Luisa Lambertini and we are happy to acknowledge the benefit of this collaboration. We are grateful for comments received at the Money Study Group conference in September 1990. This paper is circulated for discussion purposes only and its contents should be considered preliminary.

Introduction

Monetary targets lost their credibility as an anti-inflationary anchor for the UK by the mid 1980's - largely due to the impact of financial deregulation. But it was not until 1990 that the British Government finally applied for full membership of the EMS as an alternative anti-inflationary commitment.

Nigel Lawson, Chancellor of the Exchequer from 1983 to 1989, took advantage of the occasion to state publicly (what is generally accepted) that the delay was not of his choosing. Writing in the Financial Times of 8th October 1990 he recalled, "When I first became Chancellor in 1983 I reviewed the policies then in place, and the range of instruments at my disposal, and concluded that I should set myself three key targets, a balanced budget, tax reform and the entry of sterling into the exchange rate mechanism of the EMS. Over the years the first two of these were achieved but the third consistently eluded me. Needless to say this was not for want of trying, but I was unable to overcome the deep-seated opposition of the Prime Minister."

It was indeed widely known that Mrs Thatcher opposed the "loss of sovereignty" associated with entry into the EMS. In addition she had as her own personal economic adviser, Sir Alan Walters who was one of the most outspoken sceptics of the capacity of the EMS to check inflation without capital controls. Walters had expressed his own misgivings in an assessment of Mrs Thatcher's achievements published in 1986, and he further elaborated on what had become known as "the Walters critique" in another book published soon after the heated debate which led both the Chancellor and himself to resign their posts. As evidence

in favour of his position, Walters there cites the rise in UK inflation following upon Lawson's attempt to shadow the DM from 1987 to 1988, and the inflationary boom experienced in Spain since it joined in 1989.

It is the "Walters critique" that we describe and then analyse in this paper, so as to see what validity it may have, and whether it does indeed constitute a "fundamental, even fatal, flaw" in the EMS as he alleges. The discussion turns on the conditions for success in achieving a transition of regime (from monetary targets to an exchange rate peg), and we adopt a dynamic framework which allows one to study both impact effects and longer run dynamics (under varying assumptions as to how expectations adjust to the regime switch). Expectations are allowed to have a direct effect on financial markets via arbitrage, and also on labour markets, via their effect on contracts. The overlapping contracts framework adopted here is not, of course, intended accurately to represent the institutions of UK wage/price behaviour; it is intended as a useful device for combining regime-dependent expectations with a sluggish price level; see Miller and Sutherland (1990) and Lambertini et al (1990) for previous applications of this framework. A recent paper by Giavazzi and Spaventa (1990) also analyses the stability of the EMS when capital controls removed. But the framework they use assumes adaptive expectations and this rules out any direct impact on wage setting from the switch in monetary regime.

In our framework we find that a country which enters the EMS with above average inflation will successfully eliminate inflation if the regime switch is fully credible with agents in all sectors of the economy. However, the Walters effect can indeed emerge if expectations as to the nature of the regime switch held in financial

markets are "inconsistent" with those held in labour markets - specifically when financial markets adjust immediately but labour markets do not.

In conclusion it is acknowledged that Walters has given timely warning of problems that may have to be faced in the transition to a new regime if credibility is slow to build in labour markets. But the claim that there is a fatal flaw in the EMS is rejected for two reasons. Firstly, because over time inflation is squeezed by falling competitiveness (a point also emphasised by Giavazzi and Spaventa). And secondly because it seems inappropriate to assess the viability of a regime on the assumption that expectations are permanently inconsistent, as Walters himself has argued on a previous occasion.

1. The Walters Critique.

The "fundamental flaw" which Walters claims to find in the EMS is that the declared objective of producing inflation convergence, at fixed exchange rates between member countries, will be undermined by the freedom of capital movements to which they are also committed. The argument is simply that, in the absence of expected exchange rate changes, arbitrage will reduce interest differentials to zero; and that this will cause inflation rates to diverge.

In his words "The EMS forces countries to have the same nominal interest rates. If, however, Italy is inflating at a rate of 7% and Germany at a rate of 2% (both over the relevant period of [exchange rate] fixing) then there is a problem of perversity. With the same interest rate at say 5% the <u>real</u> interest rate for Italy is <u>minus</u> 2% and for Germany plus 3%. Thus Italy will have an expansionary

monetary policy, while Germany will pursue one of restraint. But this will exacerbate inflation in Italy and yet restrain further the already low inflation in Germany. This is the opposite of 'convergence', namely it induces divergence" Walters (1990, pp. 79-80).

This critique was first developed in 1986 when, as he acknowledged, there were "Substantial restraints on the free flow of capital - particularly by France and Italy - so that arbitrage is nowhere near perfect. [Consequently] ...regulation of capital flows has enabled considerable deviations in interest rates between member countries, so the countries have been able to pursue more appropriate monetary policies than those which were implied by a strict EMS". Walters (1986, p. 127).

Since that time, however, the capital controls in question have been largely abolished. Walters notes, however, that prospects of stochastic realignment of central rates may achieve much of the same effect, even where there is perfect freedom of capital movements. Thus he writes "It is usually quite easy to predict the direction of the realignment... Thus the shadow of devaluation is cast forward in time and increases interest rates in Italy relative to those in Germany. But whether that devaluation shadow effect is consistent with what a prudential finance minister would require to cope with domestic conditions in Italy is another matter". Walters (1990, p. 81)

While he does not say specifically whether these realignment premia in nominal interest rates completely offset the real interest effects which lie at the heart of his critique, he does go on to observe "it is odd that it is the uncertainty of

exchange rates in the ERM that makes it possible for Italy to pursue disinflationary monetary policies and for Germany to avoid inflationary ones. The EMS was to be an island of stability and certainty in a sea of floating flotsam. But it is only the uncertainty that keeps it above water" (1990, pp. 81-82).

Now there seems little doubt that, other things remaining equal, a lowering of real interest rates in inflation prone countries (and vice versa for those with low inflation) will tend to exacerbate inflation differentials as Walters argues. But to see whether this amounts to a "fundamental, even fatal, flaw in the EMS" surely requires an explicit analysis of the dynamics of inflation.

2. Exchange rate pegs and Calvo contracts.

The effect of exchange rate commitments in financial markets shows up in interest differentials, but to allow for the direct impact of future events on current wages while retaining the notion of nominal inertia we adopt the continuous time model proposed by Calvo (1983a, 1983b). In this model individual labour contracts behave like forward looking asset prices, and the price level is assumed to be a simple weighted average of past wage contracts. The fact that these labour contracts overlap ensures that there is inertia in the aggregate price level.

a) A fully credible currency peg.

Formally the Calvo model with a fixed exchange rate consists of the following equations

$$p(t) = \delta \int_{-\infty}^{t} x(\tau) e^{-\delta(t-\tau)} d\tau \qquad \text{or} \qquad Dp = \delta(x - p) \tag{1}$$

$$x(t) = \delta E_t \int_{t}^{\infty} [p(\tau) + \beta y(\tau)] e^{-\delta(\tau - t)} d\tau \quad \text{or} \quad Dx = \delta(x - p - \beta y) \tag{2}$$

$$E_t[Ds] = (i - i^*) = 0 \tag{3}$$

$$y = -\gamma(i - E_t[Dp]) + \eta(\bar{s} - p + p^*) \tag{4}$$

where p=log of the price level

x=log of the current new contract

y=log of output

s=log of the exchange rate (domestic units per unit of foreign currency)

i=nominal interest rate

* indicates a foreign variable

D=time differential operator

E_t=expectation conditional on time t information.

In equation (1) the current price level is given as an average of all outstanding contracts. The current new contract is a forward looking integral of expected future prices and demand pressure as shown in equation (2). Equation (3) is the usual international arbitrage equation while equation (4) is the IS relationship. The exchange rate is fixed at $\bar{s}$.

The model can be reduced to the following set of two dynamic equations

$$\begin{bmatrix} Dp \\ Dx \end{bmatrix} = A \begin{bmatrix} p \\ x \end{bmatrix} + \begin{bmatrix} 0 \\ -\beta\delta\eta \end{bmatrix} \bar{s}, \qquad A = \begin{bmatrix} -\delta & \delta \\ -\delta[1 - \beta(\delta\gamma + \eta)] & \delta[1 - \beta\delta\gamma] \end{bmatrix} \tag{5}$$

where for convenience it is assumed that $i^*=p^*=0$.

It may readily be confirmed that the model has saddlepoint dynamics and Figure 1 illustrates the solution for $\dot{\bar{s}}=0$ where the forward looking contract lies on the stable manifold marked CC which passes through the point of equilibrium at the origin. The stable manifold may be either upward or downward sloping depending on the parameters of the model, but in any case its slope must be less than 45^0 (see Appendix 1).

[Figure 1 near here]

b) A peg that is not fully credible.

To capture the lack of full credibility in this model, we start by assuming that there is a perceived constant probability of a J% devaluation in financial and labour markets: so the exchange rate peg suffers from a "peso problem". That such a modification of the Calvo model is necessary in considering UK entry to the ERM is suggested by the Prime Minister's statement at the Dublin meeting of the EC where she said, "should you come up against the upper limit it is... ...possible, or the lower limit for that matter, to have one of those weekend sessions when you alter the valuation of the currency. So there is no locking at all and it would not work if there were." (Financial Times, 2nd July 1990).

To represent the Walters critique, however, we find it necessary to allow for different devaluation expectations in different markets; so the perceived probability

of J% devaluation (per unit of time) is denoted by π in labour markets and π' in financial markets. In the currency market the expected rate of change of the exchange rate is $\pi'J$ so the arbitrage equation therefore becomes

$$\pi'J = (i - i^*). \tag{6}$$

The domestic nominal interest rate must therefore exceed the foreign rate by $\pi'J$%.

In the labour market the expectation of realignments affects the forward-looking contract (defined in integral (2)) by modifying expected future prices and demand levels. The rate of change of x, conditional on the current parity, is now

$$Dx = \delta(x - p - \beta y) - (1 - \theta_s)\pi J \tag{7}$$

where θ_s is the slope of the stable eigenvector of matrix A. The model with stochastic realignments that are expected (but never occur) consists of equations (1), (4), (6) and (7) and can be reduced to the following set of two differential equations in p and x

$$\begin{bmatrix} Dp \\ Dx \end{bmatrix} = A\begin{bmatrix} p \\ x \end{bmatrix} + \begin{bmatrix} 0 \\ b \end{bmatrix} \tag{8}$$

where A is as for equation (5), $b = ((\theta_s - 1)\pi + \delta\beta\gamma\pi')J - \beta\delta\eta\bar{s}$ and $\bar{s}$ is the current parity.

As can be seen the effect of the expected realignments is to add an extra constant term which shifts the "equilibrium" of the model to the north-east along the 45^0 line. In Figure 1 the new equilibrium is marked E' with associated manifold C'C' which has the same slope as CC.

3. The Impact Effects of a Switch from a Downwards Float to a Fixed Peg.

This framework can now be used to consider the effect of changing from a floating to a fixed exchange rate regime. Assume that prior to the regime change there is an inflationary equilibrium with money and prices growing at the constant rate μ. In Figure 2 this is represented by a steady crawl up the 45^0 line marked FF (where FF is derived from the expression $Dp=\mu=\delta(x-p)$). Now let there be an unanticipated switch to a pegged rate, so $s = \bar{s}$ henceforth.

[Figure 2 near here]

a) When the peg is fully credible ($\pi'=\pi=0$).

If the peg is set so that $\bar{s} = 0$, and no realignments are expected, then the constant term in equation (8) vanishes, so both contracts and the price level must converge to zero. In Figure 2 the regime switch involves leaving the schedule FF described above and jumping to the stable manifold labelled CC, which has an equilibrium at the origin, labelled O. But if, as we assume here, the rate is pegged when the real exchange rate is at its equilibrium value, there will be an immediate adjustment to non-inflationary equilibrium, from point A on FF to the origin in the figure. (The case where the peg is set at $\bar{\bar{s}} < 0$ when p=0, so the currency is

'overvalued', is discussed further below. Note that the way we define the exchange rate means that a fall in s is an appreciation in the external value of the domestic currency.)

So when the unexpected policy change is fully and instantly credible (and the peg involves no exchange rate misalignment), inflation disappears without any disruption to output or real interest rates. Given a nominal anchor against a non-inflationary partner and the right real exchange rate, labour markets forecast full employment without inflation: so current and future contracts are set equal to the current price level. In financial markets, the inflation premium disappears from nominal rates, but real interest rates remain unchanged.

These results for the open economy parallel those reported by Blanchard and Fischer (1989) for a closed economy with Calvo contracts. They note that "if expected inflation did not affect aggregate demand, a change in monetary growth would be matched by a simultaneous (change) in inflation, with no effects on real output: this would be the case although most individual prices would not move at the time of change. The result is... ...another warning that individual price stickiness does not necessarily imply the non-neutrality of money". (p.551).

That inflation may disappear so painlessly may seem too good to be true, however; as we find where we allow for the possibility that the peg is less than fully credible.

b) When the peg is not fully credible.

When the assumption that the shift in exchange rate regime is instantly credible is reversed, not surprisingly, inflation turns out to be more persistent. In this section, we study the consequences of this lack of credibility in order to determine whether it can generate the impact effects that Walters predicts?

We begin by assuming the degree of scepticism is the same in financial and labour markets (so $\pi'=\pi$) and see what would happen on impact were markets sufficiently cynical to expect adjustments of the peg frequent enough to match (on average) the previous rate of depreciation under floating (i.e. $\pi J=\mu$)! Intuition suggests that, in these circumstances, there should be no impact effect; with inflation expectations unchanged there should be no change to contracts, nor to nominal interest rates. Indeed, as shown in Appendix 1, the schedule giving the path of adjustment shifts up and passes through point A, i.e. it has a vertical intercept of μ/δ, see the schedule AE_A in Figure 2. So inflation is unchanged at the time the peg is put in place. (Note that while the total lack of credibility may rule out any <u>impact</u> effects on inflation, it will not prevent a squeeze on inflation developing later, as discussed in Section 4.)

More generally, as is also shown in Appendix 1, pegging in the face of imperfect credibility shifts CC upwards to cut the vertical axis at $\pi J/\delta$. In short, <u>the inflation rate on impact will adjust so as to precisely match the perceived realignment prospect per unit time</u>. By arbitrage, nominal interest rates will adjust to the same degree, so real interest rates will remain unchanged. Where labour markets are forward looking and make the same forecasts about policy as financial

markets, it turns out that real interest rates are not affected by exchange rate pegging in the way Walters predicts.

But what if one allows for different forecasts in the two markets? Assume, for example, that the financial market attaches full credibility to the policy shift (so $\pi'=0$); but labour markets make essentially no adjustment at all, (setting $\pi J=\mu$). Nominal interest rates must, by arbitrage, fall to match those overseas, but there is no matching downward pressure on inflation, so real interest rates will surely fall. Indeed we find that the schedule CC now shifts up until it has a vertical intercept above A in Figure 2 (see schedule BE_B). So the impact effect in this case is, as Walters suggests, one of inflation divergence, not convergence.

Now consider what happens if expectations in the labour market also adjust but not fully (so $\mu>\pi J>0$). Real interest rates must still fall on impact, because any difference in response ($\pi-\pi'>0$) is sufficient for this (see Appendix 1). But it is no longer certain that the inflation rate will "diverge": for that the inconsistency between the markets must be above a certain critical level. Otherwise the stimulus to inflation coming indirectly from the fall in the real interest rate will be offset by the direct effect that the fall in devaluation expectations has on wage settlements (as is also confirmed in Appendix 1).

We conclude therefore that "inconsistency of expectations" between markets ensures the "perverse" real interest rate effects that Walters predicts; but it is no guarantee of inflation divergence - the latter remains an unpleasant possibility

when expectations of wage setters adjust significantly less than in financial markets. (Whether this is a "fatal flaw" depends on how inflation behaves as time evolves - an issue explored in Section 4 below).

c) Choosing the peg to offset the initial divergence of inflation.

One way of checking any initial surge in inflation is to peg the currency at a higher value than under a free float, i.e. cause an immediate appreciation of the currency to such an extent that the inflation divergence is offset by the overvaluation of the currency. In terms of Figure 2, this involves choosing a value for the peg, $\bar{\bar{s}} < 0$, sufficient to shift the stable manifold downwards so the point B falls to the level μ/δ. The effect of changing the peg on CC itself would be to shift the point of equilibrium from O to O'. (Algebraically the value of the peg necessary to achieve this is $\bar{\bar{s}} = -\gamma\mu/\eta$, see Appendix 1).

In circumstances where entry is widely anticipated, such an overvalued rate of entry will affect the floating rate beforehand, so the squeeze on inflation will begin before interest rates are cut. Could it be that the choice of exchange rate for UK entry to the ERM owed something to the perceived need to check the Walters effect?

4. Equilibrium and Quasi-Equilibrium with a Fixed Peg.

So far we have focussed on what happens at the time of the regime switch itself. Consider now what happens as time proceeds with the peg in place.

a) When any expectations adjustment is once-and-for-all.

Where the switch is fully credible and takes place without any change to the real exchange rate there is not much more to add. As already described, current and future contracts now embody expectations of stable prices and the fall in the level of these contracts stops inflation dead in its tracks: nominal interest rates fall pari passu. So the impact effect is also the 'long run' effect with no further change in output, prices or interest rates. If this is any approximation to reality, it explains why central bankers in Italy and France are so keen to emphasise their opposition to any future realignments.

What if pegging the exchange rate causes no disturbance to the real exchange rate, but the regime switch fails to command credibility? In this case we find that the real exchange rate gravitates to a different equilibrium where prices are stable, but there is a recession offsetting the persistent upward pressure on prices (caused by expectations of devaluation in the labour market).

Consider, for example, the case where there is total scepticism about the peg in both financial and labour markets; so contracts show no impact effect, remaining at point A in Figure 2. If the peg is nonetheless maintained, future labour contracts must leave the schedule FF and move along the stable manifold until they reach the non-inflationary equilibrium at E_A. At this point the upward pressure on contracts, measured by the term $(1-\theta_s)\pi J=(1-\theta_s)\mu$ in equation (7), must be exactly offset by a recession in output, so $y=-(1-\theta_s)\mu/\delta\beta$, where output is squeezed by the combined effect of high real interest rates and an 'uncompetitive' real exchange rate. Real interest rates are high because financial markets keep nominal rates up despite the

fall in inflation; competitiveness is low because prices have risen without any adjustment in the peg. We may refer to this as a "quasi-equilibrium" as it involves a persistent discrepancy between what the markets expect (depreciation) and what actually happens (an immutably fixed peg). (The price level, p_A, at this new quasi-equilibrium is given formally in Appendix 1.)

Now consider the case (which seems closest to what Walters argues) where expectations in financial markets adjust immediately but in labour markets never do ($\pi'J=0$, $\pi J=\mu$). As already shown, this involves an initial divergence of inflation, as falling nominal rates cut real interest rate and stimulate real demand. But the subsequent evolution of the system ensures that this initial divergence (caused by the jump from A to B in the figure) is steadily reversed as contracts and prices proceed along the stable manifold to the quasi-equilibrium at E_B. Along the path from B to E_B real interest rates are gradually increasing and the real exchange rate becomes increasingly uncompetitive.

At the point of rest, the upward pressure on wage contracts must be the same as at E_A, namely $(1-\theta_s)\mu$, and so the recession needed to offset this will also be the same. But this recession must come entirely from an overvalued exchange rate (since real interest rates will have moved back in line with those overseas). So the price level has to move higher than otherwise, i.e. $p_B>p_A$ (see Appendix 1).

We conclude that the system is <u>stable</u> even when it does not command complete credibility. So inflation converges to zero in the long run in all cases, even

when the lack of response in labour market expectations causes it to diverge on impact.

b) When expectations adjust over time.

As these quasi-equilibria (at E_A and E_B) have the characteristic that people persistently expect something which will, by assumption, never happen, they are not rational expectations equilibrium. One way of bringing expectations and reality into line would be to incorporate actual exchange rate realignments, an avenue pursued in Lambertini et al (1990). The alternative explored briefly here is to leave the peg unchanged and let expectations adjust.

Perhaps the simplest way of achieving this would be by a fixed delay - with a period of no adjustment followed by complete adjustment. Thus when the rate is pegged, expectations in financial markets adjust immediately; but labour markets only follow after a fixed lag. The consequence is easy to see using Figure 2. Until labour markets revise πJ (from μ to zero), contracts and prices will move from B towards quasi-equilibrium at E_B. At the time of adjustment, contracts will drop from the point labelled L on to CC; and from then on proceed to the rational expectations equilibrium at the origin.

Of course this account will involve a sharp drop in the rate of inflation at a specific "moment of truth". Perhaps a smoother pattern of adjustment would be more plausible. Without specifying a formal model of 'learning', one can postulate a gradual adjustment of the expectations to achieve this smoothing. If for example the perceived probability of realignment decays exponentially towards zero, the quasi-

equilibrium will also then subside towards the origin. Over time therefore contracts will be subject to two forces: first is the tendency to converge towards the quasi-equilibrium; second is the tendency of the latter to shift downwards. The outcome of these two forces will be a curved path leading from A towards the origin shown as a dotted line in Figure 2. (See Appendix 2 for a formal analysis.)

The way in which expectations adjust may well be more complicated than either of these accounts. But the point to be emphasised is that for assessing the long run characteristics of a regime it seems sensible to assume that expectations do converge to reality. As warrant for such an argument, we can cite an earlier paper by Alan Walters (1971), where he argued that the pattern of expectations to be assumed in analysing the operations of monetary policies should be 'consistent' with the policy itself. The same logic applied here would rule out the Walters critique as an inherent flaw in the EMS!

Conclusion

The Walters critique of the EMS seems to hinge on the credibility associated with a switch to a pegged exchange rate regime, and we have used a framework which allows for the regime change to have direct effects on expectations in labour markets and financial markets. To obtain the 'perverse' real interest rate effects he predicts, however, we find that a degree of asymmetry between markets is required - with the expectations in labour markets responding less than in financial markets[1]. For inflation to actually diverge on impact also requires a sufficiently sluggish

[1]But perhaps he attaches too much significance to the short run real interest rate: for even if the short run real rate goes negative, that is not true of the long run real rate, which foresees the fall in inflation that is to come.

response of labour market expectations (and no pre-emptive choice of an overvalued peg on entry).

We agree that Walters has highlighted potential short term pressures on interest rates and inflation which may surprise and embarrass those trying to engineer a regime switch. Indeed the choice of a relatively high central rate for UK entry may owe something to the perceived need to head off just such pressures.

But his claim to have identified a fundamental flaw in the EMS, as an anti-inflationary mechanism, appears to ignore two crucial factors. The first is that rising prices at fixed exchange rates tend to reduce demand for domestic goods and cause a recession; and this will be anti-inflationary. Second the asymmetry in expectations will surely tend to diminish over time; particularly if the authorities refuse to accommodate inflationary wage settlements with devaluations. The force of the first point is in fact conceded by Walters in his discussion of Giavazzi and Spaventa's paper, see Walters (1990, pp. 82-83). As for the second, we can appeal to his own argument that an adequate analysis of monetary regimes should be based on what he called "consistent expectations", see Walters (1971).

The framework provided in this paper is capable of generating the impact effects that Walters predicts without entailing his own paradoxical conclusion - that the EMS only survives because people in financial markets do not believe in it! It suggests instead that the system is stable - and will converge more quickly to equilibrium as labour markets come to believe in it.

Appendix 1: Dynamics of adjustment with fixed realignment probabilities.

Let the evolution of the price level and of individual contracts be as described in equation (8), namely

$$\begin{bmatrix} Dp \\ Dx \end{bmatrix} = A\begin{bmatrix} p \\ x \end{bmatrix} + \begin{bmatrix} 0 \\ b \end{bmatrix}$$

$$\text{where } A = \begin{bmatrix} -\delta & \delta \\ -\delta[1-\beta(\delta\gamma+\eta)] & \delta[1-\beta\delta\gamma] \end{bmatrix} \text{ and } b = ((\theta_s - 1)\pi + \delta\beta\gamma\pi')J - \beta\delta\eta\bar{s}.$$

The negative determinant of A ensures that there is a saddlepath. That its slope must be less than 45^0 follows as $\theta_s<\theta_u$ and $\theta^2-(2-\beta\gamma)\theta+[1-\beta(\gamma\delta+\eta)]<0$ when $\theta=1$. The impact effects of the regime switch and the quasi-equilibria referred to in the text are derived (in reverse order) as follows:

a) Quasi-equilibria.

Setting Dp=Dx=0 yields the steady state value $\tilde{p} = -b/\delta\beta\eta$. With an exchange rate peg of $\bar{s} = 0$, and "unchanged" expectations in the labour market, so $\pi J=\mu$, substitution for b gives the two quasi-equilibria, namely

$$p_A = \bar{s} + \left(\frac{(1-\theta_s)-\delta\beta\gamma}{\delta\beta\eta}\right)\mu$$

when financial markets also assume $\pi'J=\mu$, and

$$p_B=p_A+\gamma\mu/\eta>p_A$$

when financial markets rule out realignments, i.e. $\pi'J=0$. Note that setting the peg at $\bar{\bar{s}} = -\gamma\mu/\eta$ implies $p_B(\bar{\bar{s}})=p_A(\bar{s}=0)$, i.e. pegging at an overvalued rate lowers inflation at the time of the regime switch (see Section 3(c) in the text).

b) Impact effects of pegging.

After a switch to a peg of $\bar{s}=0$ at p=0, and on the assumption that contracts lie on the stable manifold so $x=\theta_s p+(1-\theta_s)\tilde{p}$, the initial rate of inflation and real interest rate are

$$Dp=\delta(x-p)=\delta x=\delta(1-\theta_s)\tilde{p}$$

$$i-E_t[Dp]=\pi'J-\delta(1-\theta_s)\tilde{p}$$

Using the property that $\beta\eta=\theta_s^2-(2-\beta\gamma\delta)\theta_s+(1-\beta\gamma\delta)$, these can be expressed explicitly in terms of realignment expectations, as follows

$$Dp=\pi J+\frac{\gamma\delta}{\eta}(1-\theta_s)(\pi J-\pi'J)$$

$$i-E_t[DP]=\pi'J-Dp=-\left(1+\frac{\gamma\delta}{\eta}(1-\theta_s)\right)(\pi J-\pi'J)$$

Where expectations fail to respond to the regime switch, so $\pi J=\pi'J=\mu$, this implies $Dp=\mu$, $i-E_t[Dp]=0$, see point A in Figure 2.

If, however, financial markets respond promptly, so $\pi'J=0$, while labour markets do not, then we obtain the effects Walters predicts, namely

$$Dp = \left(1 + \frac{\gamma\delta}{\eta}(1-\theta_s)\right)\mu > \mu \qquad \text{Inflation Divergence}$$

$$i - E_t[Dp] = -\left(1 + \frac{\gamma\delta}{\eta}(1-\theta_s)\right)\mu \qquad \text{Lower Real Interest Rate}$$

Note that the real interest rate must fall whenever the financial market adjusts more than the labour market, i.e. when $\pi J - \pi' J > 0$: but the inflation rate will <u>not</u> diverge if the labour market makes sufficient adjustment at the time of the regime switch.

Appendix 2: Convergence to equilibrium with gradual adjustment of expectations.

Assume that $\pi'J=0$ and $\pi J=\mu$, but that this is followed by gradual adjustment of expectations in the labour market, so $D\pi=-\phi\pi$. This implies $D\tilde{p} = -\phi\tilde{p}$, as the quasi-equilibrium is proportional to π. As $x = \theta_s p + (1-\theta_s)\tilde{p}$, so $Dp = \delta(x-p) = -\delta(1-\theta_s)p + \delta(1-\theta_s)\tilde{p}$. This implies a stable second order system

$$\begin{bmatrix} Dp \\ D\tilde{p} \end{bmatrix} = \begin{bmatrix} -(1-\theta_s)\delta & (1-\theta_s)\delta \\ 0 & -\phi \end{bmatrix} \begin{bmatrix} p \\ \tilde{p} \end{bmatrix} \qquad \text{with roots } -(1-\theta_s)\delta,\ -\phi.$$

From initial values of p=0, $\tilde{p} > 0$, the quasi-equilibrium must converge steadily to zero. The price level rises at first and then it also converges to the origin, as shown in the diagram below.

[Figure 3 here]

References

Blanchard, Olivier and Stanley Fischer, (1989) Lectures on Macroeconomics, London: MIT.

Calvo, Guillermo (1983a) "Staggered Prices in a Utility-Maximising Framework", Journal Of Monetary Economics, 12, 383-398.

-------- ---------- (1983b) "Staggered Contracts and Exchange Rate policy.", in Jacob Frenkel (ed.) Exchange Rates and International Macroeconomics, Chicago: University of Chicago Press.

Giavazzi, Francesco and Luige Spaventa (1990) "The 'New' EMS" CEPR DP No 369, January.

Lambertini, Luisa, Marcus Miller and Alan Sutherland (1990) "Credibility, Disinflation and Realignment Rules in the EMS", mimeo, University of Warwick, September.

Miller, Marcus and Alan Sutherland (1990) "Britain's Return to Gold and Impending Entry into the EMS: Expectations Joining Conditions and Credibility." Paper presented at the CEPR/NBER conference on Exchange Rates and Currency Bands, July: forthcoming as CEPR Discussion Paper No. 465.

Walters, Alan (1971) "Consistent Expectations, Distributed Lags and the Quantity Theory" Economic Journal (81) 273-281.

--------- --------- (1986) Britain's Economic Renaissance: Margaret Thatcher's Reforms 1979-1984, Oxford: Oxford University Press.

--------- --------- (1990) Sterling in Danger, London: Fontana.

Figure 1: Calvo Contracts under a pegged rate - Convergence and Credibility.

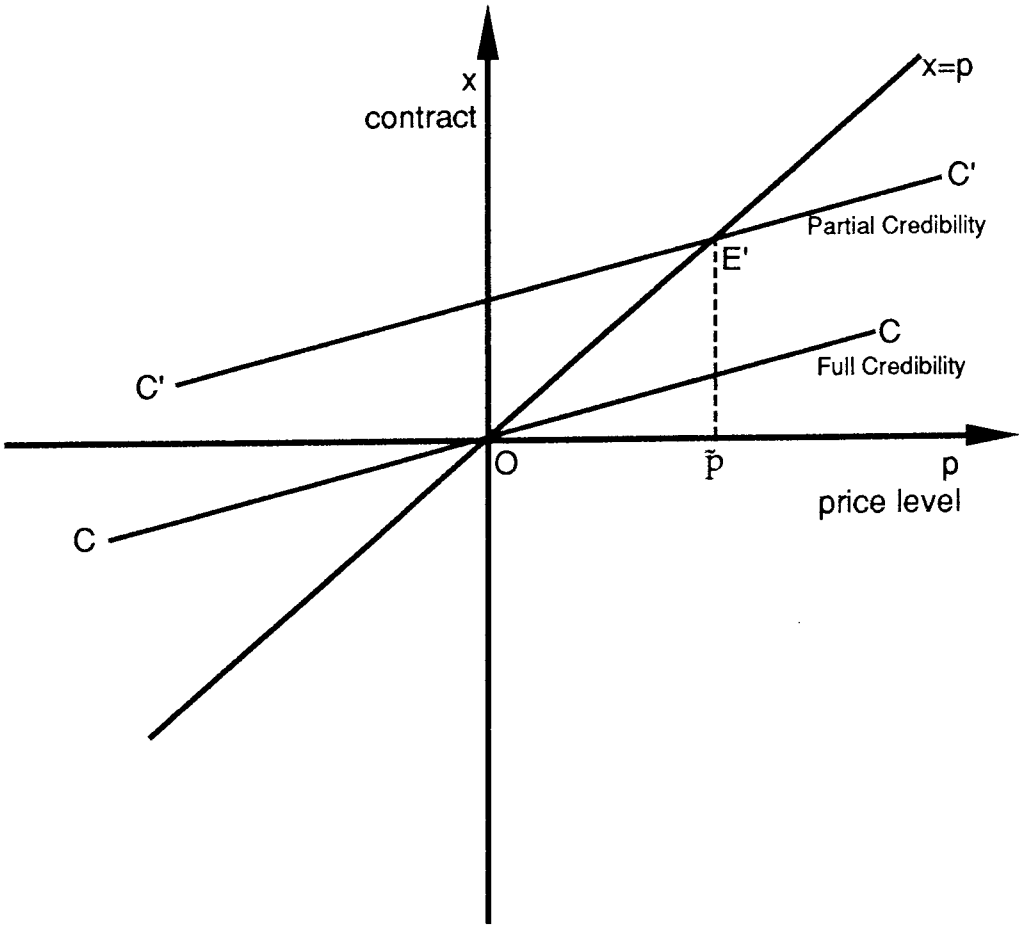

Figure 2: A regime switch from floating to pegging - impact effects, quasi-equilibrium and lagged adjustment.

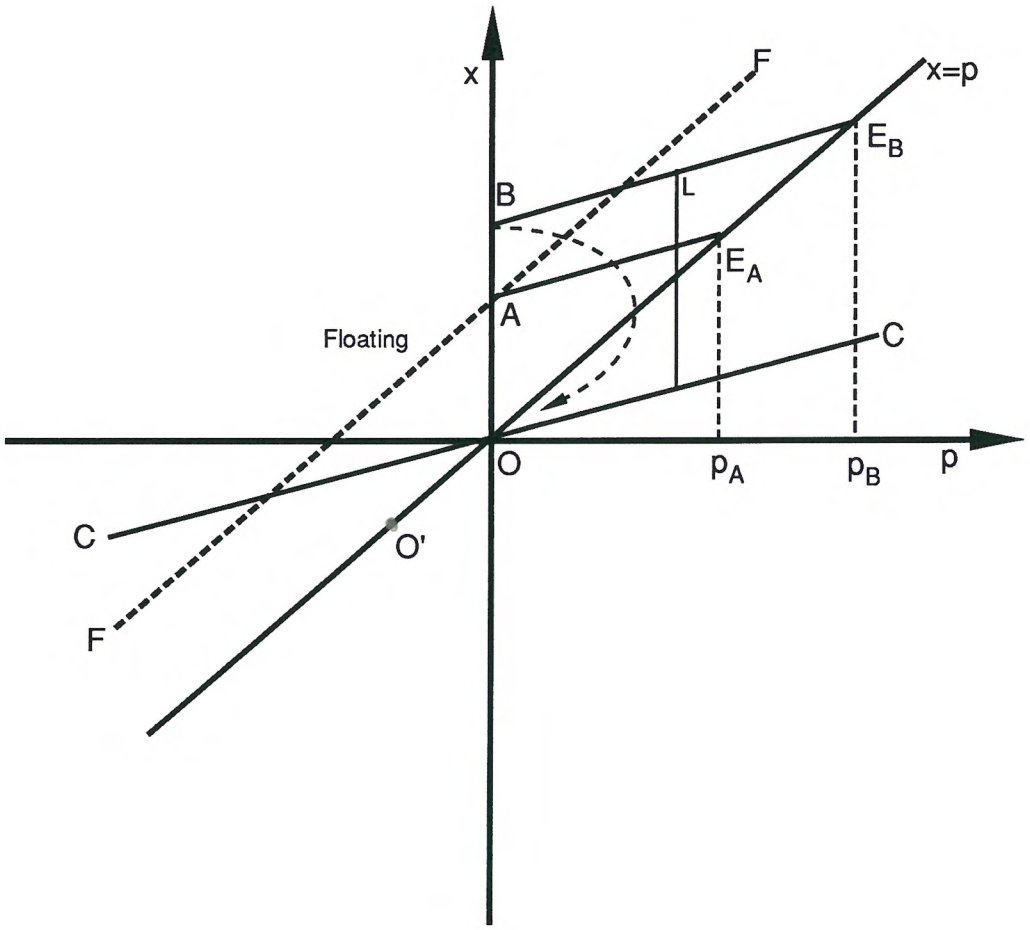

Figure 3: Convergence to equilibrium.