

The Effect of U.S. Policies on Foreign Countries: The Case of Canada

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I. Introduction

Since the introduction of the new techniques of monetary policy implementation by the Federal Reserve in October 1979, U.S. interest rates have been higher on average than previously and much more volatile. The changes in policy techniques and the associated interest rate developments have been widely discussed and analyzed in the United States, both inside and outside the Federal Reserve System. Somewhat less attention has been paid to the implications of these developments for other countries, although a section of the Federal Reserve Staff Study on New Monetary Control Procedures was devoted to the "external perspective" and the subject has arisen in various international meetings.

In this paper I examine some of the effects of U.S. interest rate movements on exchange rate and interest rate developments in other countries and the problems that the U.S. movements can pose for monetary policy in a small open economy such as Canada. In the first section I present a very brief review of the movements of U.S. interest rates and those of interest rates and exchange rates in a number of foreign countries over the past three years. I conclude that, in general, foreign interest rate movements have not been tightly linked to U.S. interest rate movements although during certain sub-periods some foreign interest rates have responded directly to U.S. rate movements. This response has been particularly noticeable at times of strong downward pressure on the value of the foreign currency.

The views expressed in this paper are those of the author and no responsibility for them should be attributed to the Bank of Canada. I am indebted to a number of my colleagues at the Bank of Canada for discussion of the ideas in this paper. However, none of them bears any responsibility for errors in the analysis.

The following section focuses on the options available to a small open economy attempting to achieve a monetary aggregate target in the face of fluctuations of U.S. interest rates. The appropriate response of interest rates in the small country depends on whether the movements in U.S. nominal rates reflect movements in real rates or movements in inflationary expectations and whether the participants in the foreign exchange market interpret them correctly. In most circumstances, the small open economy should move its domestic interest rates by some fraction of the movement in U.S. rates in order to achieve the target for its monetary aggregate.

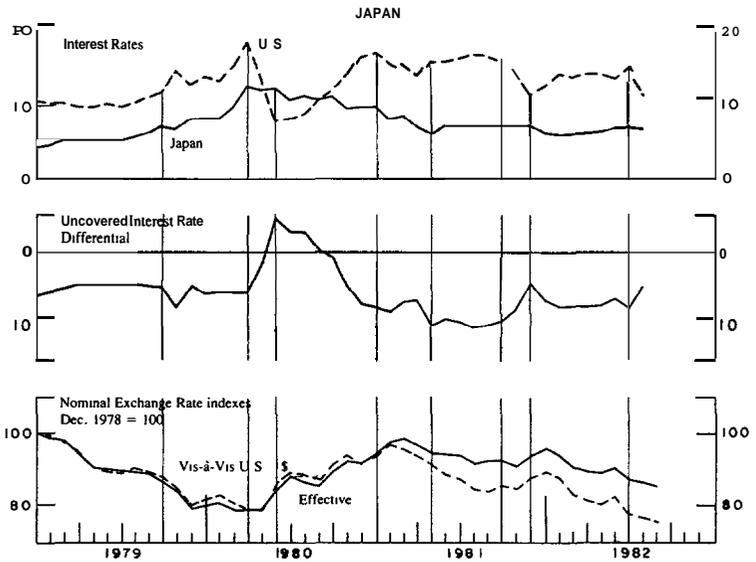
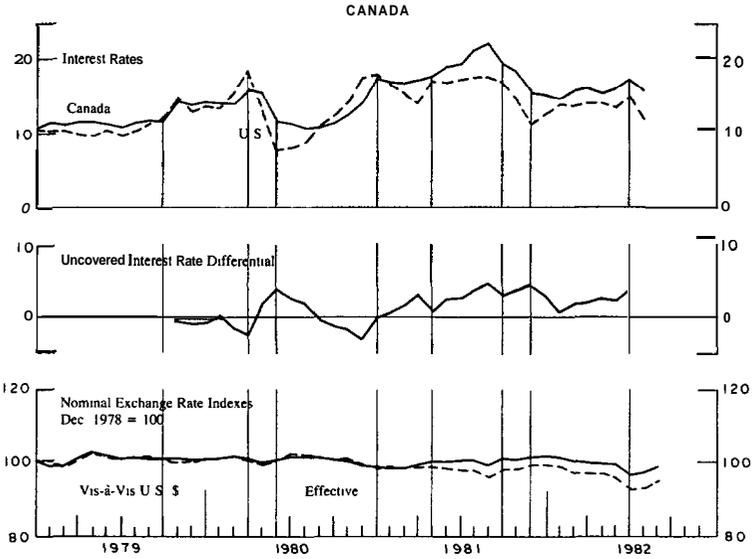
I then analyze the more basic question of whether a monetary target ought to be maintained unchanged when there are significant changes in foreign interest rates and look at the possible role of the exchange rate in the setting of policy. Most of the theoretical articles on this question have formulated the problem in the context of the Poole framework in which the policy maker knows the parameters of all the structural equations. In contrast, the argument for a monetary aggregate target derives, in my view, from the fact that there are many areas of the economic structure about which we can have little confidence in our knowledge. The question of whether and how to use the exchange rate in the policy process then hinges on whether one has reasonable confidence in one's knowledge of the response of the economy to certain kinds of shocks (e.g., an increase in U.S. interest rates). In such a case one might implement a policy in which the exchange rate plays a role; even if not optimal such a policy will at least be better than that of simply adhering unchanged to the monetary aggregate target. For other shocks, however, one might well feel that the lack of knowledge is such that one is unable to improve on the simple policy. Two crucial issues remain: first, how to distinguish between these cases and, second, if one does have reasonable confidence in one's understanding of the response to certain shocks (say a foreign interest rate increase), precisely how to integrate the exchange rate into the policy process.

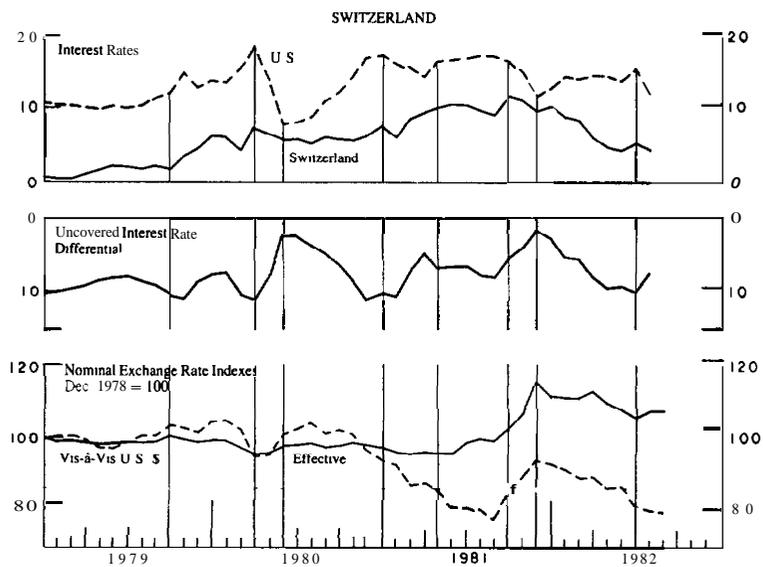
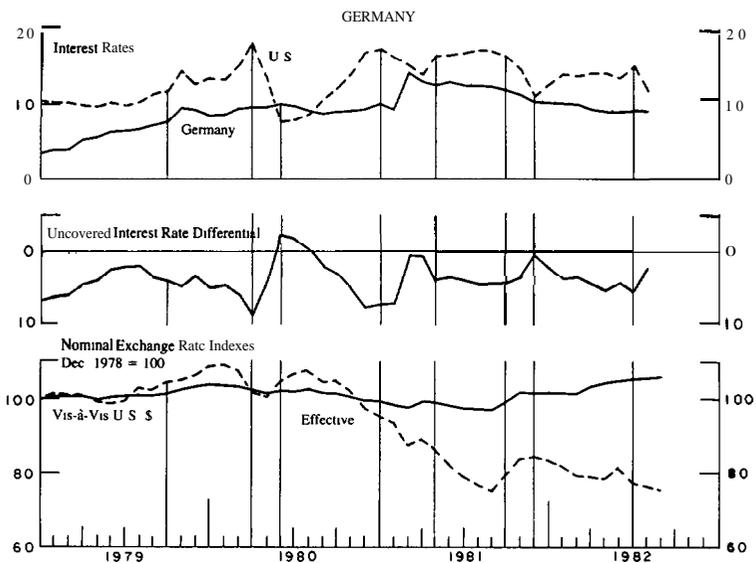
II. Some stylized facts

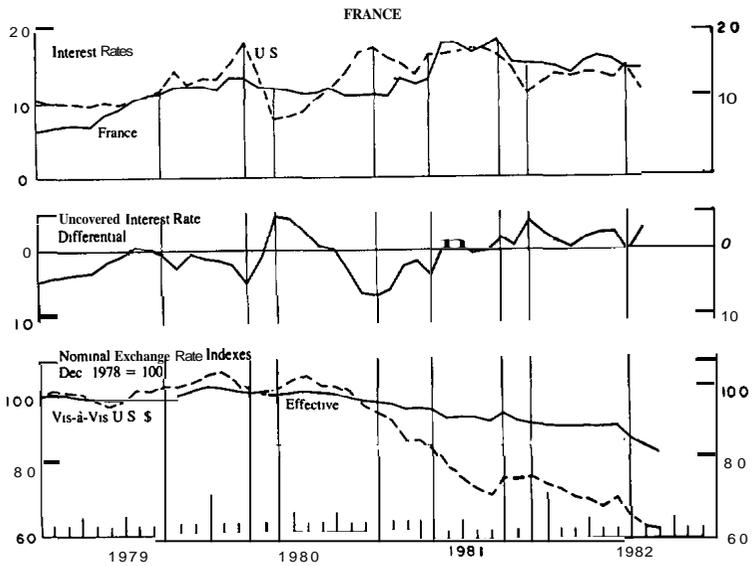
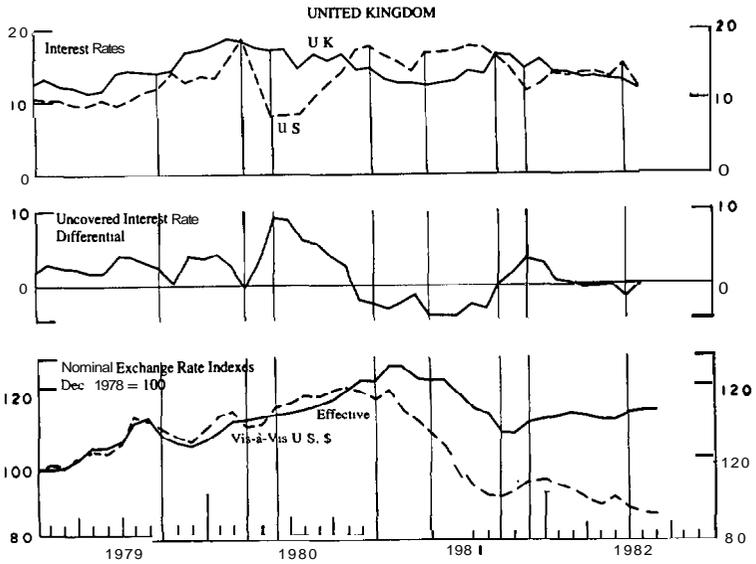
The attached charts display for a number of countries (Canada, Japan, Germany, Switzerland, United Kingdom, France) the movements of domestic short-term interest rates (the 90-day rate), uncovered interest rate differentials vis-à-vis the United States, and nominal U.S. dollar and nominal effective exchange rate indexes since the end

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**SHORT-TERM DOMESTIC MONEY MARKET RATES AND
NOMINAL AND EFFECTIVE EXCHANGE RATE INDEXES**







of 1978.' For purposes of analysis the swings in U.S. rates can be divided into a number of periods: (1) end of 1978 to September 1979, relatively stable rates; (2) September 1979 to March 1980, sharp increase in U.S. rates from about 11 percent to 18 percent; (3) March 1980 to May 1980, extremely sharp decline in U.S. rates from 18 percent to 8 percent; (4) May 1980 to December 1980, gradual rise from 8 percent to 17½ percent; (5) December 1980 to April 1981, fall and subsequent rise of about 3 percentage points; (6) April 1981 to, September 1981, very stable rates; (7) September 1981 to November 1981, decline from about 17 percent to 11½ percent; (8) November 1981 to June 1981, upward tendency in interest rates. Admittedly these divisions are very crude but they do enable us to carry out a rough-and-ready analysis of the response of the foreign interest rates to U.S. rates in the various sub-periods.²

In the first episode in which U.S. interest rates rose (September 1979 to March 1980) all the countries being examined (Canada, Switzerland, Germany, Japan, United Kingdom, France) followed U.S. rates up to a greater or lesser degree. Since this was a period of sharply rising oil prices and of increasing inflation rates in most countries, these upward movements were in line with the requirements of domestic policy. In some cases, such as Germany and France, the rise was less than in the United States and the uncovered differential moved in favor of United States whereas in others, such as Japan, the differential *vis-à-vis* U.S. rates remained virtually constant. Towards the end of this period, as U.S. rates peaked, all currencies weakened noticeably *vis-à-vis* the U.S. dollar. Most countries responded to the very sharp fall of U.S. rates in the spring of 1980 in a very muted fashion and therefore saw their uncovered differentials and the values of their currency rise *vis-à-vis* the U.S. In the next period of U.S. interest rate increase (May 1980 to December 1980) Canada was the only country to respond by raising its rates significantly. The others either increased their rates slightly or allowed them to fall somewhat. Uncovered

1. The exchange rate data are monthly averages of daily rates. Although the interest rate data used are as of month-end and not the more desirable average of daily rates they nonetheless serve to show the major swings of interest rates. The timing of the swings is not as precise, however, as would be needed for more detailed analysis. A more detailed discussion would also incorporate international differences in inflation rates and in inflationary expectations into the analysis of exchange rate movements.

2. This brief overview is not intended to explain in detail the movements in every country but rather to give a very broad description of behavior of foreign interest rates *vis-i-vis* U.S. interest rates. There are clearly many factors influencing the exchange rate that are not touched in this brief survey.

differentials moved sharply in favor of the United States and the U.S. dollar strengthened markedly except vis-a-vis the pound and the yen.

In the early part of 1981 when U.S. rates fell from 17% percent to 14¼ percent and then moved back up quickly to 17 percent, both Germany and Switzerland posted markedly higher domestic rates, responding in part to the decline in the value of their currencies in the previous period and to the continuing downward pressure on their currencies vis-à-vis the dollar. The other countries showed relatively little upward movement or some downward movement over this sub-period. In the face of fairly flat U.S. rates over the later spring and summer of 1981 rates remained more or less unchanged in Switzerland, Germany, Japan, in the case of latter in spite of the sharply declining value of the yen. In Canada, the United Kingdom and France, rates moved up over the period to counter downward pressure on their currencies arising from factors unrelated to interest rate differentials, such as the election in France, the movement of oil prices for the pound, and direct investment outflows in the case of the Canadian dollar.

During the period of declining U.S. rates between September and November 1981, short-term rates fell in all the countries under study except Japan, although the declines were smaller than those in the United States. The resulting increases in differentials vis-à-vis U.S. rates led to a strengthening of all currencies except the French franc. The rise in U.S. rates in the period between November 1981 and June 1982 was accompanied by a somewhat smaller increase in rates in Canada but declines in rates elsewhere despite the strength that the widening differentials gave to the U.S. dollar. In part, this lack of response to U.S. rates was related to the spreading international recession which resulted in more emphasis being placed on real side developments and less on external considerations in the determination of short-term interest rates.

One can derive a number of conclusions from this very brief overview. First, there is no automatic response to U.S. interest rate developments in other countries. Even Canada, whose rates have followed those of the United States most closely, has had divergent patterns some of the time and has shown significant movements over the period in the uncovered interest rate differential vis-à-vis the United States. Other countries have had long periods in which rates did not respond to movements in U.S. rates or moved in the opposite direction

to those in the United States.³ Second, it is likely that the overall level of interest rates was considerably higher, on average, as a result of the higher level of U.S. rates over the period. This is particularly true during 1981 and 1982. Third, the tendency to follow U.S. rates seems most marked in the first cycle (mid 1979 to spring 1980) than in later cycles. This is mainly related to the fact that policy concerns were similar in the major countries during this period. Fourth, the response to U.S. rates by the European countries and Canada becomes more marked at times of substantial downward pressure on the value of their currencies. Such downward pressure on its currency seems to have been less of a consideration for Japan, perhaps because of Japan's significantly better inflationary performance over the period. Fifth, although interest rate differentials clearly play an important role in influencing exchange rate movements, other factors dominate them at times. These include both noneconomic factors (e.g., the election in France, East-West relations for the mark) and economic factors (e.g., the price of oil for sterling, direct investment capital flows in Canada). Sixth, except in the case of Canada and to a lesser extent Japan, where the two indexes move fairly closely together, effective exchange rate indexes are much less volatile than are the U.S. dollar exchange rates. At times when the U.S. dollar shows generalized strength vis-à-vis European currencies the fact that the latter tend to move together limits the movement in the effective exchange rate. In the case of Canada, where 70 percent of its trade is with the United States, the U.S. dollar rate clearly plays a much more important role.

III. Possible responses to U.S. interest rate movements in a small open economy with a monetary aggregate target

As shown above, Canadian interest rates were more influenced by swings in U.S. rates than were those of the European countries and Japan. I now turn to a more careful examination of the policy options available to a small open economy such as Canada, which is faced with volatile movements in the rates of a large neighboring country, such as the United States. In this section, I assume that the small country has set a target growth rate for its monetary aggregate and analyze the implications for that aggregate of changes in U.S. rates under various

3. A similar conclusion was reached in Wallich and Haas (1982) who report that recent data "do not support the notion of interest rates tightly linked internationally."

interest rate responses in the small country. In the next section, the analysis is broadened to examine the question of whether the small country ought to try to achieve its monetary target in the face of foreign disturbances and whether it can use the exchange rate as an information variable or intermediate target in those circumstances.

Consider the case of a small open economy (SOE) with a large traded goods sector whose prices are closely tied to world prices⁴ and with financial markets closely linked to those in other countries. Assume that this country has implemented a policy of targeting on a monetary aggregate and that the authorities adjust the short-term interest rate in order to achieve such a target by sliding along the demand for money curve.⁵ Suppose that the large country (or world) interest rate rises. The two polar responses of the small country would be to leave its domestic short-term rate unchanged or to move it lock step with world rates. An intermediate response would be to move the domestic interest rate in the same direction as world rates but by a lesser amount. The implications of these options for the SOE can be analyzed for three cases — first, the rise in the large country nominal interest rate reflects a real interest rate increase consequent upon a tightening of monetary policy, say as part of a stronger anti-inflationary policy; second, it is recognized to reflect an increase in inflationary expectations without any change in real rates; third, the higher interest rates reflect higher inflationary expectations but the exchange market responds to them as if they represented an increase in real rates.⁶

1. The nominal rate increase in the large country reflects an increase in real rates.

Suppose the SOE chooses to hold its interest rates unchanged in the face of the rise in nominal and real rates in the large country. There will be a decline in the value of the currency of the SOE. The size of the decline will depend on market expectations as to the duration of the

4. The prices of Canadian exports are closely although not perfectly tied to world prices. It is also the case that Canadian exports can be significantly affected by changes in aggregate demand in other countries, especially the United States. See Freedman and Longworth (1980).

5. This is the technique used in the United States before October 1979 and still in use in Canada. The monetary aggregate used in targeting is assumed to have a reasonable degree of interest elasticity.

6. The analysis in this section draws heavily on earlier work done by my colleague Pierre Duguay.

period of high real interest rates and its implication for long-term monetary policy in the large country. The longer the period of high foreign real rates is expected to last, the sharper the decline in the value of the domestic currency. Furthermore, the greater the decline in longer-term monetary growth rates signaled by the intensified anti-inflationary policies in the large country the greater the effect on the exchange rate.

The depreciation of the domestic currency in the SOE results in a corresponding upward movement of the prices of traded goods and of those goods competing with traded goods. To the extent that wages are explicitly or implicitly indexed there will be a rise in wage inflation which will feed into the price of non-traded goods. Furthermore, for a transitional period, the real exchange rate of the SOE will have risen⁷ and therefore, with lags, there will be an increase in the demand for its goods abroad and a decline in the demand for foreign goods at home.⁸ In addition, to the extent that the increase in measured price inflation results in a rise in expected inflation, constant nominal interest rates will imply a fall in real interest rates that will result in an increase in domestic demand for goods. Both the price effects and any subsequent positive output effects will lead to an increase in the quantity of money demanded. If the target growth of the aggregates was initially being met, it will now be exceeded as a result of the price and output developments set off by the rise in foreign interest rates. This will entail a rise in domestic interest rates in order to bring money back to its target growth rate (or range). Thus, we conclude that leaving domestic interest rates unchanged when the foreign interest rate rises will lead to an upward movement in the monetary aggregate that will require an eventual rise in domestic interest rates.

The other polar policy option is to match precisely the rise in foreign rates. This will prevent downward pressure on the external value of the currency from developing.⁹ Thus there will be no tendency for mea-

7. The exchange rate is defined as the number of units of domestic currency per unit of foreign currency. Hence a rise in the exchange rate corresponds to a depreciation of the currency.

8. Depending on the strength of the changes in relative prices it may or may not offset the reduction in exports from the SOE related to the decline in aggregate demand in the large country resulting from the higher real interest rates. The possibility that the SOE may suffer an output decline sufficiently large as to outweigh the expansionary effects on money demand of the rise in prices is ignored in the rest of the analysis.

9. This conclusion would have to be modified to the extent that the market believed that the foreign country's high real interest rates signaled a change in underlying monetary policy whereas the SOE's matching response was only temporary.

sured price or wage inflation to increase as a result of external factors. However, the rise in real interest rates will eventually slow down the growth of domestic aggregate demand and the corresponding slow-down abroad will reduce real export growth. The decline in output will lead to an eventual decline in the quantity of money demanded. In addition, the rise in nominal interest rates will have a direct effect on money demand because of the negative interest elasticity of the monetary aggregate used for targeting purposes. Thus, matching the increase in foreign rates will eventually lead to a decline in the monetary aggregate below its target growth path and hence will require the authorities eventually to lower domestic rates from their new higher level in order to achieve the target growth rate of the monetary aggregate. Furthermore, in the case of Canada, where the relevant interest rate elasticity of the demand for M1, the narrow aggregate used as a target, is substantially larger than the corresponding M1 elasticity in the United States,¹⁰ moving interest rates up in step with U.S. rates would lead to a much larger downward movement of M1 than would be the case in the United States.

Since unchanged domestic interest rates in the SOE would lead to money rising above its target and an increase in the SOE rates equal to that in the large country would lead to money falling below its target, there must be an intermediate position in which interest rates rise, but by less than those in the foreign country such that the monetary aggregate achieves its target. In this intermediate case, interest rate differentials have moved in favor of the large country (although by less than in the case of no change in domestic rates) and hence there will be some depreciation of the domestic currency. The resulting price increase will put upward pressure on money demand as will any increase in output resulting from the depreciation of the currency. In the other direction, there will be downward pressure on money demand from the

10. The difference in the interest rate elasticity of demand for transactions balances in the two countries results principally from the fact that Regulation Q constrains some competing rates from adjusting when market rates change in the United States whereas no such restrictions exist in Canada. Hence, when market rates rise in Canada, all rates tend to rise whereas in the United States savings account rates and some time deposit rates are unchanged. There is thus no tendency to shift into these accounts from transactions balances. The elasticity in M1 equations with respect to the savings deposit rate is therefore irrelevant and only the elasticity with respect to market rates enters into the analysis. As more rates become decontrolled in the United States, the restrictions imposed by Regulation Q will be less binding and the relevant interest rate elasticity of transactions balances will rise (provided own rates on these balances remain fixed).

increase in domestic nominal rates and from the decline in output arising from the increase in domestic real rates. Thus, in the intermediate run, the monetary aggregate will be kept on target by this in-between policy of increasing domestic rates in response to a rise in foreign rates but by a smaller amount. In Canada this policy has been described as taking some of the pressure of foreign rates on domestic rates and some on the exchange rate." When large country rates increase, the amount by which domestic interest rates must rise to achieve the monetary aggregates target is greater, the larger the response of the exchange rate to a given increase in interest rate differential, the larger the effect of a given exchange rate change on prices and output, the smaller the interest rate elasticity of money demand, and the smaller the effect on output of a rise in real domestic interest rates.

Although this in-between policy does lead to money achieving its target in some intermediate run, the way it has been implemented in Canada does not ensure that the target will be achieved in the short run. Because of the various lags in the system the achievement of targets in the very short run would require more volatility of interest rates and possibly exchange rates than is considered desirable. Hence the focus of the policy has been the attainment of the monetary aggregate target in the intermediate run with less volatility in financial variables. Depending on the magnitudes of the various elasticities and the lengths of the different lags, the monetary aggregate may diverge from its target for some period of time. The in-between policy actually implemented in Canada thus "short-circuits" the normal process in which interest rates are adjusted in response to actual movements in money and instead adjusts them to offset movements in the monetary aggregate that appear likely to result in the intermediate run from the foreign interest rate increase.¹²

2. The nominal interest rate increase in the large country reflects an increase in inflationary expectations.

.11. Of course at times over the last two and a half years, factors other than interest rate differentials have also influenced the value of the Canadian dollar and these must be introduced into any detailed analysis of Canadian policy over this period. For such an analysis see the annual reports of the **Bank** of Canada.

12. The reader may have been surprised at the omission throughout this section of any direct effects on money demand in the SOE of the rise in foreign nominal rates. However, Alexander(1981) has shown that the effect of external factors on the demand for M1 in Canada is very weak. The analysis would therefore be changed only marginally by the inclusion of this linkage.

Suppose the rise in nominal interest rates in the large country reflects an increase in inflationary expectations. If there are no changes in inflationary expectations in the SOE, initially there will be no downward pressure on its currency even if it leaves its interest rate unchanged.¹³ Over time, if the rate of inflation does rise in the large country, the currency of the SOE will appreciate in response to the differential in the rates of inflation. The monetary aggregate will be unaffected by these developments since the currency appreciation will just offset the rise in world prices, leaving domestic prices in the SOE on their previous path.

However, if the SOE reacted to the interest rate increase in the large country by raising its nominal interest rate, it would bring about an appreciation of its currency and thereby put downward pressure on prices. The appreciation would eventually lead to a decline in output in the SOE as net exports responded to the increase in the real value of the currency. Furthermore, the rise in real rates would, in itself, tend to reduce output. The rise in the domestic interest rate along with the reductions in output and prices would all act in the direction of reducing the growth rate of money in the SOE and hence signal the inappropriateness of the initial increase in interest rates.

There is the possibility that the foreign exchange markets would attribute the same upsurge in inflationary expectations to the SOE as had occurred in the large country in spite of the fact that there was no objective basis for such a reassessment in the SOE. Until the markets came to realize their error, the SOE would be faced with the need to accept an (unwarranted) depreciation of its currency if its interest rate were held below that of the large country or an unnecessarily high real interest rate if it reacted by raising its interest rate to match that of the large country.¹⁴ Presumably, as time passed and the expected higher inflation rate did not materialize, there would be a reversal in inflationary expectations and the SOE would be able to reduce its interest rate if it had raised it previously. To the extent that wages in the SOE

13. In fact, there is apt to be upward pressure on its currency if the rise in inflationary expectations in the large country derives from an unanticipated increase in the growth rate of money.

14. Achieving a monetary target in this case again requires an in-between policy in which domestic interest rates are adjusted by a fraction of the increase in foreign rates. The fraction is somewhat larger than in the earlier case (1) since the upward pressures on price and output are both greater as a result of the market's inability to perceive the divergence of relative inflation rates in the two countries.

responded rapidly to price changes, any initial depreciation could get embedded fairly rapidly in the price and wage structure and could go some way to setting off an inflationary burst even if there had been no such inflationary pressures building up in the domestic economy previously.¹⁵

3. *The rise in the nominal interest rate in the large country reflects a rise in inflationary expectations but the exchange market interprets it as a rise in the real rate.*

At times foreign exchange markets appear to have responded to increases in nominal rates in the large country that have reflected rises in inflationary expectations as if they were increases in real rates. Or, to put the same point another way, it sometimes seems as if there are inconsistencies between expectations in domestic securities markets and those in foreign exchange markets.¹⁶ In such a case, the SOE is again faced with a dilemma. If it holds its interest rate unchanged, the result will be a depreciation of its currency with the ensuing effects on prices, wages and output and the monetary aggregate. Furthermore, if the inflation rate in the large country has in fact risen consistent with the interpretation of its own money markets, the prices of traded goods in the SOE will increase both because of the increase in world prices and because of the depreciation of the currency. If the SOE responds by allowing its interest rates to rise along with those of the large country, its currency will remain unchanged in the short run but the domestic price of tradeable goods will rise because of the rise in their world prices. However, the higher domestic real interest rates will slow output growth, offsetting the expansionary effects of the fall in the real value of the domestic currency and offsetting the tendency of the higher prices to push up money growth rates. In addition the higher nominal interest rates in the SOE will tend to slow the growth of the monetary aggregate. It is likely, once again, that the in-between policy will lead to the achievement of the monetary aggregate target for the period in which the markets have inconsistent interpretations of developments in the large economy.

15. This is not to argue that there would be an indefinitely long-lasting vicious circle beginning with the depreciation. Provided that the SOE held to its monetary targets in the long run, such a spiral could simply not continue. Nevertheless, there might well be a period of time in which measured rates of inflation were pushed up by the depreciation and resulting price and wage responses.

16. For an analysis of the effects of a similar possible inconsistency on international capital flows, see Freedman and Longworth (1980).

4. Summary

If the SOE wishes to keep its monetary aggregate on target in the intermediate run it will have to respond to the rise in foreign interest rates by a rise in domestic rates that is some fraction of that in foreign rates except in the case where the foreign interest rate increase reflects higher inflationary expectations and is so interpreted in the foreign exchange markets.

IV. The role of the exchange rate in the setting of policy

In the previous section, I analyzed the effect of a change in foreign interest rates on the monetary aggregate in the context of an economy in which the authorities have set a target for that aggregate and seek to achieve it over some intermediate run. In this section, I examine the more basic question of the role of the monetary aggregate and of the exchange rate as possible intermediate targets in a world of volatile foreign interest rates. In particular, the question is raised as to whether it is appropriate to maintain unchanged the policy of trying to achieve a given target growth rate of a monetary aggregate in the face of changes in foreign interest rates. Although there has been some research done on this topic¹⁷ we have not yet reached the stage of being able to make definitive statements on this question. Indeed, it seems to me that the theoretical literature has not dealt with the question in a way that is pertinent to the policymaker's concerns. I focus therefore on the kinds of considerations that should enter into an assessment of the potential role of exchange rates in the policy process.

Since much of the literature in this area derives from the original pathbreaking Poole (1970, 1971) analysis; let us first consider briefly the logic of the Poole approach. The illustrative model used by Poole comprises an equation representing the IS curve and an equation representing the LM curve, each with an additive error. Poole then shows that if there are shifts on the expenditure side of the economy (the IS curve is volatile), use of money as an instrument yields a smaller variance for income than use of the interest rate instrument. Conversely, if there are shifts in the demand for money (the LM curve is volatile), the use of an interest rate instrument results in a smaller

17. See, for example, Boyer (1978), Sparks (1979, 1982), Henderson (1979, 1983), Bryant (1980), Roper and Tumovsky (1980), Artis and Currie (1981) and Weber (1981).

income variance than if money is chosen as an instrument. If both IS and LM curves are volatile, the choice between money and interest rate will depend on the relative size of the shocks to the IS curve and LM curve (both variance and covariance of stochastic disturbances) as well as the parameters of both equations as all these elements are needed to calculate the variance of income.

There are a number of important points that need to be emphasized about the Poole approach. First, it assumes that the policymaker sees only the results of stochastic shocks in the form of movements of interest rates or money but has no specific information regarding the source of shocks to the system. To the extent that such information becomes available, the formal Poole analysis indicates that the authorities should try to offset the shock by manipulating their instrument, i.e., fine tuning is possible to the extent information regarding the shocks is or becomes available.¹⁸ Second, if the authorities can determine from historical evidence the relative probabilities to be assigned to the source of shocks, they can choose a policy (which Poole calls a combination policy) that dominates the simple policy of setting money or interest rate alone. For example, in an economy in which IS shocks are much more common than LM shocks, a tendency for interest rates to rise can be taken as a signal that the IS curve has shifted to the right and hence the money stock should be reduced, raising interest rates even further.¹⁹ Third, the argument for the use of the money stock as an intermediate target that does not change in response to each new piece of information requires the additional assumption of what Brunner (1980) has called "diffuse uncertainty" regarding the structure of the economic system. As I have argued at length elsewhere,²⁰ if the authorities have, or believe they have, reasonably good estimates of the demand for money equation but have much less confidence in their estimates of the coefficients of the IS curve (or price equation, etc.) including those of the lag structures, then a case can be made for simply setting the money stock or the growth rate of the money stock at a given magnitude. This type of policy will ensure reasonable long-run outcomes although the short-run results may be

18. This is one of the messages contained in Kareken, Muench, and Wallace (1973), in which instruments are adjusted in response to each piece of information that becomes available. As Friedman (1975) has pointed out, in such a model there is no need for an intermediate target and instruments should be linked to ultimate goal targets.

19. See Mitchell (1980) for a diagrammatic treatment of this type of analysis.

20. Freedman (1981).

substantially inferior to those that could be achieved in a hypothetical world with full information. The policymaker thus opts for a policy that is "second-best", but which will strongly guard against disastrous long-run outcomes. Thus, for example, a money supply target prevents the sort of cumulative one-way errors that lead to accelerating inflation although it can do little to offset short-run cycles in the economy.

As an example of how some of these elements (specific knowledge of source of shocks, historical evidence on source of shocks, knowledge of economic structure) enter into policymaking, consider the response of the authorities to a decrease in the monetary aggregate. Initially it is assumed that the decrease in money represents a disturbance to the demand for money equation rather than a shift in the IS curve. The reason for this judgement is that historically money has been a very "noisy" series and tells us very little in the short run about income movements (i.e., the signal to noise ratio is very low for weekly or even monthly movements in money). If the low money stock numbers persist one searches for innovations in financial markets as a possible source of the movement. However, if no such structural shift is discovered to have occurred, and if the low money numbers continue one interprets the decrease in money stock as a signal that income has been declining (i.e., the signal to noise ratio in the money stock is considerably higher in the intermediate run than in the very short run). Of course, all other data are also being analyzed for confirmation or rejection of the interpretation regarding the decline in income. In short, the authorities respond to the underlying thrust of money movements rather than short-run "wiggles" in the series because of historical evidence regarding the relative volatility of IS and LM curves over different time periods. Specific knowledge of sources of shocks, where available, is also used as an input to decision making.²¹

The extensions of the Poole analysis to an open economy can be examined in the light of the above discussion. Unlike the closed economy literature which has used the simple IS-LM model as a common basis, the open economy literature has diverged in a number of directions as a result of different specifications of the exchange rate equation and other related equations. In adding an external sector to the model, the investigator has to make a number of choices: (1) perfect versus imperfect substitutability between domestic and foreign assets;

21. See Thiessen (1982) for further discussion of some of these issues.

(2) completely flexible domestic prices versus sticky prices à la Dornbusch; (3) if sticky prices, ad hoc stickiness versus the overlapping or staggered wage contract structure; (4) rational expectations in the exchange market versus some form of adaptive expectations; (5) rational expectations in the long run only versus rational expectations at all points of time; (6) minimization of output variance versus minimization of price variance; (7) perfect versus imperfect substitutability of domestic and foreign traded goods; (8) existence of non-traded goods sector."²²

Some of these choices can have very significant implications for the modeling strategies that can be followed and the kinds of questions that can be asked. Thus, for example, the assumption of perfect substitutability between domestic and foreign assets immediately rules out the possibility of effective governmental intervention in the foreign exchange market. And the assumptions of perfectly flexible domestic prices and perfect substitutability of assets and goods are sufficient to entail the strongly monetarist approach to exchange rate determination. Moreover, by restricting the loss function to the variance of output or prices, the literature rules out the possibility that there are costs to interest rate or exchange rate volatility. Given the array of choices listed above it is not surprising that the various articles dealing with the topic of the exchange rate as instrument or target have not arrived at a consensus position. Furthermore, as will be argued below, some of the very important aspects of the problem have thus far been neglected in the theoretical literature.

A number of the articles basically follow the original **Poole** approach by asking whether a money rule or an exchange rate rule minimizes the variance of income. Not surprisingly, the general result is that for certain shocks a money rule dominates and for certain shocks an exchange rate rule dominates. In the case of a more complex model in which there is imperfect substitutability between domestic and foreign securities, Henderson (1979) compares a "rates constant" policy in which both interest rates and exchange rates are held at target values in the face of shocks with a "aggregates constant" policy in which both money supply and foreign exchange reserves are held at target values. He too finds that different policies dominate for different shocks. Henderson also shows that a combination policy in which both rates

22. Many of these considerations are relevant for closed economy models as well but have been ignored in that literature.

and stocks changed would be better than either of the polar cases of constant rates or constant aggregates. Thus the case is made that a controlled float may be better than either a pure float or a fixed exchange rate.²³

Some papers focus explicitly on the response of domestic policy to foreign interest rate increases and other foreign shocks. Sparks (1982) traces out the implication for the SOE of the various interest rate responses discussed in Section 3 and comes to the conclusion that the SOE ought to respond to a temporary foreign interest rate increase by raising domestic rates by a fraction of the foreign rate increase. Artis and Currie (1981), after examining the implications of a variety of external and domestic shocks, raise the possibility of making money targets conditional on exchange rate movements in a world in which price stabilization is a primary concern of policy. This suggestion appears to be a version of the optimal combination policy discussed by Poole and others.

From the point of view of a SOE such as Canada, the policy literature developed thus far has not been overly helpful. In practice, Canada has had only one policy instrument, namely the interest rate, since the amount of international reserves at the disposal of the authorities was never sufficient to have a long-lasting effect on the exchange rate in a world in which foreign and domestic assets were very close substitutes. From this perspective those articles, such as Artis and Currie, in which international reserves are not treated as an instrument are more useful than those, such as Henderson, in which they are treated as a potential instrument. A second aspect of much of the literature that lessens its usefulness is the focus on minimization of the variance of output. In practice the concern about foreign interest rate movements has derived principally from the effect that the resulting exchange rate movements would have on inflation at a time when policy was directed to slowing the rate of inflation. The type of model required to deal with this type of question is one in which shocks are superimposed on a disinflationary path and the analysis focuses on the effect of the shocks on the rate of inflation.

23. Roper and Tumovsky (1980) reach this conclusion as well but in their model intervention is the way of changing the level of the money supply and therefore the optimality of the "dirty float" is equivalent to the conclusion that a fixed money rule is not optimal.

24. The role of intervention in Canada is simply to smooth out short-run fluctuations and, on occasion, to prevent a completely one-way market from developing.

More important, the Poole-type assumption made throughout this literature that the authorities have equally good knowledge of all sectors of the economy is precisely what is at issue. If one assumes that there is "diffuse uncertainty" about most of the economy but that the demand for money equation is believed to be stable, it is most unlikely that any policy will dominate the fixed money rule policy. However, it can be argued that there are certain types of shocks for which the authorities have a reasonably good ability to trace out the economic results and hence that these shocks can be partially offset whereas the same assertion cannot be made for other types of shocks. In the case of the latter, a simple unchanged target for the monetary aggregate is probably the preferred policy. However, in the case of the former one might be able to improve on the simple money rule by integrating the exchange rate into the policy process as part of a Poole-type combination policy. The challenge is to distinguish between the two types of shocks and to specify precisely how exchange rates can be used in the latter case.

Putting these elements together, one has the following rationale for focusing on the exchange rate, at least in short-run policy analysis.²⁵ First, at a time in which the anti-inflationary strategy is the primary goal of policy, one wishes to avoid or at least partly offset shocks that could be detrimental to this strategy.²⁶ Second, U.S. interest rate increases have, via their effect on the exchange rate, fairly direct and fairly rapid effects on SOE prices.²⁷ In economies in which wages are implicitly or explicitly indexed, these prices will feed fairly quickly into wages. Third, the links are sufficiently straightforward that the authorities feel that they can track the effects through the system and, by adjusting interest rates, offset them at least in part. That is, the shock itself is identifiable and the effects of the shock can be traced with a degree of accuracy. The assumption of diffuse uncertainty does not hold in the case of this shock although it does hold for others, particularly those where the shock can only be identified from the conse-

25. In the long run, the monetary targets remain the principal focus of policy since the main long-run concern is to avoid cumulative policy errors in one direction which might lead to accelerating inflation. It is a challenge to the theoretical literature to try to integrate both the short-run and long-run policy concerns of policymakers.

26. There remains the difficulty of distinguishing between shocks that are transitory and need little or no offset and those that are longer lasting and may require a policy response.

27. Indeed the effect of the exchange rate on prices is more direct and more rapid than that of money.

quences. Fourth, to the extent that there is upward ratcheting of expectations when prices rise there may be some asymmetrical behavior by economic participants that makes it harder to reverse upward shocks to prices. Whether such ratcheting exists is of course an empirical question. Fifth, at times exchange markets have behaved in a way that can be interpreted as overshooting. To the extent that such behavior exists, a policy response that avoids the kind of sharp movements in exchange rates that may lead to the build-up of extrapolative expectations is much more defensible.

The literature in this area, although interesting, does not yet come to grip with many of these issues. The research agenda for the future should include both empirical work to determine the quantitative significance of some of the conditions on which the argument for focusing on exchange rates has been based as well as theoretical models that reflect and analyze the perceptions of the policymakers regarding different levels of confidence in their knowledge of the behavior of different sectors of the economy.

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