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Inflation - Unemployment Tradeoffs under Fixed and Floating Exchange Rates

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by

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I. Introduction

In Canada recently we have witnessed considerable discussion about improving the tradeoff between inflation and unemployment. The present paper is concerned with the effect of alternative exchange rate policies on this tradeoff for "dependent" countries.[1] Initially it is assumed that the tradeoff relationship depends on the rate of foreign inflation--as seems to be the case for Canada([1],[10])--and is stationary (i.e., does not depend on price expectations over the relevant time interval). Under these assumptions a long run tradeoff exists only under a floating exchange rate system and the short run tradeoff (i.e., when the nation has sufficient international reserves) is better (worse) under a fixed rather than floating rate system if the nation has a propensity to inflate more (less) rapidly than the world rate. The implications of the model for the behavior of nations are:

1) If nations have positive rates of time preference, we can anticipate continuing balance of payments problems;

2) Nations that do go to floating exchange rate systems from fixed rates will generally do so if their currency is initially undervalued rather than overvalued; and

3) If nations can exert some influence on the rate of growth of international liquidity, the long run world rate of inflation will be greater under a system of fixed exchange rates than under a world system where all exchange rates float.

In Section II we develop the model. Section III considers the implications of the model for the behavior of nations and Section IV briefly indicates how these implications would be modified if price expectations

are introduced. We summarize the major results in Section V.

II. Theoretical Background

The theoretical foundations of the relationship between unemployment and the rate of change in money wages, and subsequently the rate of change in the price level, for a closed economy have been discussed in considerable detail elsewhere ([6], [8], [9]). Due to uncertainty, an economy would not be expected to have full employment and, due to dynamic considerations, the actual rate of inflation of wages and prices will be inversely related to the level of unemployment. Empirical studies confirm this relationship ([1], [2]). Theoretical studies have also generally concluded that expected rates of inflation play a major role in determining the relation between actual inflation and unemployment ([5], [8]). In particular, as the expected rate of inflation converges to the actual rate, the unemployment rate converges to the "natural" rate consistent with the structure of the economy. In other words, in the long run, there can be no permanent reduction in unemployment due to the rate of inflation. This has not yet been confirmed empirically,[2] perhaps because of the difficulty of testing the hypothesis with the data available or because the restrictions on the theoretical models are poor representations of the real world. For instance, the possibility that the rate of technological change is influenced by the level of unemployment through "learning by doing" is not included in the models. The possibility that the rate of inflation might influence the equilibrium capital stock and through this, the structure of the economy and the "natural" level of unemployment is also ignored. Because of the lack of confirmation of expected inflation on the inflation-unemployment tradeoff we shall assume

that its influence occurs only in the very long run and adjusts the least rapidly (if at all) of all those influences affecting the tradeoff relationship.

In an open economy on fixed exchange rates[3] there is good reason to believe that the consequences of altering aggregate demand on the inflation-unemployment tradeoff will be different from those in a closed economy. If the nation is a dependent one, then prices and the rate of inflation on internationally traded goods are given independently of domestic demand. Thus, we would expect that a change in aggregate demand in the dependent economy will alter real quantities and the unemployment rate more, and the rate of inflation less, than the same change in demand for a closed economy. In the limit, when all prices are set internationally we would have the domestic rate of inflation independent of the unemployment rate and homogeneous of degree one in foreign price inflation.[4] This is obviously an extreme case, but it does set limits on the effects of foreign inflation on domestic inflation. If foreign inflation increases, domestic inflation will also increase but less than proportionately at any given unemployment level.[5] This is empirically confirmed in a number of studies ([1], [3], [10]).

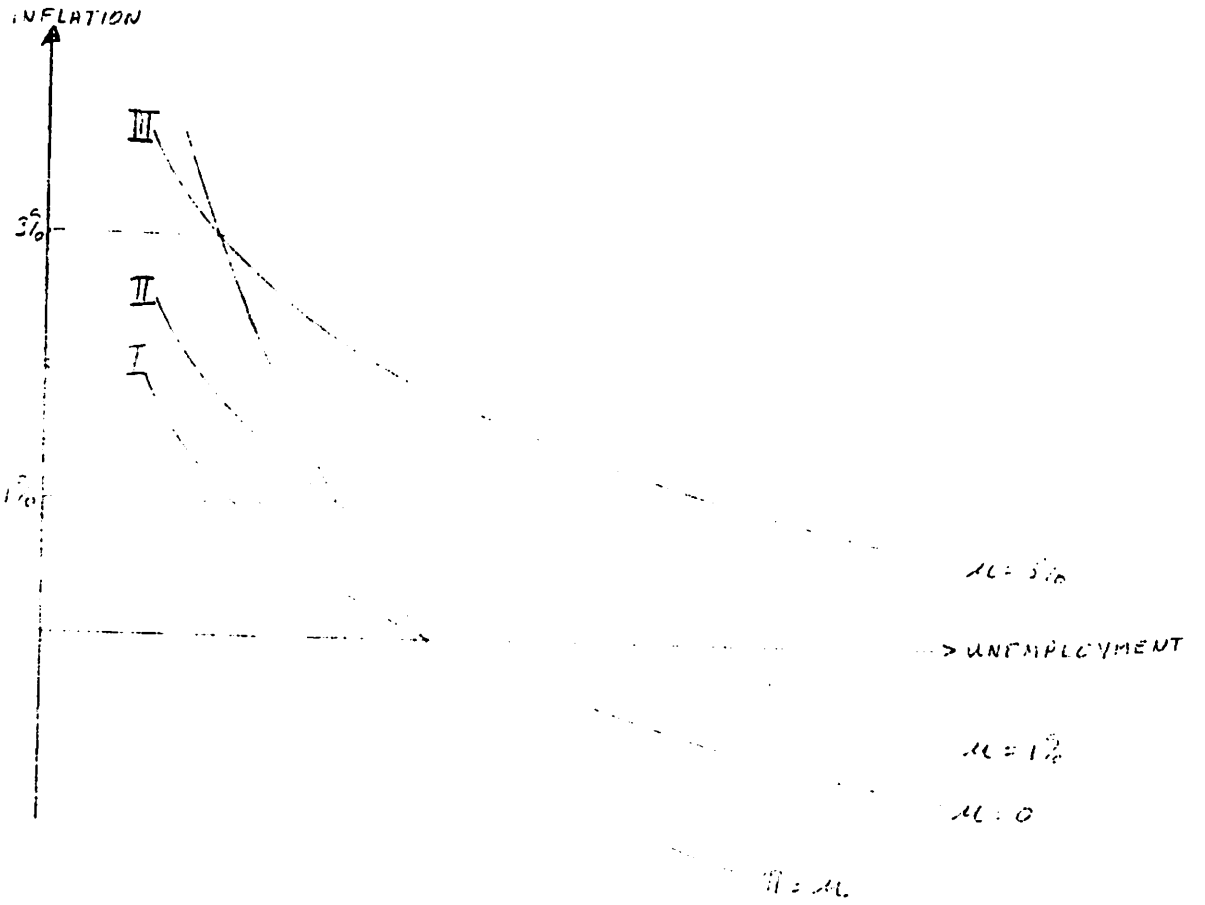
A further effect of foreign price inflation on domestic inflation under a fixed exchange rate regime has been discussed a number of times before: In the long run, the domestic rate of inflation must be equal to the foreign rate ([13]). If the nation attempts to inflate more rapidly than the rest of the world, then, through time, it would suffer a decrease in exports, an increase in imports, and an ever increasing loss of international reserves. Consequently it can sustain an inflation greater than

the rest of the world's only so long as it has reserves and, provided that it is committed to a fixed exchange rate, it must later inflate at a rate less than the world rate. Similar forces are at work if the nation attempts to inflate at a less rapid rate than the world. In this case, there will be an ever increasing rate of accumulation of international reserves and consequently an increasing rate of monetary growth. This will force the domestic rate of inflation up until such time as the average rate of domestic inflation is equal to the average rate of foreign price inflation. The government authorities can, of course, attempt to sterilize the inflow, but it is doubtful that this could be done continuously even if it was considered a desirable policy.

The above description of the inflation-unemployment relationship in an open economy holds if exchange rates are fixed. We now consider what happens if the exchange rate floats. In this case the exchange rate itself will adjust to clear the foreign sector. Assume that the economy is in equilibrium. If the nation began to increase the money supply more rapidly and therefore the domestic price level rose, what would happen to the exchange rate? Under fixed exchange rates only the prices of non-internationally traded goods would rise and there would be a substitution toward imported goods and a balance of payments deficit would develop. However under floating rates, rather than a deficit, local currency will depreciate until the foreign goods market again clears. But given equilibrium in the first instance, this means that, in terms of local currency, all prices must be increasing at the same rate. Consequently, given the initial equilibrium, the increase in the price level in terms of local currency must equal the increase in world prices in

terms of foreign currency plus the rate of depreciation of the local currency. This means, of course, that the government authorities can choose any rate of increase in the money supply they desire and the rate of price inflation in the foreign sector will adjust passively via changes in the exchange rate. Therefore we can argue that the tradeoffs between inflation and unemployment for a nation having a floating exchange rate corresponds to the equilibrium tradeoffs for all rates of foreign price inflation under a fixed exchange rate.[6,7] The above discussion is described diagrammatically in Figure I.[8]

Figure I



Curves I to III show the short run tradeoff curves for a country on a fixed exchange rate at given rates of world price inflation, μ_i. If the world rate of inflation is 1% then the short run alternatives are described by Curve II so long as the possibility of running down or sterilizing international reserves continue to exist. When those options are no longer available, of course, the domestic rate of inflation must equal 1%, the world rate, and therefore, in the long run we can say no meaningful tradeoff exists under fixed exchange rates. The tradeoff relationship for a country on a floating exchange rate is described by those combinations of points where domestic inflation equals the world rate in terms of local currency, the $\pi=\mu$ curve.

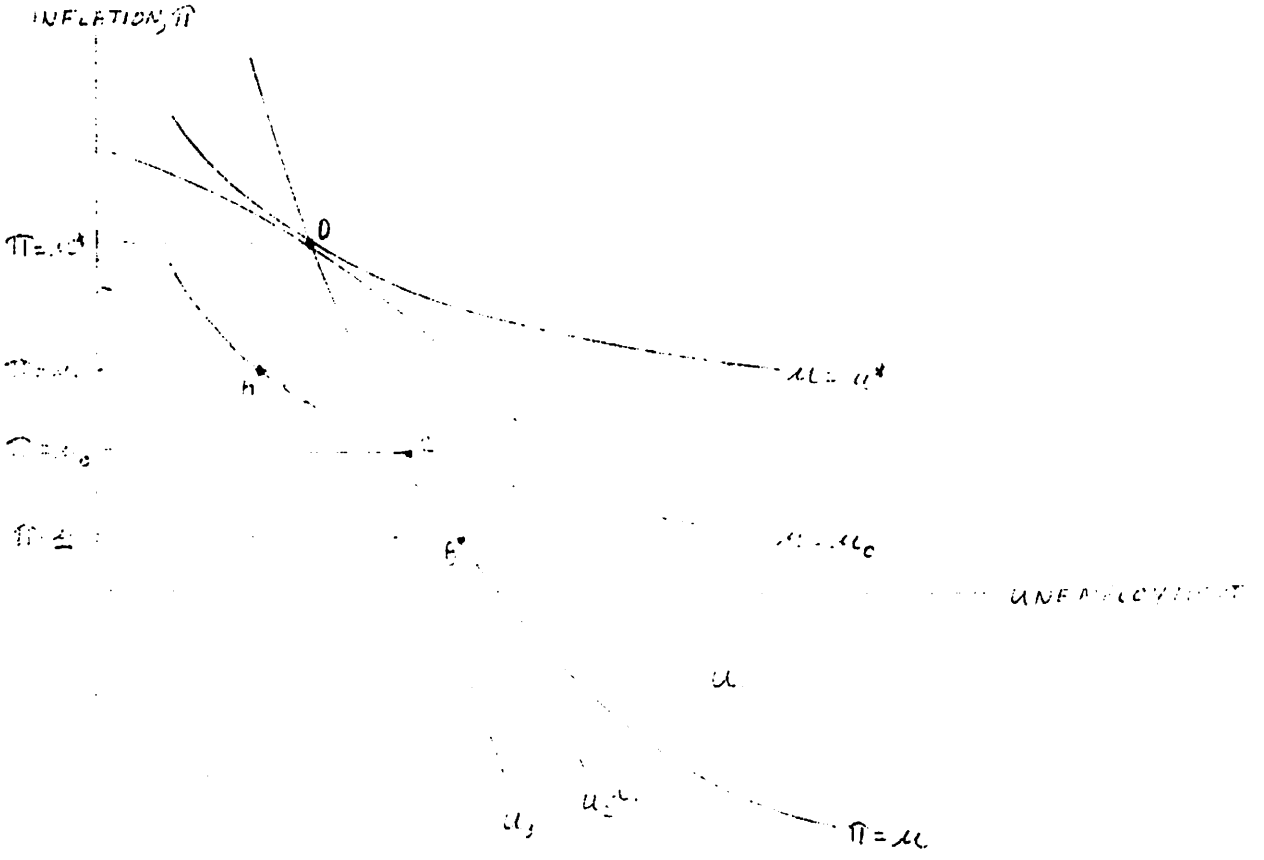
The relationship between inflation and unemployment represents the structure of the supply side of the goods market in a macroeconomic model. We have implicitly assumed that the monetary and fiscal authorities can control the level (and rate of change) of aggregate demand to achieve any desired point on the relevant tradeoff relationship. Mundell's work ([7]) on stabilization policy in an open economy is relevant for determining the policies needed to achieve this desired level of aggregate demand.[9] With perfect capital mobility, monetary policy is effective in altering aggregate demand under a floating exchange rate and fiscal policy is effective under a fixed rate regime. If capital mobility is less than perfect, then both monetary and fiscal policies will have some effect under both systems. Consequently, we can assume that all points on the $\pi=\mu$ tradeoff curve are obtainable under a floating exchange rate and all points on the short run tradeoff curve associated with the world rate of inflation are feasible for a nation on a fixed exchange rate, <u>given sufficient</u>

international reserves or ability to sterilize capital inflows. We now consider the implications for behavior of operating under fixed and floating exchange rates.

III. Implications for the Choice of Inflation and Unemployment Rates

Assume that both inflation and unemployment are considered undesirable by the government authorities and that they are able to order the disutility attached to every combination of inflation and unemployment. Then we may use indifference curve analysis to determine what combination of inflation and unemployment the authorities will choose. This is described in Figure II. Consider first a "dependent" nation, completely

Figure II



committed to a fixed exchange rate with static preferences as in Figure II and let the world rate of inflation be μ_0. Ultimately, of course, the country would be forced to have a rate of inflation as at point C. However, in the short run, the government authorities can be made better off[10] by going to a point such as A. Whether the authorities will or not depends on how much they weight present satisfaction relative to future satisfaction. If they are concerned only with the present (i.e., discount the future completely), then A represents the optimum point. If the satisfaction of future generations is weighted equally with that of the present, then the constrained optimum would be at point C. In general, we can say that the greater the rate of time preference of a nation on fixed exchange rates, the greater the propensity to inflate at a rate other than the world rate.[11]

For the nation on a floating rate, behavior is straightforward given the stationarity of the tradeoff and preference relationships. In this case the long run equilibrium would be at point B. It should be noted that on all the long run equilibria that could be faced by the nation on fixed exchange rates, none will yield the nation more satisfaction than B.

Given that nations with high rates of time preference will consistently encounter balance of payments problems, the question then arises as to whether the decrease in employment (increase in inflation) is worth the cost to the generation that is forced to go through the unemployment. There always exists the alternative of devaluation (revaluation), thus altering the rate of foreign inflation in terms of domestic currency. In recent times it seems that there is no shortage of nations adopting this alternative. This policy would cause a rapid

inflation for a short period of time as export and import prices adjust to the devaluation. This would imply that, through time, the actual rate of inflation would be that where $\pi=\mu$ is consistent with the short run choice of unemployment levels. In other words, if devaluation (or revaluation) is used consistently, then "fixed" exchange rates provides the same tradeoff relation as the floating exchange rate regime. It is not necessarily the case, however, that the optimum point on the $\pi=\mu$ tradeoff locus will be the same under flexible and periodically fixed exchange rates if the country has a positive rate of time preference. In particular, it will generally be the case that the policy of periodic devaluation will lead to a greater long run rate of inflation than a policy of continuous flexible exchange rates. This is basically because the cost of less unemployment in terms of greater inflation is less on the given μ curve than on the $\mu=\pi$ tradeoff curve. Consequently, there is a substitution effect toward lower unemployment while on fixed exchange rates. But, because this cannot be maintained, the lower average unemployment must mean a higher average rate of inflation.

The divergence between short run tradeoffs under fixed and floating exchange rate systems has implications for the exchange rate policy that will be adopted when a nation decides to alter its exchange rate parity. If a nation has been consistently inflating at a rate less than the world and is forced to revalue, it will always be the case that its level of satisfaction will not be decreased by choosing the floating rate policy.[12] This follows because the $\pi=\mu$ curve everywhere dominates the revealed preferred point on the fixed exchange rate tradeoff curve. Consequently, if we were to abstract from world pressures and historical accident we would expect those nations whose currency is undervalued to move to a floating

rate regime. In the case of the nation that inflates more rapidly than the world the choice is less clear since the revealed preferred point does not dominate all points on the $\pi=\mu$ curve or vice versa.[13,14] In any case, a general test of the above implication of the model would be whether nations appreciating their currency opt for a floating rate system proportionately more often than nations depreciating their currencies.[15]

Another implication of the model relates to the question of world liquidity. It can be argued that a shortage of world liquidity is only a shortage relative to national price levels and rates of inflation. At a lower price level there would be no shortage and at a lower rate of inflation none would develop. Assume that the world is composed of a large number of nations with the stationary preferences shown in Figure II and let μ_0 represent the rate of world inflation consistent with the growth of world liquidity (e.g., the rate of growth in money issued by the world's central bank). Then, in a world on fixed exchange rates all nations will eventually be required to inflate at the rate μ_0. On the other hand, if all nations adopted floating rates then the world rate would be $\underline{\mu}$ consistent with the point B on the $\pi=\mu$ tradeoff curve. By construction $\underline{\mu}$ is less then μ_0. In any case $\underline{\mu}$ will never yield less satisfaction to the world than μ_0. However, if nations have positive rates of time preference and do not collude there are no automatic forces that will lead to an inflation rate $\underline{\mu}$. Indeed, forces will be working to increase the rate of inflation. Each nation, maximizing its own welfare, will attempt to inflate at a rate (between μ_0 and μ_1) greater than the world rate because of the short run gain in employment. But this behavior means that the world rate will increase and, if those

controlling world liquidity insist on maintaining their previous rate of increase then, by our earlier definition, a shortage will develop. The alternatives then become a period of "excessive" unemployment or ex post acceptance by the central bank of the higher rate of inflation. Assume that the bank accedes to the demands for more liquidity and rolls the printing presses at a faster rate. We are right back to the same disequilibrium situation except that the world rate of inflation we begin with is greater than μ_0. Given positive time preference, this will continue until the rate μ^* in Figure II is reached. As this point the short run optimum coincides with the world rate and there is nothing more to be gained by inflating at a rate other than the world's irrespective of the rate of time preference.

IV. Price Expectations

Up to now we have assumed that the tradeoff relationship is unaffected by price expectations. We shall briefly discuss the implications for the analysis when this assumption is removed.

Phelps ([9]) has shown that, in a closed economy model where there can be no long run reduction in unemployment irrespective of the rate of inflation, the greater the rate of social time preference, the greater will be the long run rate of inflation. One of our earlier conclusions was that there will be a tendency for nations on fixed rates and with positive rates of time preference to attempt to inflate more rapidly than the rest of the world. This was because the tradeoff under fixed rates favored lower unemployment relative to floating rates. We now add to this the fact that positive time preference in itself adds to the long run equilibrium rate of inflation and the conclusion is reinforced. Adding

expectations we should also expect fewer nations attempting to inflate at rates below the world rate. Consequently, our conclusion of a general upward drift in the world money supply and inflation rate under a fixed exchange rate system is also strengthened. A word of caution is warranted, however. Relative prices change in a well identified way in our model under fixed exchange rates. We cannot say if general price expectations adjust more rapidly to international price changes or domestic price changes. Similarly, under a floating rate the foreign rate of inflation in terms of foreign currency might enter into the formation of expectations of domestic inflation. If domestic price expectations are dependent on specific groups of commodities and on the exchange rate system adopted it is difficult to make meaningful comparisons.

V. Conclusion

While the model developed above is relatively uncomplicated, it does seem reasonably consistent with present day international financial arrangements. The number of currency revaluations taking place since Bretton Woods suggests that a significant number of nations have high rates of time preference. Depreciations have been more common than appreciations.[16] The major experiments with flexible exchange rates have been when the nation wished to inflate less rapidly than the world.[17] The founding of the International Monetary Fund itself can be considered an attempt at collusion to reach the optimum world rate of inflation. Its relative lack of success plus pressures for a crawling peg suggest that nations do not agree as to the best rate of inflation and that collusion among independent nations, as

among individuals, is not the stablest form of organization.

There is one fact that does not seem to be consistent with the model: the tenacity of nations in believing fixed exchange rates are superior. Besides inertia, ignorance and fear of the unknown there may well be some valid economic reasons for doing so. The model suggests at least one: If the disutility of inflation and unemployment increase at a decreasing rate it might be the case that satisfaction (as seen at a given point of time) is maximized by the boom and bust environment--i.e., the periodic application of the inflationary "brakes", given the foreign rate of inflation, still yields greater utility than choosing the optimum long run equilibrium under floating exchange rates. That devaluations continue to occur only suggest a lack of intergenerational commitment within the nation.

Another economic reason for fixed rates not included in the model is that this method provides real gains in carrying out international transactions that outweigh gains from more desirable inflation--unemployment tradeoffs under floating rate systems. The theoretical foundations of the social gains from alternative institutional exchange relationships for a closed economy is too poorly developed at this stage to even suggest the magnitude of the gains from alternative international relationships. However it is important for policy recommendations to take this aspect into account.

FOOTNOTES

[1]By a dependent nation we shall mean one that has no influence on its terms of trade or on international prices under fixed exchange rates.

[2]Brechling [2] and Reuber [11] present evidence inconsistent with the expectations hypothesis.

[3]And with sufficient international reserves or the ability to sterilize capital inflows.

[4]We will define "foreign price inflation" as the rate of change in import and export prices denominated in domestic currency. Under a fixed exchange rate this rate of inflation would be equal to the rate of price increase in the rest of the world denominated in foreign currency. Under a floating rate this equality need not hold because of exchange rate changes.

[5]For instance, Reuber's study of Canada [10] assumed the following structural relationships:

$$(1) \qquad \pi = f(\mu,\omega)$$
$$(2) \qquad \omega = g(\pi,u)$$

where

π = domestic rate of inflation
μ = foreign rate of inflation in terms of domestic currency
ω = rate of change in wages

and

u = unemployment rate.

Substituting (2) into (1) we obtain an implicit tradeoff relationship:

$$(3) \qquad \pi = h(\mu,u)$$

We are arguing--and empirically it is the case--that $0 < \partial h/\partial \mu < 1$.

[6]We could also say that this represents the tradeoff for a closed economy.

[7]Mathematically, under a floating exchange rate we have (3) subject to the constraint:

$$(4) \qquad \mu = \pi.$$

[8]The slope of the tradeoff curve under a floating rate is:

$$d\pi/du = \frac{\partial h/\partial u}{1-\partial h/\partial \mu}.$$

Under fixed rates the short run slope (keeping $d\mu=0$) is $d\pi/du\,|_{\mu=\underline{\mu}} = \partial h/\partial u$.

Because $0 < \partial h/\partial \mu < 1$ the tradeoff under fixed rates is flatter than under a floating rate at any given level of unemployment. In Reuber's study ([10], p. 118):

$$\partial h/\partial \mu = .63008 \qquad \text{and} \qquad \partial h/\partial u = - \frac{.03477}{u^2} \ .$$

[9]Mundell assumed that prices and wages were rigid and consequently all money income changes were identical to changes in real income. The tradeoff relation in the present paper is basically a description of how changes in money income are broken down into real and nominal components if prices are allowed to vary.

[10]"Better off" could well be interpreted as winning more seats in Parliament.

[11]It should be noted that, because of the convexity of the tradeoff relationship, it will generally be the case that the more a nation diverges from the long run equilibrium (e.g., point C), the greater will be the <u>average</u> level of unemployment provided the nation does not alter the exchange rate.

[12]We are assuming a non-negative social rate of time preference.

[13]It might be the case that the marginal disutility of inflation and unemployment decreases sufficiently so that even without positive time preference total satisfaction is increased by inflating at one time and deflating at another. I would like to thank Ron Hansen for this point.

[14]Given that nations and individuals are relatively averse to major institutional changes, not much weight can be attached for economic reasons in saying that fixed exchange rates are revealed to be preferred to a floating one.

[15]We should also expect that, as the world rate of inflation drifts upward, a floating rate would appear to be a more viable alternative, even among some nations that, under fixed rates, inflated more rapidly than the world.

[16]In the industrialized countries for the period January 1950 to July 1970 there were 21 devaluations, 3 revaluations and 2 moves away from fixed exchange rates to a floating rate.

[17]For the industrialized nations, only Canada (in 1950 and in 1970) moved to a floating rate and in both cases the Canadian dollar appreciated.

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