

Advanced Topic 9: Conducting Monetary Policy

John E. Floyd
University of Toronto
July 24, 2013

It is time now to pull things together and come up with some ideas as to how monetary policy should be conducted when the analytical framework available to the monetary authorities can be represented by the basic two-country model developed in *Advanced Topic 8: A Basic Two Country Model*. A more complete presentation of the material below can be found in Chapter 14 of John E. Floyd, *Interest Rates, Exchange Rates and World Monetary Policy*, Springer-Verlag, 2009.

Monetary policy has three basic objectives:

- 1) Monetary growth must be such as to **make the domestic price level grow at an appropriate stable rate over the long run**. For developed countries this desired inflation rate would normally be on the positive side of but not far from zero.
- 2) The stock of liquidity should under ideal circumstances be varied around its long-term growth path in a manner that will **prevent deviations of output and employment from their full-employment levels**.
- 3) Although necessarily independent of political control, central banks nevertheless have to maintain public credibility by **not appearing to create or allow unstable conditions in domestic foreign exchange and capital markets**.

To do their job perfectly, the authorities in a big world-dominant economy that has little concern for its tiny trading partners have to know the time paths of the full-employment levels of output and interest rates and the magnitudes and timing of short-run real shocks and demand for money shocks, as well as the magnitudes of the coefficients in their underlying model together with its dynamic properties. While forecasts of the underlying full-employment paths of income and interest rates are clearly possible though subject to error, forecasts of future short-term real and money demand shocks are virtually impossible. And the current levels of output, employment, wages and prices can only be observed with hindsight. While nominal interest rates can be observed on a daily basis, real interest rates cannot be observed at all. And, of course, the magnitudes of the parameters in any credible basic model like the one developed here are not known with any precision, and the same is true of prospective dynamic paths of the variables.

Traditionally, **two alternative rules of operation** been favorably regarded in the profession. **The most popular of these would have the authorities continually adjust nominal interest rates to keep domestic investment at levels that will continually maintain output as close as possible to its full-employment level and the inflation rate on target**. The alternative would have the authorities continually maintain an appropriate rarely-changing rate of growth of nominal liquidity, thereby ensuring that major inflations and depressions will not occur, while giving up on the prospect of fine-tune corrections of short-term movements in the levels of output

and employment. Both rules face a similar problem. In the case of interest rate control, the authorities can only observe nominal interest rates, and these can deviate substantially from the relevant unobservable real interest rates as a result of changing public expectations concerning future inflation. In the case of liquidity growth rules, the authorities do not observe the level of nominal liquidity—they only observe the monetary base and a number of monetary aggregates, all of which give only partial information about liquidity growth. And they can only learn with hindsight about changing trends in the demand for the various monetary aggregates and in long-run output growth.

Policy implementation problems facing small open economies are much worse. The authorities in the small economy need information about their domestic variables and, in addition, the same information about the rest-of-world aggregates. Moreover, the objective of controlling domestic real interest rates by manipulating a short-term nominal call-money rate is mythological, with the only useful results being the possible effects on market expectations or on commercial banks' expansion of reserves and deposits. Indeed, independent monetary policy in small open economies operates via its effects on nominal and real exchange rates and consequent trade balance adjustments in an environment in which there is every reason to believe that significant monetary shocks, from either the supply or demand side, will lead to substantial overshooting movements in real and nominal exchange rates. Accusations of creating or allowing market disorder are a central banker's nightmare.

The overall tendency in both big and small open economies has been to muddle along using the best current information obtainable about a wide variety of variables, with publicly-stated emphasis on interest rate control combined with the maintenance of orderly markets while in many cases using inflation rate targets as the measure of performance.

One option for a small country is to adopt a fixed exchange rate by pegging its currency to that of a big and stable neighboring country. However, it was clearly demonstrated in the empirical evidence presented in *Advanced Topic 6: Exchange Rate Determination III* that major movements in long-run equilibrium real exchange rates of major industrial countries have been common. **Recall the definition of a country's real exchange rate**

$$Q = \frac{\Pi P_d}{P_f} \quad (1)$$

where Q is the real exchange rate with respect to an important trading partner, Π is the foreign currency price of the domestic currency and P_d and P_f are the price levels of domestic and foreign output. **When the nominal exchange rate is fixed, this equation reduces to**

$$P_d = Q P_f \quad (2)$$

which clearly indicates that, given the price level abroad, domestic price level will have to change in direct proportion with the long-run equilibrium real exchange rate for domestic full-employment equilibrium to be maintained. By fixing its

exchange rate a country loses important short- and long-run insulation advantages of flexible exchange rates, which protect domestic output and prices from the asymmetric domestic relative to foreign real shocks that result in variations in the domestic full-employment real exchange rates with respect to major trading partners. When Q is constant, and purchasing power parity therefore holds, the adoption of a fixed exchange rate enables a country's authorities to free-ride off a neighboring the big country's monetary policy, ending up with the same time-paths of short-run economic conditions and long-term inflation as exist abroad. When the big neighbor country is politically stable and hires its economic advisors from the same pool as does the small country, it is very unlikely that under these circumstances the small country could do better on its own. But purchasing power parity clearly does not hold. Even the real exchange rates of countries like Canada with respect its closely related United States neighbor have frequently varied by 20 to 30 percent over periods of a few years.

The alternative is to let the exchange rate float, but then the authorities have to decide how to manage the growth of liquidity. The process of achieving a stable average rate of price-level growth over four or five year horizons should not be too daunting since it is possible to maintain a stable rate of base money growth that can be adjusted from time to time to compensate for emerging trends in the ratios of various monetary aggregates to base money, in full-employment real income, and in various measures of the velocity of money. The problem is that, whatever the potential benefits of maintaining a constant rate of monetary growth in a large world-dominant economy might be, such a policy is completely out of the question for a small open economy. The problem is not one of maintaining a stable average rate of inflation. Rather, it is one of avoiding unacceptable deviations of output, employment and exchange rates around their full-employment levels.

It turns out that the variances of a small-country's liquidity demand and full-employment output shocks are likely to be many times larger than the variances of the corresponding big-country shocks. Think of the world as consisting of n equal-sized areas each with a variable S_t^i (not in logarithms) subject to random shocks. Let one of these areas be the small country, denoting the magnitude of its variable by S_t^1 and let the remaining $n - 1$ areas be the big country whose aggregate level of the variable is denoted by $S_t^R = \sum_{i=2}^n S_t^i$. The deviation of the big-country's aggregate variable from its initial value taken as a proportion of that initial value will equal

$$\begin{aligned} \Delta S_t^R &= \sum_{i=2}^n \left[\frac{(S_t^i - S_{t-1}^i)}{S_{t-1}^R} \right] = \sum_{i=2}^n \frac{S_{t-1}^i}{S_{t-1}^R} \left[\frac{(S_t^i - S_{t-1}^i)}{S_{t-1}^i} \right] \\ &\simeq \sum_{i=2}^n \frac{1}{n-1} \left[\frac{(S_t^i - S_{t-1}^i)}{S_{t-1}^i} \right] = \frac{1}{n-1} \sum_{i=2}^n \Delta S_t^i. \end{aligned} \quad (3)$$

When the shocks in the different areas are independent and have the same variance, the variance of this aggregate shock will equal

$$\text{Var}(\Delta s_R) = \frac{1}{(n-1)^2} \sum_{i=2}^n \text{Var}(\Delta s_i) = \frac{(n-1)}{(n-1)^2} \text{Var}(\Delta s_i) = \frac{1}{n-1} \text{Var}(\Delta s_i) \quad (4)$$

where s_R and s_i are logarithms of S^R and S^i .

The variance of the shock in the small country will be $(n - 1)$ times the variance of the shock in the big country. By pegging its currency to the large-country's currency, the small country in effect pools its overall demand for money shocks with the big-country shocks—the average percentage shock over a large area will always be smaller than the percentage shocks of the individual small areas that comprise it. There is thus a pooling advantage of fixed exchange rates.

A classic example is the Canada/U.S. case during the period 1962:Q4 through 1970:Q1 when the Canadian dollar was pegged to the U.S. dollar. The standard deviations of the quarter-to-quarter percentage changes in Canadian base money, M1 and M2 were respectively around 3, 8 and 10 times the standard deviations of the quarter-to-quarter percentage changes of the corresponding U.S. variables. These monetary aggregates should be viewed simply as indicators of the degrees of liquidity in the respective economies. During the fixed exchange rate period the Canadian money supply can be assumed to have been adjusted endogenously in response to demand for money shocks to maintain the fixed exchange rate. By tying the Canadian dollar to the U.S. dollar, the Canadians essentially pooled their demand for money shocks with those in the U.S. so that unanticipated domestic output and price level changes became dependent on the U.S. shocks rather than their own. Because of the fixed exchange rate, the Canadian authorities were forced to generate a domestic monetary policy comparable to that in the United States. The higher standard deviations of the Canadian aggregates as compared to their U.S. counterparts thus necessarily reflects excess variability of the demand for liquidity in Canada as compared to the United States.

A small country's monetary policy problem is to try to simultaneously achieve the pooling advantages of fixed exchange rates together with the insulation advantages of flexible exchange rates. It turns out that its authorities could do this to a highly satisfactory degree if they can determine which market shocks to the domestic exchange rate are portfolio shocks and continually adjust domestic liquidity to neutralize them. All asymmetric demand-for-liquidity shocks result in an attempt by domestic residents to adjust their liquidity holdings to the desired level. They do this by selling assets to or buying them from foreign residents in return for money. If the authorities can sense when this is happening they can supply the desired additional liquidity or mop up the excess liquidity to offset the effects of these private portfolio adjustments on the exchange rate. This is what would happen automatically if the exchange rate were fixed. **When the exchange rate is flexible it will then move entirely on the basis of real factors, with all monetary shocks being neutralized. Monetary conditions will be the same in the small domestic economy as in the rest of the world and the domestic and rest-of-world business cycles, to the extent that they arise from monetary factors, will be the same.**¹ There will be no overshooting movements in exchange rates—indeed, the ability of the authorities to create the same monetary conditions at home as abroad implies an ability to recognize when overshooting movements of the exchange rate are about to take place and neutralize them. Essentially, the task facing the small country's authorities is to maintain an 'orderly' foreign exchange market. To the extent that asset holders would sense when over-

¹There are quite different good reasons to expect that business cycles based on real shocks will also be similar.

shooting is occurring and thereby put pressure on forward exchange rates and domestic interest rates, this would also lead to the maintenance of orderly domestic asset markets.

The continual creation by the domestic authorities of the same monetary conditions at home as exist abroad will not necessarily result in the same inflation rate in the domestic economy as abroad because by offsetting domestic portfolio shocks the authorities, in effect, create whatever supply of liquidity domestic residents wish to hold. Indeed, **an increase in the expected rate of domestic inflation will cause the demand for liquidity to decline immediately and then grow at a more rapid rate thereafter than the current growth rate.** The above-noted monetary policy will lead the domestic authorities to mop up this initial excess stock of liquidity and then provide the greater future liquidity growth desired by domestic residents with the result that shifts in inflation expectations become self-fulfilling. Accordingly, it is necessary for the authorities to constantly make clear their intentions to maintain a desired current core inflation rate in an attempt to keep domestic residents' inflation expectations unchanged at the appropriate level.

The only way the authorities could deal with an unwanted shift in domestic residents' inflation expectations is to use the nominal exchange rate as a policy instrument, constantly adjusting the domestic stock of base money to maintain the current and future growth of the nominal exchange rate equal to the underlying growth of the full-employment real exchange rate minus the excess of the desired domestic inflation rate over the foreign inflation rate. One way of doing this would be to adjust the nominal exchange rate each period by an amount equal to the observed change in the real exchange rate in the previous period during which the nominal exchange rate was maintained virtually constant. The nominal exchange rate would then become a near random walk, approximately one period behind the real exchange rate, and the domestic price level would exhibit a more or less constant trend. The problem is that, since prices tend to be sticky in the short run, the observed level of the real exchange rate will differ from its underlying full-employment level by an amount that will depend on the deviations of domestic and foreign output and employment from their full-employment levels. If domestic output is below its full-employment level there is a clear advantage to forcing the nominal exchange rate below the level suggested by the previous movements of the real exchange rate.

A seemingly better procedure would be to continually adjust domestic monetary conditions to keep movements of the nominal exchange rate within 'a normal trading range' with the result that the gradual movements in the equilibrium full-employment real exchange rate would automatically be financed and the overshooting consequences of portfolio shocks could reasonably be offset. Then, if the price level begins creeping above or below its target level, appropriate upward or downward pressure on the nominal exchange rate can be applied. The problem, of course, is that once the authorities begin controlling the nominal exchange rate, they lose sight of its equilibrium level. The evidence in *Advanced Topic 7: Exchange Rate Determination IV* that unanticipated monetary shocks have little effect on real exchange rates strongly suggests that the authorities of several major countries have in fact performed the above suggested tasks to a reasonable approximation.

Our analysis suggests that, **whether or not small countries adopt fixed exchange rates with a single large economy, cyclical deviations of output from full-employment levels and persistent deviations of price levels from individual countries' core inflation rates will be roughly the same over the entire world. And, in the event that there is a single large country that is uninterested in its exchange rates with respect to trading partners, that country will run world monetary policy. When no such self-centered country exists and most other countries let their exchange rates float, world monetary policy will be a blind-leading-the-blind exercise.** To the extent that the world demand for liquidity changes, pressures on world output, employment and prices will typically result. Countries whose demand for liquidity has increased will expand their money supplies to smooth out the appreciation of their currencies, but those whose demand for liquidity has not increased will tighten their domestic credit conditions to smooth out the depreciation of their currencies. The net effect will be an overall excess demand for world liquidity, causing world interest rates to rise and world output and employment to fall in the short run and all countries' price levels to fall in the long run.² If most countries are politically stable and multi-country banking crises can be avoided, there is little reason to believe that major changes in the world demand for liquidity and resulting major inflations and depressions will arise. But there is also little reason to expect that significant business cycles will be avoided. In cases **where a country of major size ignores developments in its foreign exchange market, monetary shocks in that country will be transmitted abroad and have world-wide effect. The avoidance of major world problems will then hinge on the stability of conditions in that dominant country.**

The above analysis has **important implications for the practice, which has a long history, of setting target zones within which the countries' authorities commit themselves to maintain future levels of nominal exchange rates.** A nominal exchange rate fundamental can be thought of as the level of the nominal exchange rate that would occur at each point in time in response to the economy's underlying full-employment real exchange rate together with the desired course of monetary policy. Suppose that, as shown in the Figure below, the nominal exchange rate fundamental is a white noise shock around a constant mean. Then suppose that a credible target zone extending 7.5% on either side of the exchange rate parity, set as 1.0 in the Figure, is established. As long as it is believed that the authorities will intervene in the foreign exchange market as necessary to keep the exchange rate within the target zone, the actual exchange rate will automatically remain within the zone—as the exchange rate approaches the upper (lower) bound, investors will anticipate that, given the potential action by the authorities, it will be more likely to fall (rise) than rise (fall), creating market pressures to maintain it within the zone.³

²Only if the countries whose demand for liquidity remains unchanged do not attempt to keep their exchange rates from depreciating will the increase in the world demand for liquidity be fully financed, avoiding downward pressure on world output and prices.

³This idea originated in the work of nobel-prize-winning economist Paul Krugman.

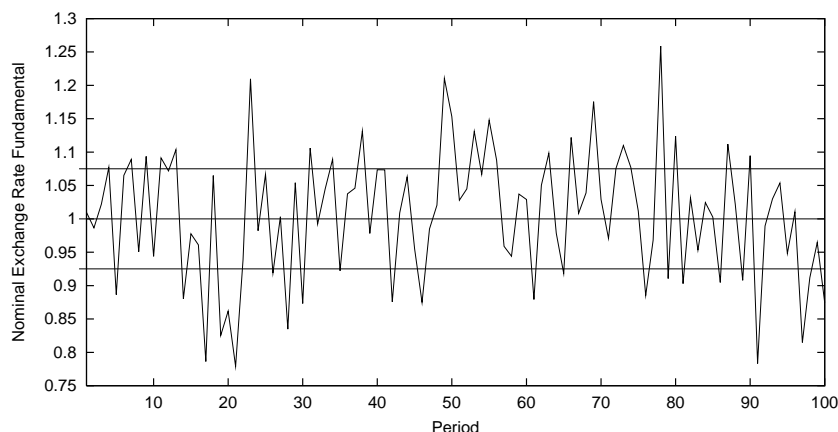


Figure 1: A target zone of $\pm 7.5\%$ when the nominal exchange rate is fundamental a stationary normal random process with mean of 1 and variance of 0.2

If the shocks to the exchange rate fundamental appearing in the above Figure are the result of demand for money shocks which the authorities are not offsetting with appropriate adjustments of the supply of liquidity, then limiting the extent to which these fluctuations can occur together with the shocks to output, employment and prices that will result from them is good. But it would be even better for the authorities to fix the exchange rate at its parity level 1.0 since the optimal target zone is of zero width. On the other hand, if the shocks to the exchange rate fundamental are the result of shocks to the full-employment real exchange rate and the authorities are able to verify that no demand-for-liquidity shocks are occurring, it is not in the public interest to in any way limit the resulting nominal exchange rate movements. Capping nominal exchange rate movements will divert these unanticipated shocks onto domestic output, employment and prices. If the decision is to go for the insulating properties of flexible exchange rates within the bounds of variability due to real shocks, then there would seem to be little advantage in setting a target zone because if the authorities know the appropriate target zone they know enough to substantially eliminate the exchange rate fluctuations in excess of these bounds without setting a target zone.

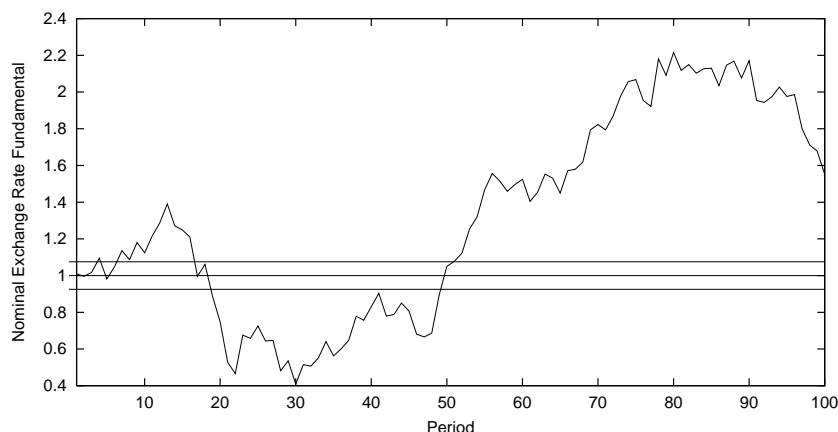


Figure 2: A target zone of $\pm 7.5\%$ when the nominal exchange rate fundamental is a random walk starting at a value of unity with innovations generated by the random process in Fig. 1

When we take into account the fact that full-employment real exchange rates are near random walks and, even with appropriate control over long-term domestic inflation rates, nominal exchange rate fundamentals will therefore wander far and wide as indicated in the Figure above, the case for target zones becomes even weaker. It is clear that **any reasonable fixed target zone will be quickly violated. The alternative is to adopt a flexible target zone but again, if the authorities have enough information to set an appropriate target band beyond which the exchange rate should not be allowed to fluctuate, then they have the information to neutralize the offending asymmetric monetary shocks without setting a target zone.**

The only reason for setting a target zone would appear to be to establish credibility in the eyes of the public that there will be limits to the domestic monetary finance of government expenditure that will be allowed to affect the exchange rate. A target zone could thus be viewed as a commitment to maintain the nominal exchange rate within a band dictated by the evolving full-employment real exchange rate. **But as long as the authorities allow themselves to adjust the target zone, as the random walk nature of the real exchange rate requires that they must do from time to time, it will be difficult for them to maintain credibility that the zone will be adjusted only in response to real exchange rate movements and never in anticipation of future inflationary finance. To establish monetary policy credibility under these circumstances, it would be wiser to commit to an inflation rate target zone rather than an exchange rate target zone.**

From our analysis above, **it is clear that countries will tend to adopt fixed exchange rates only when the underlying full-employment real exchange rates vary little through time, reverting to flexible rates when, as in recent years, real exchange rates are highly variable. Yet one frequently hears the argument, based on historical evidence, that the adoption of flexible exchange rates leads to real exchange rate variability that would not be present under a fixed exchange rate regime. The historical evidence is presented in the two Figures below.**⁴

⁴A more detailed discussion of the arguments that follow can be found in Chapter 15 of *Interest Rates, Exchange Rates and World Monetary Policy*.

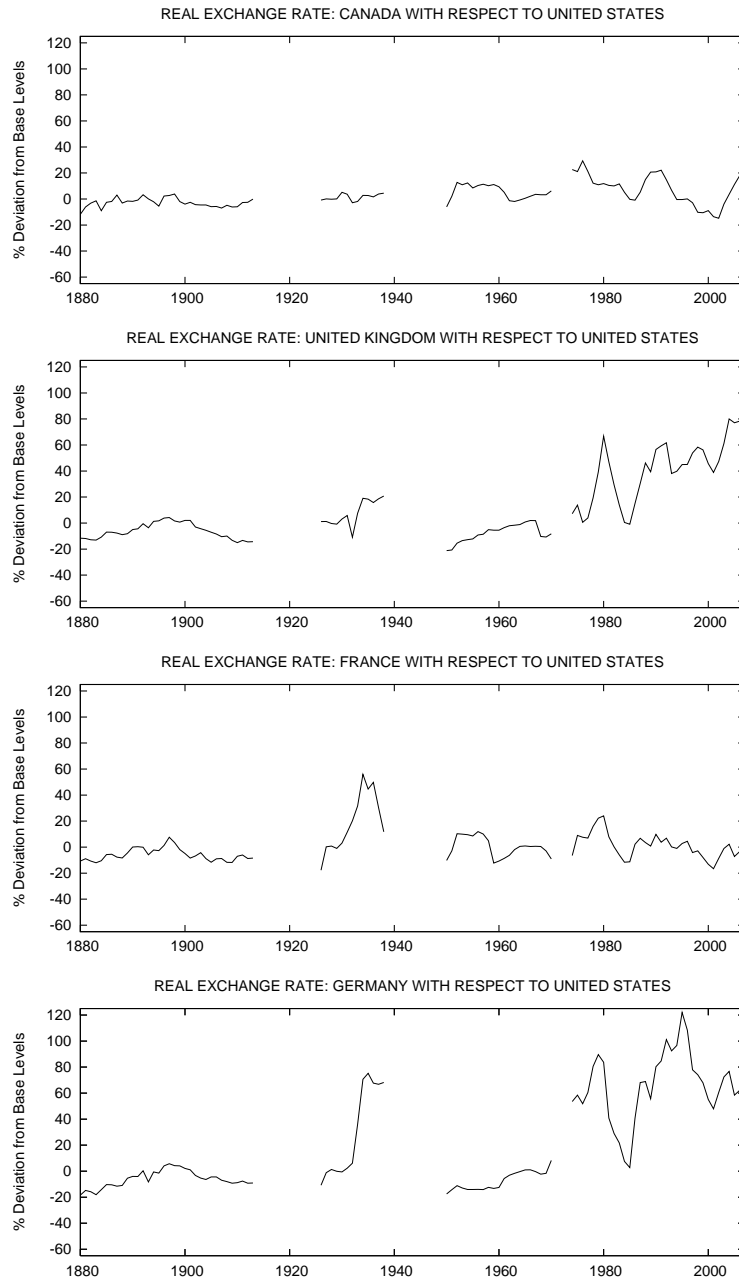


Figure 3: Percentage deviations of real exchange rates from base levels: 1880–1913 (1890–99 base), 1926–1938 (1927–29 base), 1950–1970 and 1974–2007 (1963–66 base)

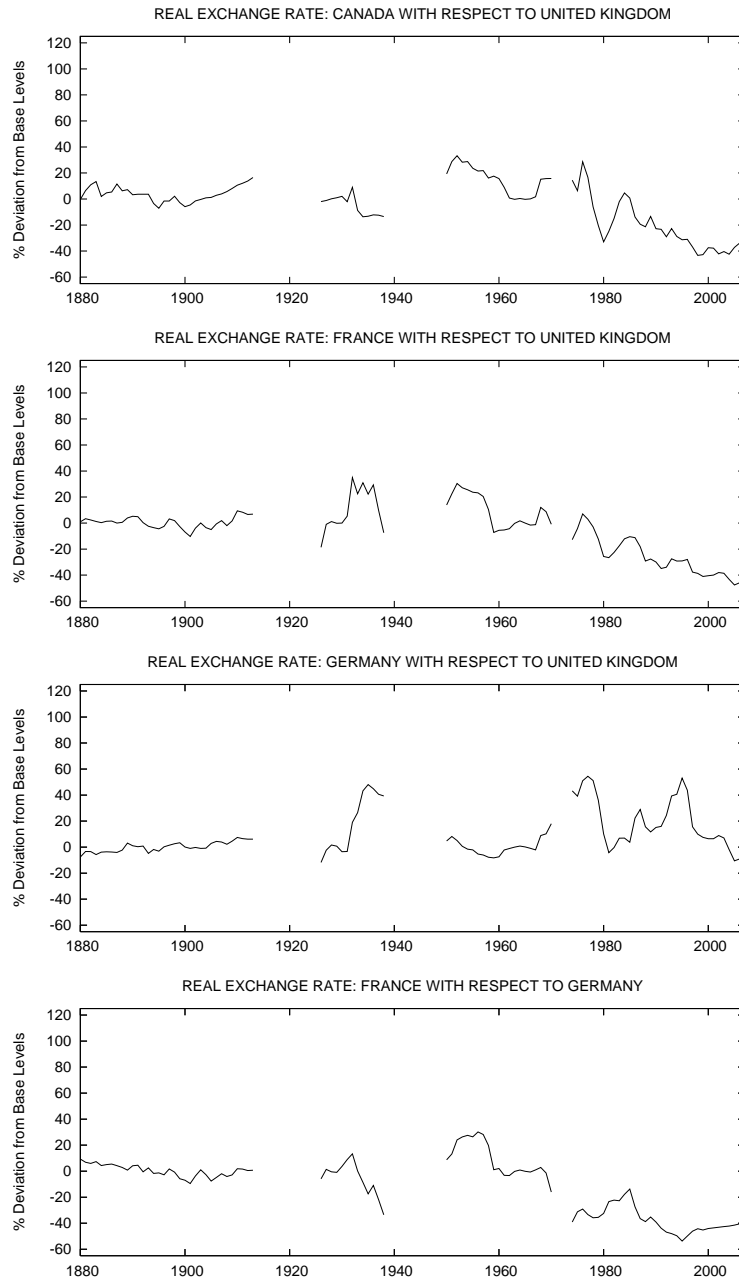


Figure 4: Percentage deviations of real exchange rates from base levels: 1880–1913 (1890–99 base), 1926–1938 (1927–29 base), 1950–1970 and 1974–2007 (1963–66 base)

Each series is broken into four segments corresponding to separate international exchange rate policy regimes—the gold standard period before 1914, the inter-war period between 1926 and 1938, the Bretton-Woods period between 1950 and 1970 and the Post-Bretton-Woods period after 1973. The series are indexed with bases equal to 1890-99 = 100 in the gold standard period, 1927-29 = 100 in the inter-war period and 1963-66 for the periods after World War II. The first and third of these periods were characterized by fixed exchange rates and the fourth period by flexible rates. The interwar period was characterized by an unstable mixture of fixed and managed flexible rates. The years of transition between these distinctive regimes are omitted.

Real exchange rates are clearly more variable in the floating exchange rate period after 1973 than in either of the two fixed exchange rate periods. The viability of the gold standard in the 19th century and earlier hinged on the restrictions it placed on government printing of money to finance public expenditures. There had been little experience with ‘responsible’ government management of fiduciary monetary systems up to that time. So one cannot rule out the possibility that flexible exchange rates would still have been adopted during the past three decades even if real exchange rate variability was as low in that period as it was during the period before 1914. Except for Canada with respect to the United States, there is clear evidence of greater real exchange rate variability during the interwar period than before 1914. One plausible reason for the stability of real exchange rates prior to the First World War may have been the high degree of labour mobility between Europe and North America during the period when that Continent was being settled. A gold standard was re-established by the mid-1920s in the face of considerable uncertainty about the appropriate gold parities. Canada effectively left the gold standard in 1929 when the authorities suspended convertibility of government produced Dominion Notes although the exchange rate remained close to the gold parity until 1931 when restrictions were placed on the export of gold and substantial depreciation occurred. France maintained the gold standard parity until 1937, and Germany did so beyond that year, although its exchange rate level was meaningless because of the presence of restrictions on capital flows, first adopted in 1931. The United States devalued in 1933. The last decade of this period was one of competitive devaluations and beggar-thy-neighbor impositions of tariffs and other trade restrictions as the world economy went through the Great Depression.

While it cannot be concluded that the United States was responsible for the onset of the Great Depression, the bank failures in that country and the Federal Reserve System’s failure to expand base money to counter the effects on the money supply of the public’s conversion of deposits to cash and the banks’ scramble for reserves was an important factor increasing its magnitude. As shown in the Figure on the next page, the U. S. money supply had fallen by more than one-third by late-1934, even though the stock of base money grew substantially.

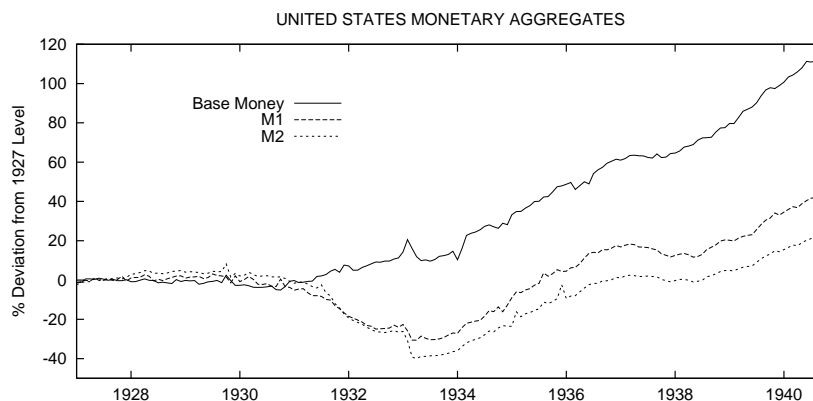


Figure 5: United States monetary aggregates during the Great Depression

The Figures on the next two pages give the **real and nominal exchange rates and the price levels of Canada, the United Kingdom, France and Germany as compared to those of the United States. While there is substantial variability of real and nominal exchange rates, price levels fell to roughly the same degree as that in the United States in every case but the United Kingdom.**

Following the debacle of the 1930s, it became apparent that an international monetary regime had to be established that would maintain orderly exchange rate movements and make it unnecessary and undesirable for countries to engage in the competitive imposition of restrictions on international trade. **While the agreement concluded at Bretton Woods envisaged a gold standard similar to the one that had been successful prior to 1914, the result was really a key-currency system using the U.S. dollar as the key-currency with international reserves consisting of gold and U.S. dollars redeemable in gold at \$35 per oz.** Restrictions on international trade were to be eliminated as soon as possible and exchange rates were to be adjusted only in response to ‘fundamental disequilibria’ in consultation with the International Monetary Fund, the international agency created to coordinate management of the system. International capital movements could be restricted if required to prevent speculative deviations of exchange rates from their fundamental equilibrium levels. While the removal of trade restrictions was accomplished by 1958, widespread efforts to control international capital movements were common throughout the Bretton-Woods period, although as capital markets improved with the passage of time it became increasingly difficult to successfully control unwanted capital transfers. Maintaining the system became an increasing struggle as the years passed. The problem was that indications of a willingness to devalue under appropriate circumstances raised the possibility of near-certain profits from currency speculation when such circumstances began to appear, while an unequivocal commitment to the existing exchange rate level required either the use of direct controls and other restrictions to force the real exchange rate into line with the nominal parity value, or increases and declines in domestic employment and prices as the equilibrium real exchange rate varied through time, an inevitable occurrence given its near-random-walk nature.

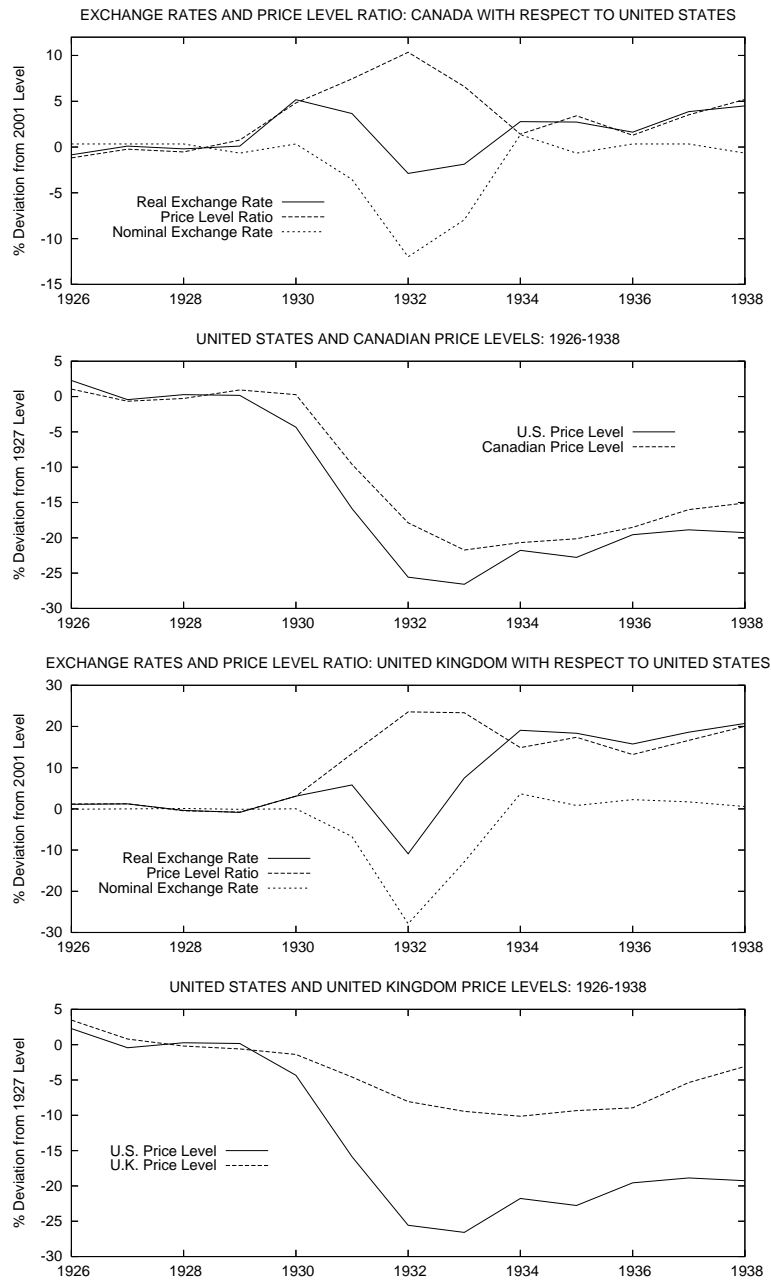


Figure 6: Percentage deviations of exchange rates, price level ratios and price levels from 1927–29 levels during the Great Depression

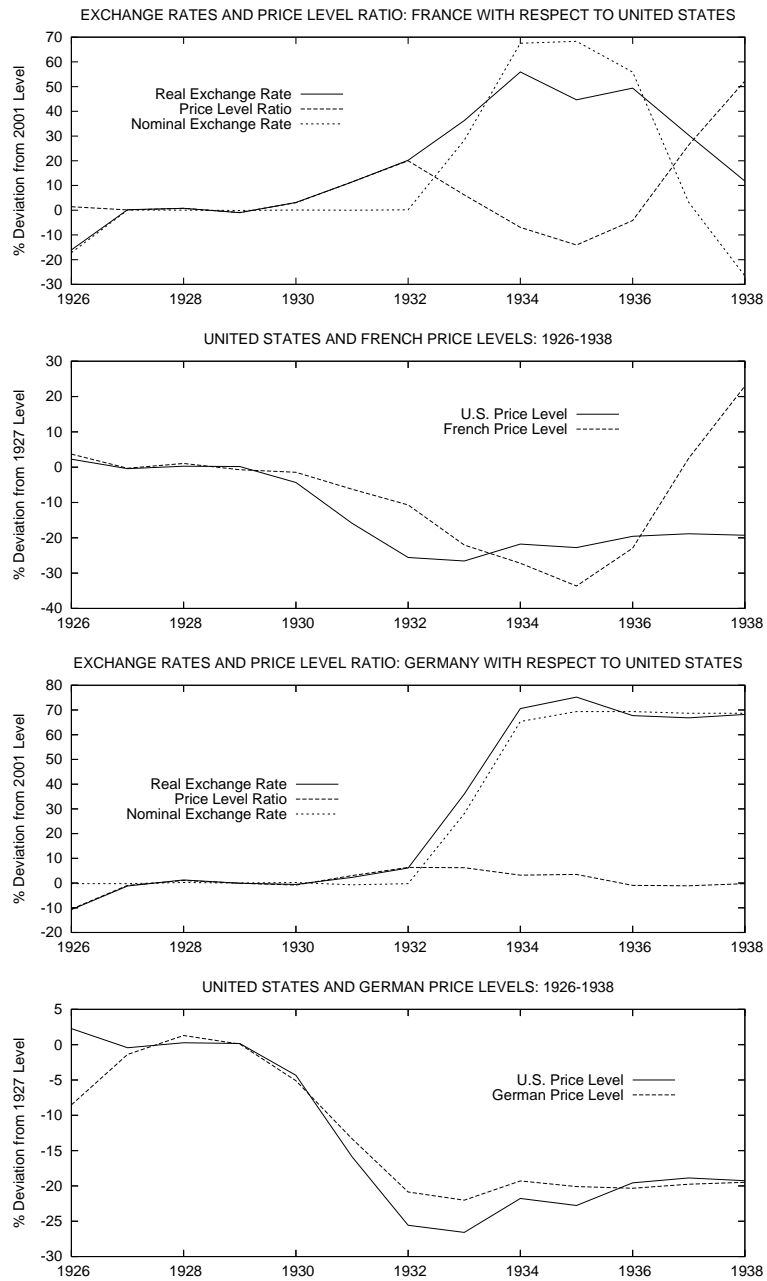


Figure 7: Percentage deviations of exchange rates, price level ratios and price levels from 1927–29 levels during the great depression

Unlike the other countries, **Canada broke with the rules and adopted a floating exchange rate in 1950, fixing it again in 1962, and then abandoning that fixed rate in 1970. It is reasonable to argue that these events were driven by movements in Canada's real exchange rate with respect to the U.S.**⁵ Because of the close proximity and interrelationship between the Canadian and U.S. economies it was difficult for the Canadians to control real exchange rate movements by direct controls over international capital transfers—among other things, the Federal Government could not impose restrictions on borrowing in the U.S. by the provincial governments. Under these circumstances it was virtually impossible to prevent real exchange rate movements from feeding through onto the domestic price level and employment.

Three factors were instrumental in the collapse of the Bretton-Woods system. First, as capital markets developed, it became increasingly difficult for countries to implement sufficient controls over international capital movements to offset underlying movements in real exchange rates that would otherwise be reflected in domestic employment and prices. Second, as world output grew and the need for foreign exchange reserves grew accordingly, the world stock of gold reserves became an increasingly small proportion of total reserves of gold and U.S. dollars. It became plausible to speculators that the U.S. dollar price of gold would eventually have to be increased and, as a result, private conversions of dollars into gold had to be stopped in 1968—thereafter, gold reserves could only be exchanged among central banks at \$35 per oz. and a two-tier system resulted with a private market price of gold above the official price. **The problem of preventing central-bank hoarding of gold remained amid assertions that the United States should do something to cure its balance of payments deficit.** These assertions were nonsensical because in a key-currency system it is the peripheral countries that choose whether or not to have balance of payments surpluses, and thereby accumulate reserves, with the key-country's consequent payments deficit or surplus being a mere technicality. **Third, the U.S. was entering into a period of increasing inflation associated with the financing of the Viet-Nam War and other countries, particularly Germany, objected to the pass-through of this inflation to the rest of the world via the fixity of exchange rates.**

In 1971, under the pressure of foreign central banks on U.S. gold reserve holdings, the United States decided to no longer buy or sell gold at \$35 per oz. or any other price. Under the Smithsonian Agreement in December of that year the price at which the U.S. would not buy or sell gold was increased, a number of countries' currencies were revalued in terms of the dollar and the permissible fluctuation bands of exchange rates from their parity values was increased from 1% to 2.25%. But U.S. policy remained too expansionary to be compatible with pegging foreign currencies to the dollar, and by 1973 most countries had adopted flexible exchange rates. The Bretton-Woods experience clearly suggests that countries do not want to let even small pressures, especially downward ones, on the real exchange rate feed through onto domestic employment and prices. And in a world of international capital mobility, it is difficult to neutralize these pressures by direct controls.

⁵See page 324 of the author's book *Interest Rates, Exchange Rates and World Monetary Policy*.

Table 1: Correlations between domestic and U.S. real GDP growth and inflation rates, 1974–2007 for Canada, U.K. and Japan, 1974–98 for France and 1974–88 for Germany

	Real GDP Growth		Inflation Rate	
	Correlation	P-Value	Correlation	P-Value
Canada	0.528	0.000	0.874	0.000
United Kingdom	0.544	0.000	0.830	0.000
Japan	0.320	0.000	0.717	0.000
France	0.376	0.000	0.853	0.000
Germany	0.639	0.000	0.779	0.000

When we focus our attention on the flexible exchange rate period after 1973, there is strong evidence that the business cycle is international in scope. Consider the Table above.

Verification of our theory that countries adopt similar monetary policies is better established by the high correlations between the countries price levels rather than between their outputs because the latter could have resulted from real business cycle variations quite independently of similarities of monetary conditions across countries. Additional evidence is presented in the Figures below. The first page of Figures plots the deviations of the logarithms of base money, M1, M2 and the consumer price index from standard linear trends for the United States for the period 1960 through 2007. The subsequent two pages plot the base money and CPI series for the five other countries.

The U.S. authorities increased the rate of growth of base money substantially in the early 1970s, quite likely as a result of financing the Vietnam War and maintained it roughly the same until 1995. M1, M2 and the CPI grew much faster than base money up until the early 1980s. **The Federal Reserve System, as in the 1930s, failed to adjust base money growth to compensate for changes in the money multipliers. The inflation peaked well before base money growth began to decline, suggesting the the end of the inflation occurred as a result of a shift in the money multipliers and not a decline in base money engineered by Federal Reserve Chairman Paul Volker, who received the credit for ending the inflation.**

Notice now that for all the other Countries, base money growth occurred before and in step with the growth of their consumer price indexes. This is exactly what our theory predicts—the other Countries adjusted their base money growth to maintain domestically the same monetary conditions as those in the United States.

The behavior of the U.S. monetary authorities during the recent financial collapse and recession is analyzed on pages 339 and 340 of *Interest Rates, Exchange Rates and World Monetary Policy*. And a simpler version of that analysis together with its conclusions is presented in *Lesson 14, Conducting Monetary Policy*.

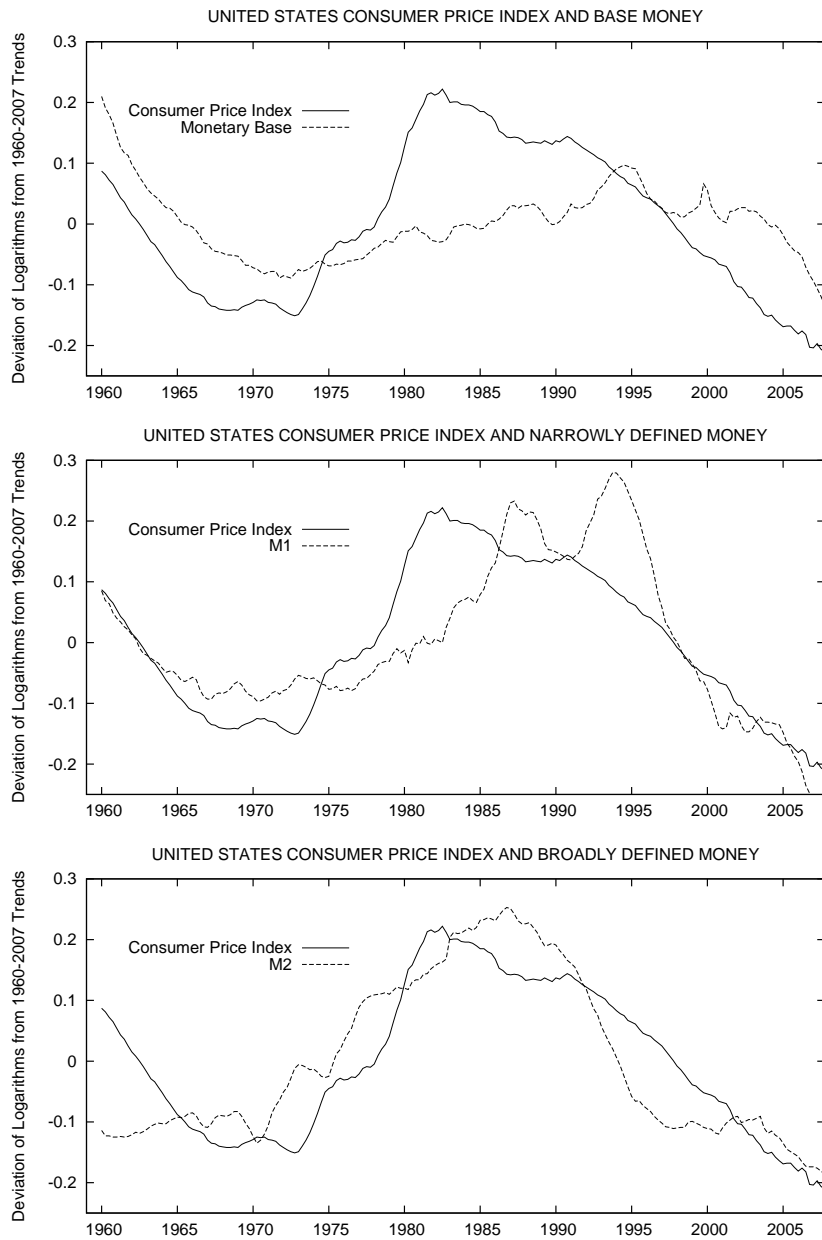


Figure 8: Deviations of the logarithms of monetary aggregates and price levels from their trends

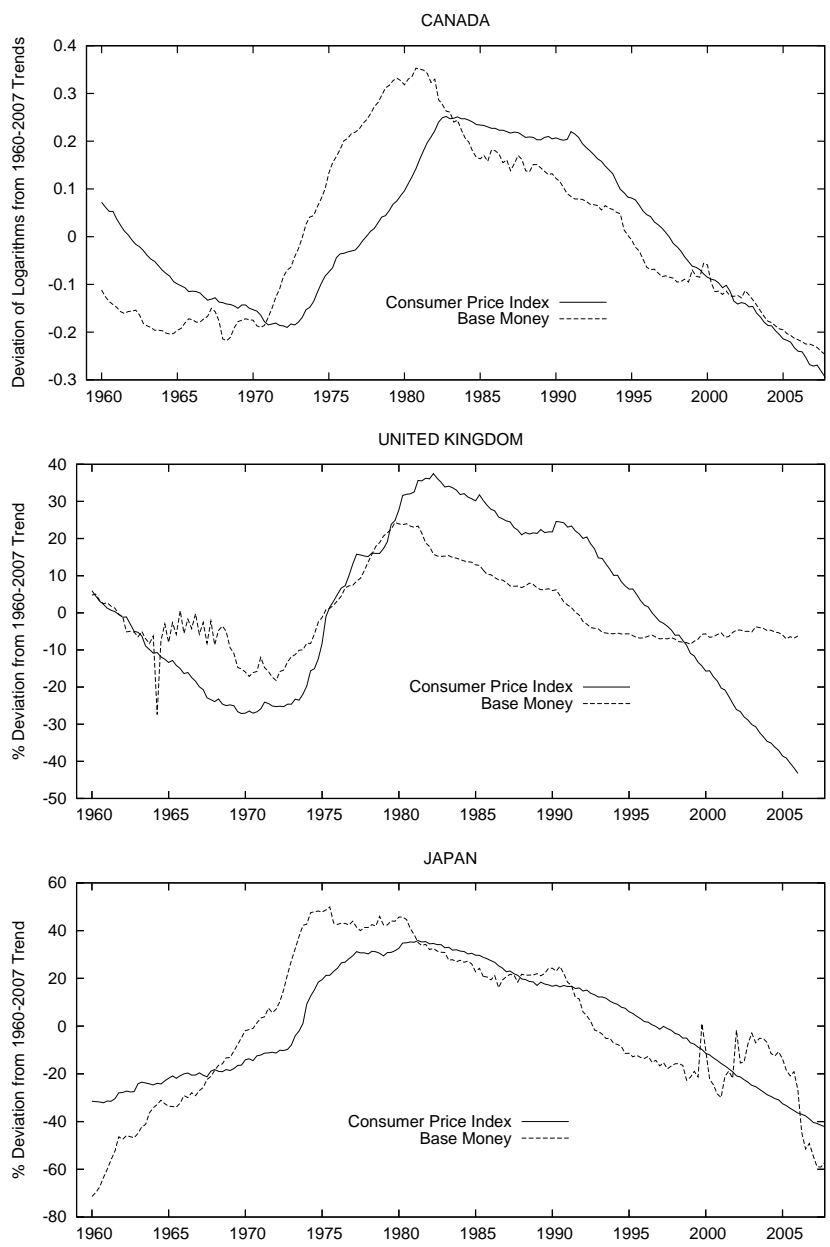


Figure 9: Deviations of the logarithms of monetary aggregates and price levels from their trends

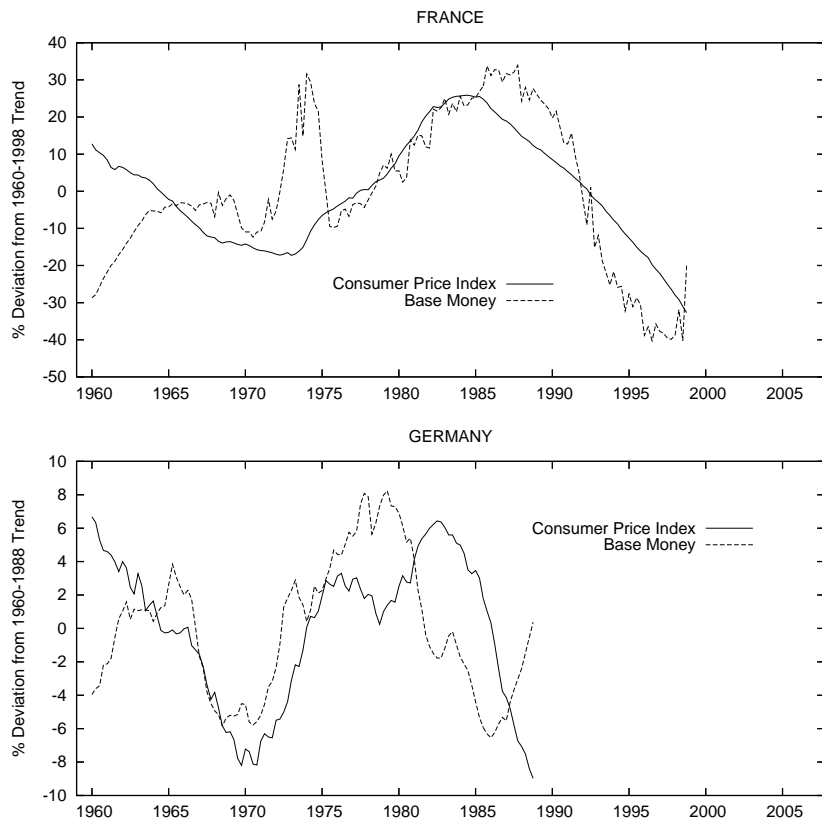
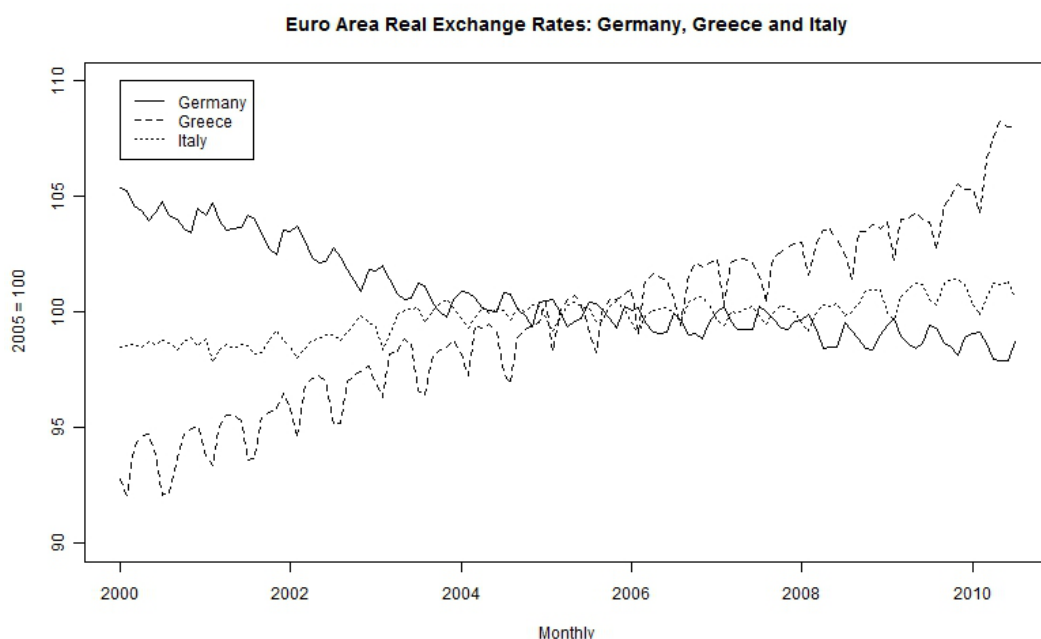


Figure 10: Deviations of the logarithms of monetary aggregates and price levels from their trends

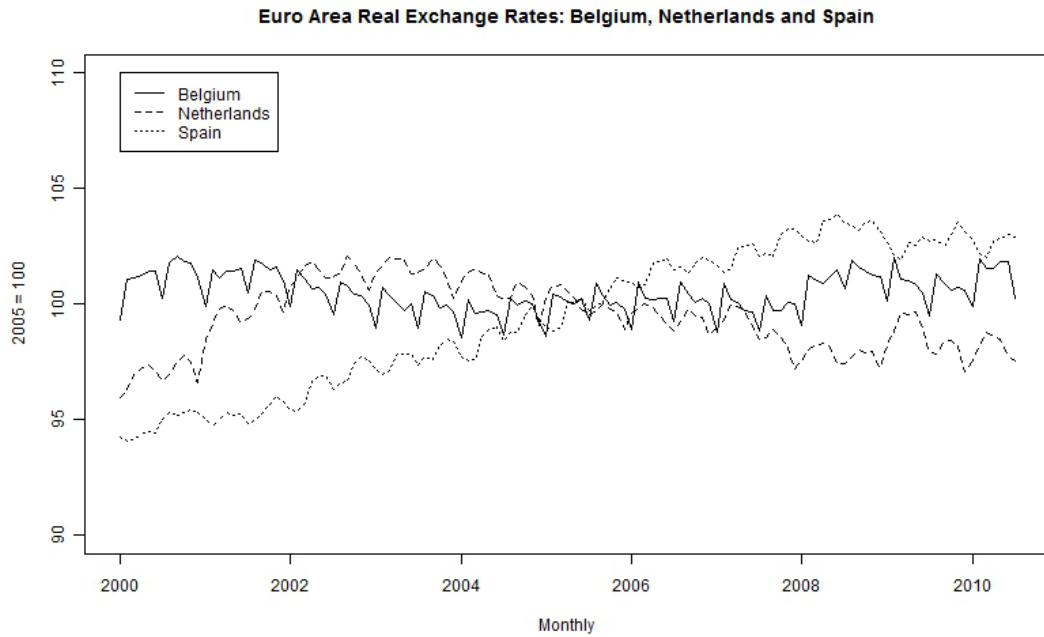
Finally we turn our attention to currency unions. These, of course, involve fixed exchange rates within a group of countries. **Currency unions gain the pooling advantages of fixed exchange rates and minimize the costs of cross-border exchange, while avoiding the loss of the insulating properties of flexible exchange rates by allowing free migration within the union. The interesting question is the degree to which cross-country labour migration reduces the variance of individual countries' real exchange rates with respect to the other countries in the union. Consider the Euro Area.**⁶

The real exchange rates of the original twelve Countries with respect to the remaining eleven Countries are plotted in the four Figures that follow, covering the period since the beginning of the year 2000.



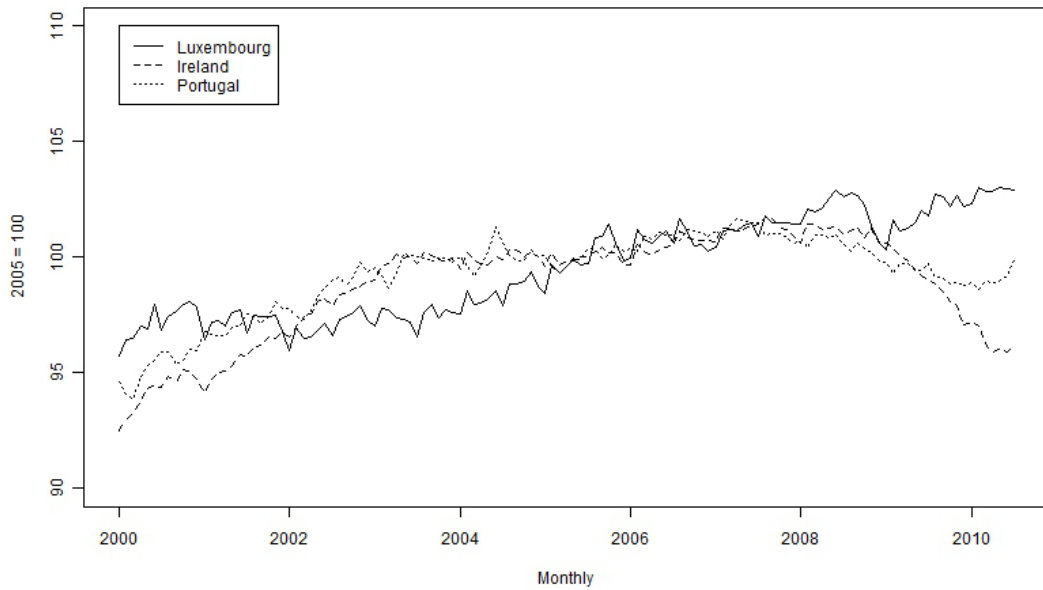
As you can see from the Figure above, the real exchange rate of Germany with respect to the other eleven Euro-Area Countries trended downward, falling by about 7.5% over the over ten-year period with probably two-thirds of that fall taking place during the first five years, when the decline averaged about 1% per year. The real exchange rate of Greece with respect to the rest of the Area, on the other hand, rose by a bit more than 1% per year on average over the period with a somewhat larger upward jump during the first half of the year 2010. Italy's real exchange rate rose by a slight amount on average during the first half of the period and remained virtually trend-less for the remainder of the period.

⁶The issues that follow are discussed on pages 341 through 358 in the above cited book although the empirical work here can take advantage of new data that was unavailable when the book was written.

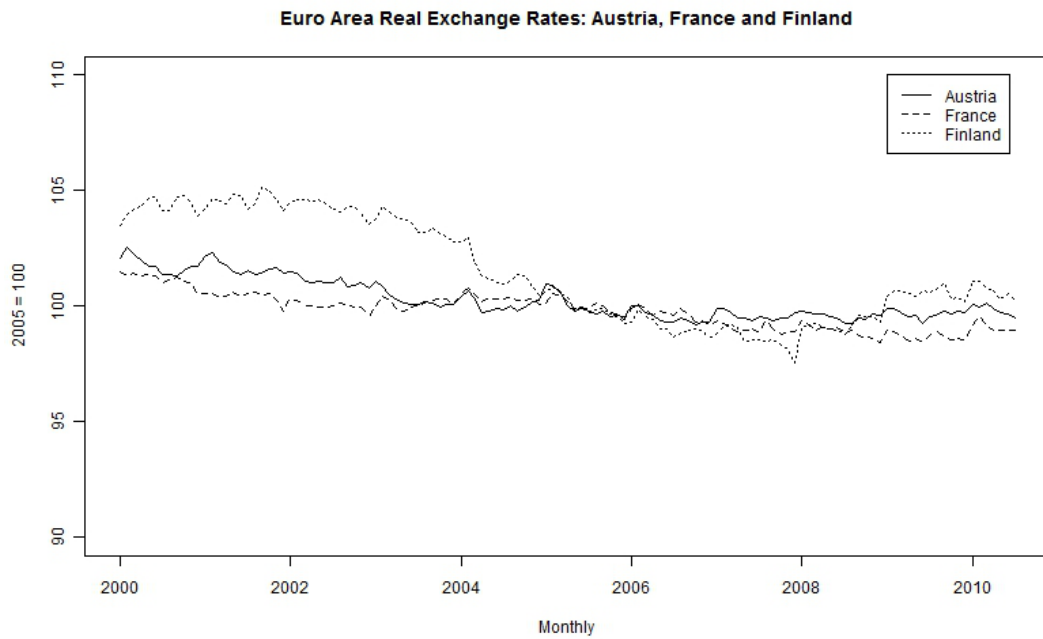


The above Figure gives the real exchange rates of Belgium, the Netherlands and Spain with respect to the remaining eleven Euro-Area Countries. In the case of Belgium there is virtually no trend and the movements around the average level are primarily seasonal. With respect to the Netherlands, there was an upward movement of about 5% over the first couple of years and a very slow decline of less than that amount over the remaining years of the period. The real exchange rate of Spain increased by somewhat more than 1% per year between 2000 and 2008 and then remained rather constant on average thereafter.

Euro Area Real Exchange Rates: Luxembourg, Ireland and Portugal

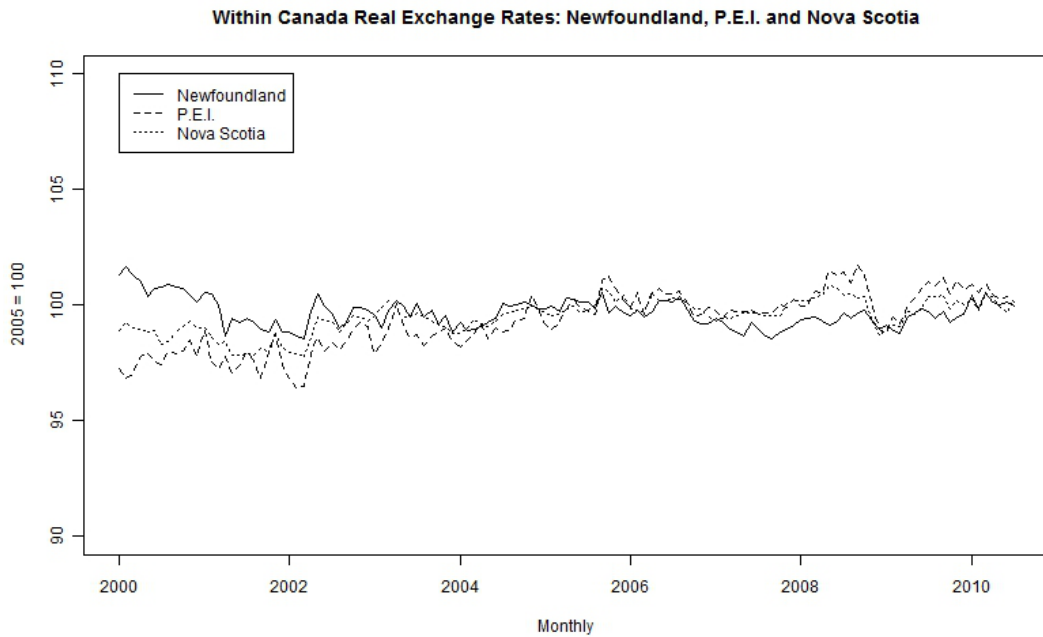


As can be seen from the above Figure, Luxembourg's real exchange rate with respect to other Euro-Area Countries was trend-less from 2000 to late-2003 and then showed an upward trend of a bit less than 1% per year until late-2008. At that point there was a sharp decline of around 2% with the previous upward trend resuming thereafter. Ireland's real exchange rate increased about 8% between the beginning of 2000 and late-2003 and then virtually not at all until mid-2008, after which it declined about 5%. The real exchange rate of Portugal with respect to the other Euro Area Countries followed pretty much the same pattern as that of Ireland except that the decline after 2008 was much smaller.



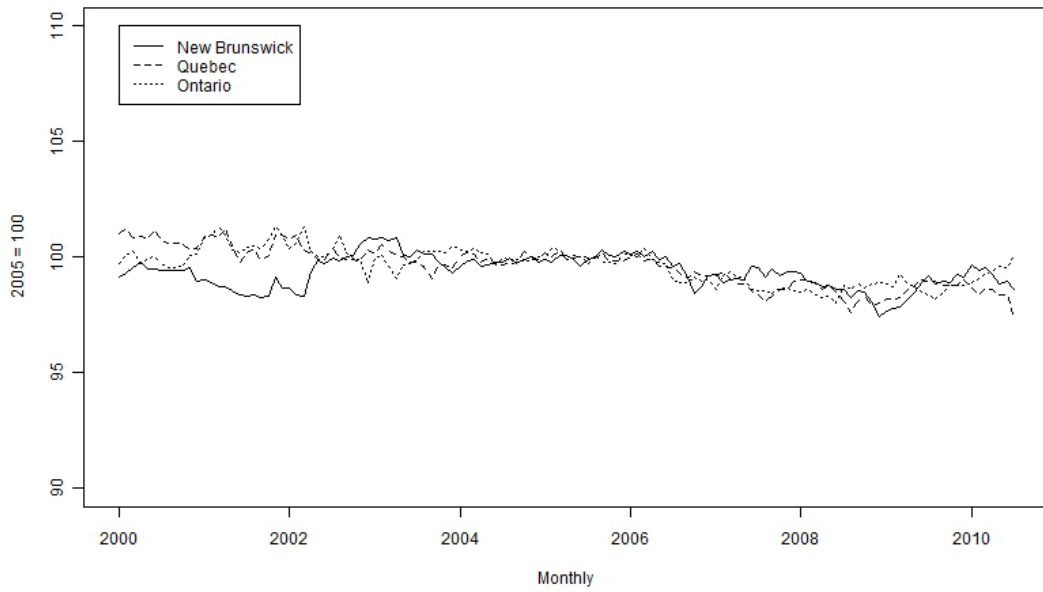
In the Figure above, Austria's real exchange rate, as well as that of France, with respect to the respective eleven other Euro-Area Countries trended downward by perhaps 2% over the first 6 years of the period and then showed little trend thereafter. The real exchange rate of Finland, on the other hand showed a decline of around 1% per year between 2003 and 2008, and then increased by about 2% over the remaining two years.

It is useful to compare the above real exchange rate changes within the Euro Area to those within a common currency area that has existed since Canada was formed in 1867.

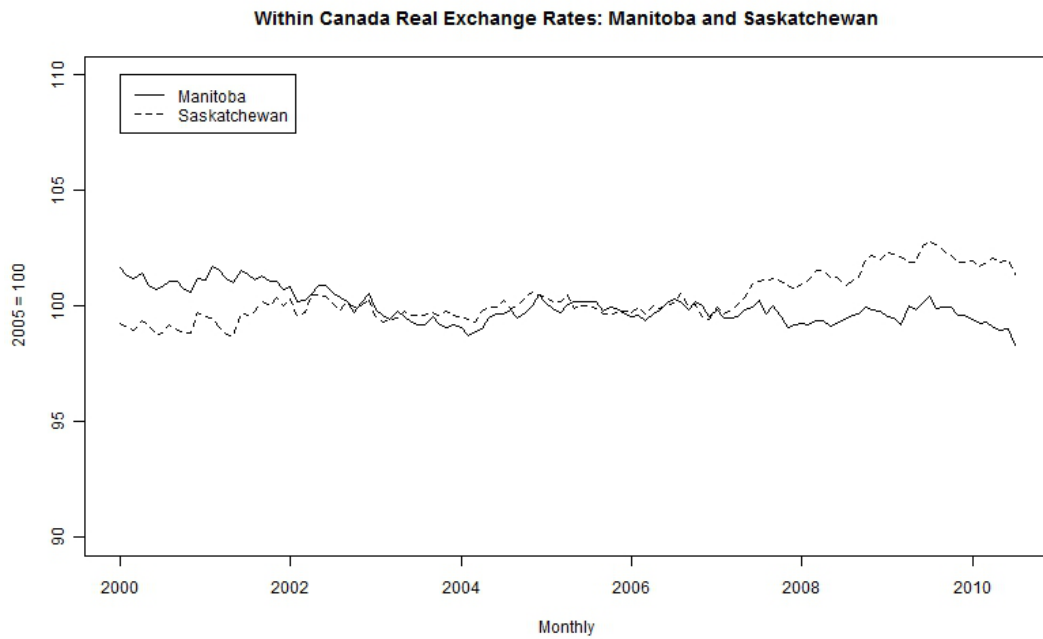


The above Figure gives the real exchange rates of Newfoundland, Prince Edward Island and Nova Scotia, each with respect to the other 9 Provinces. The scale on the vertical axis is the same as in the case of the Euro Area Figures to facilitate comparison. The real exchange rate variability in these three cases is clearly less than that of the Countries in the Euro Area other than Austria and France. Notice the relatively sharp declines in Prince Edward Island and Nova Scotia near the beginning of 2009 which could quite possibly be related to the recent world recession.

Within Canada Real Exchange Rates: New Brunswick, Quebec and Ontario

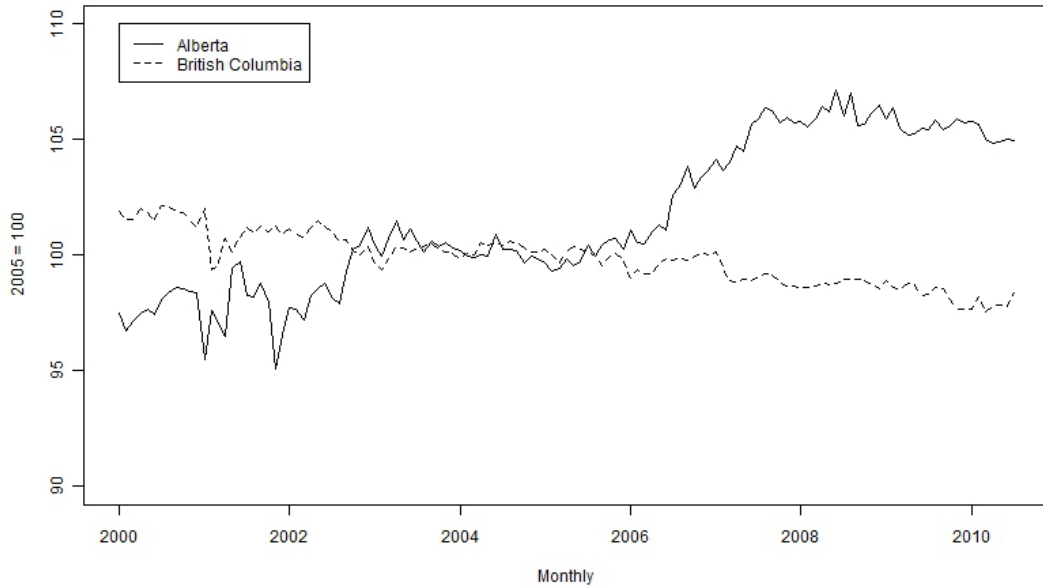


The patterns for New Brunswick, Quebec and Ontario in the Figure above are very similar to those of the previous three Provinces, although couple of incidents involving a change of 1% over a period of two or three months occurred.



Again, we observe stability in the movements of the above real exchange rates of Manitoba and Saskatchewan with respect to the rest of the Country. It appears that, at most, the trend movements amounted to no more than a couple of percentage points over the entire period.

Within Canada Real Exchange Rates: Alberta and British Columbia

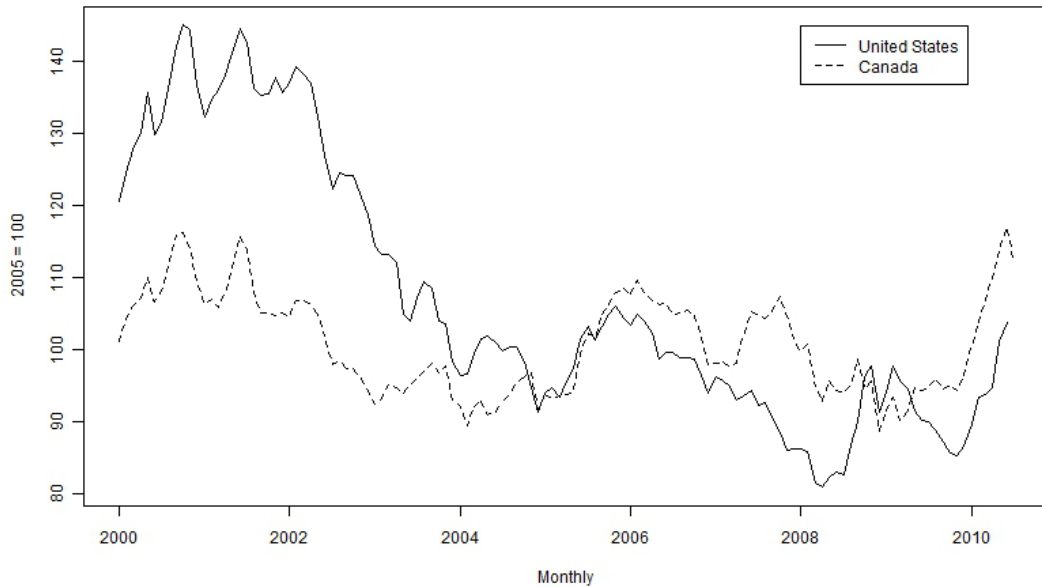


As can be seen from the above Figure, the real exchange rate of British Columbia with respect to the rest of the Country was as stable as that of the previously noted Provinces with a declining trend amounting to three or four percent over the entire period. **Alberta**, on the other hand **experienced real exchange movements that are comparable with the greatest of those in the Euro Area**. Its real exchange rate shows an upward trend close to 3% per year over the period from 2002 through 2008, and the upward movement was especially sharp in 2002 and 2003 and between early-2006 and mid-2007.

Overall we have to conclude that although the movements of the real exchange rates of one Province relative to the rest of the Country was as great as the biggest movements within the Euro Area, in nearly all Provinces the movements were smaller than those in the European Currency Union for the period examined. We should also note that the Government of Canada has followed a policy of giving equalization payments to the poorer Provinces in the Country.

Before turning to the current problems being experienced by the Euro Area, let us have a look at the real exchange rates with respect to the twelve Euro-Area Countries of some other countries that are not part of it. The relevant real exchange rates of the United States and Canada are shown in the Figure below. The real exchange rate of the United States with respect to the twelve Euro-Area Countries fell by over 40 percent between 2001 and mid-2008 with a temporary reversal of around 10 percent in 2005. Canada's real exchange rate with respect to

Real Exchange Rates vs. the Euro Area: United States and Canada

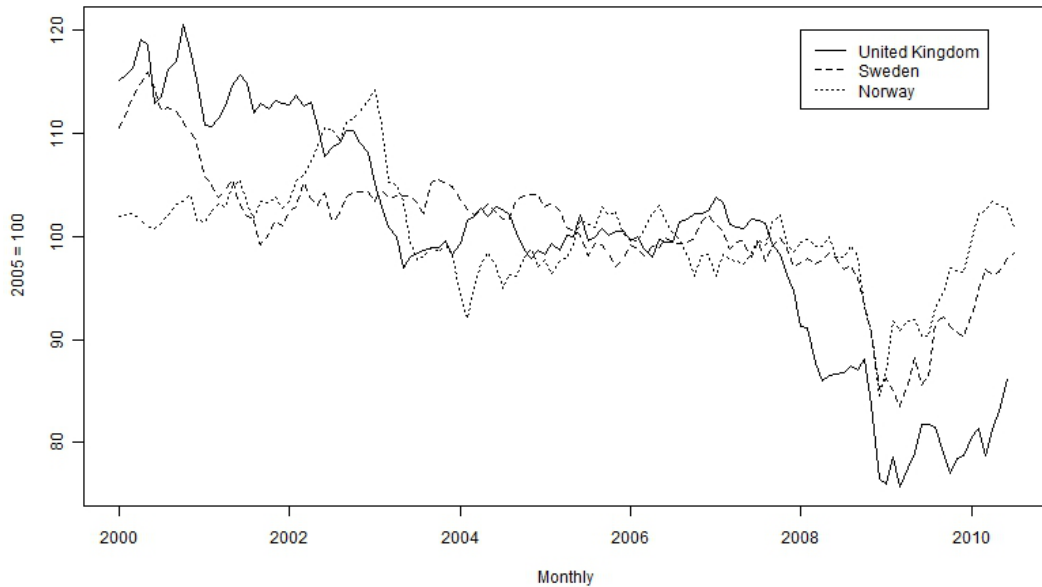


those Euro-Area Countries, which was less variable than that of the United States, fell by more than 25 percent between early-2001 and early-2004, then increased by more than 20 percent to early-2006, then fell again to its early-2004 level by 2009, jumping back up more than 25 percent by mid-2010.

The real exchange rates with respect to the Euro-Area-Twelve of three important European Countries that did not adopt the Euro as their currency are shown in the Figure below. The United Kingdom and Sweden were part of the European Union but not in the Euro Area. The third Country, Norway, has not even joined the European Union.

The real exchange rate of the United Kingdom with respect to the Euro-Area-Twelve fell by 20 percent between 2001 and 2003 and then, after increasing very slightly by 2007, fell by about one-quarter of its 2007-value by 2009, and then increased by more than 10 percent by mid-2010. This British experience raises an interesting question. **While it did not adopt the Euro, the United Kingdom was part of the European Union and therefore allowed free migration of labour to and from other Countries in the Union. Why did migration not reduce the variability of the British real exchange rate with respect to the Euro Area in the same fashion as seems to have done for the real exchange rates of those Countries that adopted the Euro? The answer would seem to be that the movement of the real exchange rate, by insulating the British price level and wage rates measured in British pounds from the associated movement in the nominal exchange rate, made outward migration unnecessary. The typical worker's wage earnings in pounds were not under pressure, so neither was the level of unemployment in Britain. Had the United Kingdom been part of the Euro Area, the downward pressures on domestic prices and employment, and the required degree of out-migration, would have been enormous. Staying out of the**

Real Exchange Rates vs. the Euro Area: United Kingdom, Sweden and Norway



Euro Area would therefore seem to have been a smart move.

The real exchange rate of Sweden was quite stable except for a drop of more than 10 percent in late-2008 and early-2009, the period of world recession, and a recovery to its 2007-level by mid-2010. Again, the argument that applied to the U.K. above also applies here.

Norway's real exchange rate with respect to the Euro-Area Countries was substantially more variable than that of Sweden. It increased around 10 percent in 2002 and fell by around 15 percent in 2003, and showed about the same movements as the Swedish real exchange rate during 2008 and 2009.

It would appear that, by and large, free labour migration has been successful in eliminating major movements of within-Euro-Area real exchange rates although it has not done quite as well as free-labour-migration within Canada has done in removing real exchange rate movements within that Country. Could this be a source of the problems the Euro Area has been experiencing in 2010 and 2011? The answer would seem to be no! As can be seen from the Figure back on page 20 of this document, the real exchange rate with respect to the other eleven Countries here examined of Greece, the major Country having problems, has actually trended upward while the real exchange rate of Germany, a Country not experiencing problems, has trended downward. Clearly, any pressure on output and employment in Greece must surely have been upward. Also, it should be noticed in that Figure that the real exchange rate of Italy with respect to the other eleven Countries has also trended upward, although by much less than in the case of Greece. The comparable Figure on page 21 shows the real exchange rate of Spain as having an upward trend from 1990 to 2008 although it has flattened out during the past few years. And the real exchange rates of Portugal and Ireland with respect to the

other eleven Countries, shown in the Figure on page 22, also trended upward to 2008 but declined substantially thereafter. While we cannot rule out the possibility that the unemployment rates of Portugal and Spain, which in September 2011 were 12 percent and 22 percent of the respective labour forces, could have been due to their real exchange rate declines in the past few years, one could not explain the 17.6 percent unemployment rate in Greece on this basis.

There is another basis for the problems being experienced by Greece and possibly also Spain, Portugal and Italy. It turns out that the annual inflation rates of Greece and Portugal during 1990 and 1991, which were years of relatively low inflation in most industrial Countries, were around 20 percent and 12 percent respectively. And Italy and Spain had inflation rates of well over 6 percent. This compares with Germany, France, the Netherlands and Ireland, whose inflation rates were less than 3.5 percent. It is clear that Greece and Portugal and, to a lesser extent, Spain and Italy were financing their government expenditures in significant part by inflation taxes—that is they were running government deficits and financing them by printing money. And in Greece especially, the regular tax system was not very functional—although appropriate taxes were levied, they were not in fact being paid. When these Countries joined the Euro Area they gave up the ability to run monetary policy of any sort—the money supply is created by the European Central Bank. How then could they finance their government deficits?

The imposition and collection of additional taxes instead of generating inflation is likely to have adverse political implications for elected politicians running a country, in significant part because the combined tight monetary and fiscal policies are likely to have short-run adverse effects on output and employment. To survive the next election, an obvious approach is to borrow the money to finance current the excess of current expenditure over tax revenues. While this will moderate adverse political pressures from election to election, it cannot succeed in the long-run—borrowed funds must eventually be paid back! As the government debt of a country like Greece approaches one-and-one-half times that country's level of GDP, the interest on that debt becomes a significant fraction of national income—currently over 10 percent of Greek GDP. The growing required interest payments on expanding government debt become a burden additional to the requirements for covering current government expenditure. Given the nature of the underlying political pressures within most countries, it is not surprising that these national debts expand until international investors come to recognize the possibility of future default, with the result that the interest that must be paid on the debt to cover default-risk becomes enormous, putting further pressure on the government as it goes through the ongoing process of re-financing its debt at regular intervals. And once investors become aware of the problems facing Greece, the first country having these difficulties, they become concerned that other countries like Italy, whose government debt is about 120 percent of its GDP, and Ireland with its debt level approaching 100 percent of GDP, are also at risk of default. The basis of Ireland's problem is not a required switch from monetary to tax finance of government expenditure—that Country had a low and stable inflation rate like Germany

and the Netherlands before adopting the Euro. Its enormous public debt was created in the process of coping with a major banking crises related to collapse of its real estate markets. Also, countries like Spain, whose debt is around 60 percent of its GDP, attract attention because its current government deficit, like those of Greece, Ireland and Portugal, is in the neighborhood of 10 percent of GDP.

Behind all the above fears of default by investors is the fact that defaults or bail-outs benefit domestic residents at the expense of others in the currency union and in the world at large who hold the country's debt and are trying to avoid losses—these underlying incentives are adverse in terms of political will within countries at risk. This is especially the case because the percentages of the labour force unemployed as of September 2011, were over 20 percent in Spain, nearly 18 percent in Greece, over 14 percent in Ireland and over 12 percent in Portugal.

How can these problems be fixed or, better still, avoided? Clearly, when a currency union of countries is created, as opposed to a single-country union of provinces, it would make sense to establish appropriate currency-union-based fiscal policy. In addition to a central bank, a stabilization facility to implement fiscal policy in the currency area should also be established. The existing government debt of each country joining the union can be re-financed in the form of a perpetuity with a fixed monthly, quarterly or annual interest payment. That debt would remain the liability of the country who would be required to continually pay the interest and gradually pay down the principal. By converting the countries' debts into perpetuity-form, the requirements of regular re-finance would be avoided. Upon choosing to join the union and having its debt so restructured, a country would no longer be allowed to borrow from anywhere but the currency-area fiscal stabilization facility. When its government revenues are lower than normal a country would be allowed to borrow from the facility and when its government revenues are above normal it would pay back those debts. Similarly, in a recession the stabilization facility would lend to the individual countries to enable them to run deficits and in a boom those funds would be paid back, forcing the countries to run budget surpluses. Under conditions where expansionary or contractionary fiscal policy is appropriate, the nature of the policies in the particular countries in the union would have to be agreed to by the stabilization facility. While the above principles could be implemented as a requirement for entry by countries wishing to join the union, it is not clear whether they could now be established within the Euro Area unless they become conditions for remaining in that Union.

Was the formulation of a European Currency Union a good idea? In part, this surely depends on the political and social integration between the areas involved—that is, on whether it is desirable to allow the mingling of the domestic and rest-of-union populations. While it would appear that language differences would be somewhat of a barrier to migration within the Euro Area, the degree of migration necessary to stabilize real exchange rates may have been maintained by migration of immigrants to the EU area back and forth across borders within it. Also, we should investigate whether the movements in observed real exchange rates within the Area represented changes in the underlying full-employment real exchange

rates, or fell short of them on account of the moderating effects of changes in levels of employment. And finally, of course, there is the question of whether the individual Euro Area Countries can agree to maintain balanced budgets on average and to let fiscal policy be managed by an appropriate stabilization facility just as monetary policy is decided by the European Central Bank.