NBER WORKING PAPER SERIES

REAL EXCHANGE RATES AND MACROECONOMICS: A SELECTIVE SURVEY

Rudiger Dornbusch

Working Paper No. 2775

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
November 1988

NBER Working Paper #2775
November 1988

REAL EXCHANGE RATES AND MACROECONOMICS: A SELECTIVE SURVEY

ABSTRACT

This paper discusses exchange rate issues in advanced and in developing countries. For the determination of exchange rates among industrialized countries the key question is the following: What is the right framework-- the monetary approach, the equilibrium approach, the new classical approach or the macroeconomic model in the tradition of Mundell-Fleming. To shed light on that question two empirical problems are considered: What is known about the behavior of real exchange rates and how well do alternative models explain the relation among interest rates, expected depreciation and actual depreciation.

The second half of the paper discusses real exchange rates in developing countries. This strand of literature has become important in the context of adjustment programs. We focus on the relation between real exchange rates and the profitability of capital. The model highlights the sharp discrepancy between the mobility of capital (even physical capital, in the long run) and the immobility of labor.

Rudiger Dornbusch
E52-357 MIT
Cambridge, MA 02139

REAL EXCHANGE RATES AND MACROECONOMICS: A SELECTIVE SURVEY

Rudiger Dornbusch
Massachusetts Institute of Technology
and
National Bureau of Economic Research

This paper discusses exchange rate issues in advanced and in developing countries. For the determination of exchange rates among industrialized countries the key question is the following: What is the right framework-- the monetary approach, the equilibrium approach, the new classical approach or the macroeconomic model in the tradition of Mundell-Fleming. To shed light on that question two empirical problems are considered: What is known about the behavior of real exchange rates and how well do alternative models explain the relation among interest rates, expected depreciation and actual depreciation.

After twenty or thirty years of exchange rate modelling, from the work of Meade and Mundell to the New Classical Economics, we are left with an uncomfortable recognition that our understanding of exchange rate movements is less than satisfactory. Most models have lost their ability to explain what has happened, when exchange rates moved a lot, as in the 1980s. The dollar movements of the 1980s are to open economy macroeconomics what the Great Depression has been to macroeconomics-- a baffling, largely unexplained phenomenon. For some approaches the explanation has to rely on mystical productivity shocks, other approaches

now use models of asset markets that consciously reject conventional rationality.

The uncertainty about the relevant model spills over to policy advice. Recommendations abound. They range from a return to a managed system of target zones to dual exchange rates, financial transactions taxes and doing nothing. None of the recommendations has a firm basis, but the activist ones reflect a belief that when one does not understand what is going on it is good to tie down some things. Others believe that nailing down variables may simply shift the problem from one market to another, and they therefore prefer to tax speculative activity directly. Taxing speculative activity is justified, in their opinion, because such activity generates negative externalities. By contrast, the equilibrium approach views even large exchange rate movements as the reflection of market adjustments to disturbances and sees no need for policy intervention. On the contrary, equilibrium theorists argue that policy will lead at the best to extra noise and will more likely lead to distortions.

The second half of the paper raises some issues about real exchange rates in developing countries. This is an entirely different strand of literature, which has become important in the context of adjustment programs in developing countries. We focus on the relation between real exchange rates and the profitability of capital. The model we present highlights the sharp discrepancy between the mobility of capital (even physical capital, in the long run) and the immobility of labor.

We begin our discussion now with alternative approaches to exchange rate economics in industrial countries.

I. REAL EXCHANGE RATES AMONG INDUSTRIALIZED COUNTRIES IN THE LONG RUN

Figure 1 shows the real exchange rate (using GDP deflators) between Sweden and the US. The figure shows more than one hundred years of annual data. Two patterns are of interest. One is the year-to-year fluctuations as for example in the early 1920s or the 1980s. The other is changes in the decadal averages.

The barter theory of international trade provides a suitable framework for the analysis of real exchange rates in the long run. This theory emphasizes that real exchange rates are determined by resource endowments, tastes, technology, and intertemporal saving and investment choices. In the short run, it may be superseded (in ways to be explored below) by macroeconomic considerations, including price stickiness. But over a horizon of decades these factors cannot possibly matter (except in so far as they influence growth performance); and, hence, the microeconomic framework is appropriate.

We emphasize at the outset the relevance of the barter model of trade for long run real exchange rate economics, not purchasing power parity (PPP). Samuelson (1964,p.153) aptly summarized the discussion on PPP when he wrote:

> "Unless very sophisticated, indeed, PPP is a misleading, pretentious doctrine, promising what is rare in economics, detailed numerical prediction."

The idea that exchange rate movements tend to offset (passively) divergent trends in national rates of inflation was discredited virtually on

conception. The hyperinflation in Germany and Central Europe was an extreme counterexample as was the French experience prior to the Poincare stabilization. The 1970s and early 1980s have simply brought additional confirmation for the proposition that PPP does not hold in any form.

To explore the relationships between exchange rates and prices it is useful to separate out long-term trends in real exchange rates from movements in the short run. Whatever one's macroeconomic persuasion, the long run trends of real exchange rates must certainly be interpreted in terms of microeconomic models of resource allocation. We introduce here a Ricardian model of real exchange rates and use it to review the evidence developed by Kravis (1986) and his associates.

Trends in Real Exchange Rates: Ricardo, Harrod, Samuelson, Balassa and Irving Kravis argue that movements of real exchange rates over time reflect the divergent trends of productivity between home goods and traded goods sectors.

Let P and P* be the home and foreign consumer price levels measured in a common currency. Suppose, as in Dornbusch, Fischer and Samuelson (1977) that there are traded goods and home goods with prices P_T and P_N, and let 1-k be the share of nontraded goods in spending. Then the real exchange rate, R, is given by :

$$R = P/P^* = (P_N/P_N^*)^{1-k} \qquad (1)$$

where we have assumed that the prices of traded goods are equalized and that expenditure shares are equal across countries. Let $P_N = a_N W$, and $P_N^* = a_N^* W^*$ be

the unit labor costs in the home goods sector. Then the real exchange rate is equal to:

$$R = \phi(W/W^*)^{1-k} \qquad (2)$$

where v is a function of the given relative unit labor requirements in the home goods sector. The model is closed by noting that the relative wage must solve the goods market equilibrium condition:

$$WN = \beta(WN+W^*N^*) + (1-k)(WN+TN); \quad \beta = (W/W^*,A); \ \beta_1<0,\beta_2>0 \qquad (3)$$

where N and N* denote the home and foreign labor force and T is a (per capita) transfer received by the home country, and numerical subscripts denote the derivatives with respect to the arguments. The term A denotes the relative level of home country technical efficiency requirements. The expenditure share falling on the home country's tradables is β and has a maximum value of k. The share of spending falling on home goods in each country is a constant 1-k. The expenditure share of domestic tradeables is determined by efficient geographic specialization. An increase in the relative wage, given technology, reduces the share. But a relative improvement in home technology, or an increase in the shift parameter A, raises the share of goods produced competitively by the home economy.

Equation (3) can be solved for the equilibrium relative wage, $\kappa=w/w^*$:

$$\kappa = \kappa(T,\ N^*/N, A); \quad \kappa_T, \kappa_A\ ,\ \kappa_{N^*/N} > 0 \tag{4}$$

The equilibrium relative wage in (4) shows a central result of Ricardian trade theory: an improvement in a country's relative efficiency (a rise in A) leads to real appreciation. The mechanism is simply the following: The gain in productivity reduces unit labor costs at the competitive margin and thereby leads to an incipient expansion in output and employment. The excess demand for labor at home (and the excess supply abroad) bring about a change in the relative wage and hence in the competitive margin. The real exchange rate appreciates, because wages at home rise in the home goods sector and they fall abroad. The wage increase raises costs and prices of nontraded goods at home while lowering them abroad where there was no progress. This movement of home goods prices, initiated by productivity growth in tradables and transmitted via the labor market, is the source of the real appreciation.

Support for this theory was adduced first by Balassa and then, in a major way, by Kravis and his associates in the context of the national income comparison project of the World Bank. Table 1 reports one set of results from this research. Kravis and his associates show that the real price structure of a large group of countries shows an systematic correlation with the level of per capita income. Specifically, prices of services are low in poor countries relative to rich countries. Even goods prices (at the consumer level) are low, because delivered prices have a significant service component.

Table 1: Real Prices by Countries' Real Income Level: 1975
(Index U.S. = 100)

Group[a]	Goods	Services	GDP Deflator
0 - 14.9	57.4	20.7	40.6
15 - 29.9	65.9	34.1	51.7
30 - 44.9	83.1	41.2	64.7
45 - 59.9	94.0	46.3	73.5

[a] Percent of U.S. real per capita income.
Source: Kravis (1986)

The data reported in Table 1 are built up from detailed consumer price data for closely comparable consumption baskets with equal weighting. The price comparisons thus present as good a test of absolute PPP as possible. It is clear that the presence of home goods causes an important departure from absolute PPP and more so, the poorer the country. Interestingly even for "goods" as opposed to "services" is the departure significant. One reason is certainly distribution and hence the service content of consumer prices for goods.

A different kind of evidence of the effect of productivity growth on relative prices is based on the time series of relative prices within industrial countries. The higher the growth rate of productivity, other things equal, the more rapid the change in the relative price of manufactures in terms of the GDP deflator.

Figure 2 shows this effect for Japan. The figure shows that over the past quarter of a century the relative price of exports (manufactures) has declined by about one half in terms of the deflator. Similar diagrams can be shown for any country with a pronounced rate of productivity growth, such as Korea.

Equation (4) helps establish a further point. A transfer received by the home country leads to real appreciation. The mechanism through which the real appreciation comes about is as follows. The transfer raises real aggregate demand in the home country. Part of the increased spending falls on traded goods and is offset by reduced foreign spending. But the part that falls on home goods is not offset by reduced foreign spending. As a result there is an excess demand for home goods and labor at home. The relative wage and hence the relative price level rise in the country receiving transfers.

The idea of a transfer can be interpreted quite broadly, as it indeed has been in the literature. In particular we can think of the transfer-receiving country as borrowing from abroad. Thus Ricardo's remark "in borrowing countries prices are high" has a counterpart in this model.

Relative Deflators: The previous discussion focussed on the trend behavior of relative consumer prices. But we can also interpret PPP relations in terms of producers' prices, and in particular relative value added deflators. Letting $R' = Q/Q^*$ denote the relative value added deflators in a common currency we have:

$$R' = Q/Q^* = (P_T/P_T^*)^k (P_N/P_N^*)^{(1-k)} \qquad (5)$$

It is apparent that the relative producer prices represent a mixture of the terms of trade and of the relative price of nontraded goods. In this framework, factors that worsen the terms of trade, such as an unfavorable demand shift, will tend to lead to real depreciation.

Figure 3 shows 100 years of the US-UK real exchange rate as measured by relative value added deflators. It is interesting to observe the relative stability of the real exchange rate prior to World War II, followed by a large structural adjustment, and then the extraordinary fluctuations associated with British and US macroeconomic policies under flexible exchange rates in the 1970s and 1980s.

The large realignment in the aftermath of World War II stands out as a striking example of a change in the real exchange rate in response to a loss in wealth, income, and world market share. Note, however, that because of price controls during World War II and relatively effective exchange control in the early postwar period the rate in the 1940s cannot be interpreted as an "equilibrium" real exchange rate. But even so a significant difference remains between the average of the pre and post World War II real exchange rates remains. This large shift attests to the critical importance of structural factors in the long-run behavior of real exchange rates.

II. REAL EXCHANGE RATES IN THE SHORT RUN

In this part, we discuss two central issues of exchange rate economics among industrialized countries: the link between exchange rates and prices, and difficulty in accounting for observed exchange rate movements in terms of the "fundamentals" suggested by theoretical models of the exchange rate.

1. Four Approaches

There are four broad approaches to modelling short run exchange rate behavior. They are not strictly alternatives and, on occasion, come in combination. These are respectively the monetary approach (MOA), the new classical economics (NEC), the equilibrium approach (EA) and, for lack of a better term the macroeconomic approach (MAC). Within each of these broad groups there are differences of models. Our focus, however, is on broader differences which have two dimensions. One is whether the model assumes market that all markets clear. The other is whether an effort to establish the microeconomic foundations of the model on the basis of uncompromising, explicit maximization is made. Table 2 presents an overview of how the various approaches fall into categories.

Table 2: Alternative Modelling Strategies

	MICROFOUNDATIONS	
	YES	NO
MARKET CLEARING: YES	NCE-EA	MOA
MARKET CLEARING: NO	NCE	MAC

We will use the macroeconomic approach as a benchmark to judge the specific contentions of alternative approaches.

The Macroeconomic Approach: A generally accepted, simple model of the macroeconomic determinants of exchange rates is the extended Mundell-Flemming model. One version in this tradition is as follows:[1]

$$y = \alpha(p^{*}+e-p) - \beta(i-\dot{p}) + u \qquad (6)$$

$$m - \sigma p - (1-\sigma)e = ky - \lambda i \qquad (7)$$

$$i = i^{*} + \dot{e} \qquad (8)$$

$$\dot{p} = \pi(y - y') \qquad (9)$$

where p and e denote the domestic prices and the exchange rate, y denotes output and i denotes the home interest rate. The term y' denotes potential output and m denotes money. All the other terms are positive constants. All variables, except nominal interest rates, are in logs, and u is a disturbance term representing foreign demand or fiscal policy.

In this macroeconomic approach, the asset market (equations (7) and (8)) clears continuously, but prices adjust only gradually. Given the future paths of the forcing variables (foreign interest rates, money and fiscal policy) the model can be solved for the level and path of output, prices and the exchange rate.

The model has the property that in response to a permanent, unanticipated increase in the money stock the exchange rate and the price level

---

[1]See Dornbusch (1976,1986), Obstfeld and Stockman (1985).

ultimately rise in the same proportion. In the short run, because prices are sticky, there is an immediate depreciation of the exchange rate, which overshoots the long-run equilibrium level. The overshooting is a consequence of the combination of the perfect foresight assumption and instantaneous asset market adjustment: an increase in the nominal money stock, is an increase in the real money stock which, absent changes in any other variables influencing real money demand, must lead to a decline in the equilibrium home interest rate. But the home interest rate decline is compatible with an international equalization of returns only when the exchange rate is expected to appreciate, thus yielding capital gains offsetting the lower interest earnings. Appreciation can be expected only at a level of the exchange rate that is higher than the long run equilibrium value. Hence the overshooting characteristic where the exchange rate is immediately driven above the long run equilibrium level.

The model can also be expressed in terms of real interest differentials and the rate of depreciation of the real exchange rate. Let $q = p^* + e - p$. Then we have:

$$r - r^* = \dot{q} \qquad (8a)$$

where r and r* are the home and foreign real interest rates. It can be shown that in the model laid out above the real exchange rate converges asymptotically to the steady state real exchange rate q'.

$$\dot{q} = -\gamma(q-q') \qquad (10)$$

Combining (8a) and (10), the dynamics of the real exchange rate following an unanticipated, nonrecurrent money supply changes can be summarized in an equation for the real exchange rate:

$$(11) \qquad q = q' - v(r-r^*); \quad v=1/\gamma$$

From (11) and (8a), it is apparent that the impact effect of a monetary disturbance and the resulting impact on real interest differentials depends on the speed of adjustment of the system. The more gradual the adjustment the larger is the initial overshooting. The speed of adjustment depends in turn on all the structural parameters.

The model is not limited to studying once and for all current and unanticipated money supply changes. It also lends itself to asking questions about the effect of fiscal (or export) shocks. A permanent fiscal expansion, for example, leads immediately to a real appreciation that crowds out fully the increased demand by an offsetting current account deterioration.

Wilson (1979) and Mussa (1982, 1984), in particular, have emphasized the forward looking nature of exchange markets. The above model captures this aspect because the future time paths of the forcing variables -- m,u,i* -- determine the current values of interest rates, output, and the exchange rate.

This macroeconomic approach has as a central working hypothesis the continuous clearing of asset markets and stickiness of prices of at least some goods. Attention focuses on the implications of this asymmetry in the speed of adjustment of goods and asset markets for real exchange rates, employment and trade flows. Uncompromising informational efficiency is imposed in asset markets, as it is in the other approaches.

Alternatives: Competing with the macroeconomic approach are three alternatives: the new classical economics, the monetary approach and the equilibrium approach.

The monetary approach today commands virtually no attention. Soon after the move to flexible exchange rates, there was considerable interest in a model of exchange rate determination based on PPP and money market equilibrium.[2] With strict purchasing power parity prices and the exchange rate are related by a constant and thus in logs we have $e = p - p^*$. Using money market equilibrium to solve for prices in terms of nominal money, interest rates and output, yields the central equation:

$$e = (m-m^*) - \sigma(i-i^*) + \phi(y-y^*) \qquad (12)$$

The empirical success of this equation has been so poor, and the PPP foundations so doubtful, that this approach is basically extinct.

---

[2]See Frenkel and Johnson (1978) and Dornbusch (1971).

The Equilibrium and New Classical Approaches: The equilibrium approach shares an emphasis on market clearing with the monetary approach. In fact, the central assumption is that all markets, specifically the markets for goods and labor clear continuously. In this model, all prices and wages are flexible and the focus of attention is the determination of absolute and relative prices and their possible correlations. But there is, at the same time, an uncompromising attention paid to microeconomic foundations. Behavioral equations are derived from maximization considerations rather than assumed ad hoc.

The double edge of the approach are market clearing and microeconomic foundations, in particular maximization and an explicit role for budget constraints as well as informational efficiency on the part of agents. A focus of the search for microfoundations is the concern for an explicit well-motivated role for money. As a result, transactions technologies play a central role in establishing a demand for money. This approach also emphasizes in particular intertemporal consumption and investment choices and the effect of intertemporal and intratemporal relative price changes on saving and spending decisions. But the model must be closed by an explicit assumption about how markets function, and it differs occasionally from the equilibrium approach in this respect.

The closure may be obtained either by the assumption of short-run stickiness of wages and prices (as might be the case in models with long-term, overlapping contracts) or else in the same way as the equilibrium approach. Work by Calvo, for example, tends to emphasize utility maximizing, money using, forward looking agents operating in a world of full price flexibility or of

contracting with only marginal prices flexible. Some work by Helpman, Razin and Svensson, in the same manner tends to be uncompromisingly in the tradition of the new classical economics but with different scenarios as to prices. Specifically, models of liquidity constrained behavior emphasize the interaction of price stickiness (and hence real balance shortages) and maximizing behavior.[3] In summary, the new classical approach is less catholic than the equilibrium approach in that it studies, in some applications, situations where markets do not clear. But, except in those instances, it fully overlaps with the equilibrium approach.

2. Evaluation

How does one choose among these approaches? The choice between non(explicit)-maximizing approaches in the equilibrium tradition and the macroeconomic approach must be based on their predictive ability. We look at that issue below. The choice between the new classical and macroeconomic approach is a much more difficult one.

In principle the new classical approach should win hands down because it derives properly those relations which the macroeconomic approach assumes are derived from maximization. Thus, in case of doubt, one would invariably turn to the new classical approach to give the more specific, qualified answer. And this would be the case especially for specific intertemporal, intersectoral issues where answers depend on the exact relative price effects and the budget constraints to which consumers or firms are

---

[3]For an extensive list of writings see the reference section.

subjected. For example, the distinction between transitory and permanent import price changes might be easily glossed over in a macroeconomic approach but is addressed a a central concern by the new classical economics.

The hands down superiority of the new classical approach may falter, however, on two features: One is that the formulation of transactions technology-based money use, for the time being dominates the predictions of the model in a most idiosyncratic fashion. Traditional, ad hoc money demand formulations, even though they cannot (yet?) be derived, may offer a more sturdy building block. The other difficulty is an overabundance of Ricardian equivalence effects which undo much of the potential role of fiscal policy.

It is clear though, at least in respect to this latter issue, that the new classical approach is being revamped in the direction of ad hocery either by imposing and exploring the implications of credit constraints for consumers or by introducing Blanchard-type nonneutrality. When the task is ultimately completed, one suspects that we will all use the new classical approach, having learned to assume rigorously everything that the macroeconomic approach assumed as critical features of the operation of the economy. I use the term to "assume rigorously" to denote the current fashion of introducing ad hocery at a lower level, and then deriving its implications rigorously.

Macroeconomic vs Equilibrium Approach: Stockman (1987,1988b) has confronted the task of setting out the claims of the equilibrium approach, its empirical relevance and the evidence that favors this view over an alternative approach that relies on price stickiness as an essential element in the explanation of

exchange rate movements. The Stockman contributions are welcome because they offer in stark colors the claims and evidence. We quote here at length from Stockman (1987) :

> "Economic theory predicts that real disturbances to supplies and demands for goods cause changes in relative prices, including the 'real exchange rate'. In a wide variety of circumstances, these changes in the real exchange rate are partly accomplished through changes in the nominal rate. Repeated disturbances to supplies and demands thereby create a correlation between changes in real and nominal exchange rates. This correlation is consistent with the equilibrium in the economy, in the sense that markets clear through price adjustment."

He further notes several implications, of which two deserve special emphasis:

- the correlation between nominal and real exchange rates is not exploitable by government policy, and
- statistical evidence indicates that changes in exchange rates (real and nominal) are nearly permanent. This persistence is inconsistent with the view that monetary shocks or transitory real shocks are the source of exchange rate movements. Instead, it is consistent with the view that most changes in real exchange rates are due to real shocks with a large permanent component. Because of the high correlation of nominal and real exchange rate changes the evidence is consistent with the view that most changes in nominal exchange rates are caused by largely permanent real disturbances.

In making the case for the equilibrium approach Stockman has no doubt exaggerated his message in two ways: the macroeconomic approach does not predict that exchange rates overshoot in response to any and all disturbances. In the model set out above, real disturbances, i.e. changes in exports or

fiscal disturbances represented by the parameter u, do change the nominal and real exchange rate permanently. As the model is an equilibrium model in the long run, and exchange rate determination is forward looking, the adjustment of prices is exactly the same, as would be the case in an equilibrium model. It is also the case that support for a unit root in the time series of real exchange rates is increasingly being questioned. There is evidence of reversion rather than random walking even if the reversion is not rapid and fails to exhibits stable patterns.

To appreciate the difference between the two approaches, we can focus explicitly on the dynamics of output and prices in the macroeconomic approach. A fiscal contraction, to give a concrete example, has the following effects: in the long run, the real exchange rate adjusts to achieve full crowding in. This is accomplished by a depreciation of the nominal rate and a fall in domestic prices. The equilibrium approach would predict this as the immediate effect. In the macroeconomic approach, because prices are not fully flexible in the short run, there is an immediate depreciation and a decline in output. The output decline lowers prices over time. After prices have declined sufficiently and the exchange rate has further depreciated, the economy ultimately settles at the new fullemployment equilibrium.[4]

An obvious variable to use to judge the macro versus equilibrium approach is the behavior of output. The equilibrium approach asserts that

---

[4]Note that if the relevant deflator in the money market equilibrium condition is p and not $xp+(1-x)e$, the exchange rate will do all the work and domestic prices will be unaffected in the short and long run. In that case, the macroeconomic and equilibrium approach cannot even be distinguished.

output follows its full employment path with productivity shocks (and world factor cost shocks) as the only disrupting events. By contrast, the macroeconomic approach asserts that monetary and fiscal disturbances (in addition to supply side shocks) cause output to diverge from its full employment path. But the fact is that protracted deviations of output from potential have never been accepted as a fact by adherents of the equilibrium approach, even though they have not offered satisfactory explanations for major recessions other than to appeal to mystical productivity events.

The behavior of real and nominal exchange rates is the main area where a resolution of the superiority of one of the contending approaches is sought. One obvious challenge is to explain the real exchange rate behavior of the 1980s. Figure 4 shows the (multilateral) real effective exchange rate for the US.[5] The macroeconomic approach has sought to explain the large real appreciation of the dollar in terms of fiscal policy developments in the US and in other industrialized countries. In the period of the early 1980s, US fiscal policy (measured by the structural budget) became very expansionary even as fiscal policy tightened in other industrialized countries. In Europe and Japan the reverse pattern prevailed. The Mundell Fleming model predicts a real appreciation in these circumstances.[6]

But even if the real appreciation can be explained by fiscal developments, three questions remain to be answered. First, how does this same theory explain the dollar decline since 1985, second, does the theory also

---

[5]We use the Morgan Guaranty data.
[6]See Feldstein (1987).

apply to other episodes, as for example the Yen appreciation of 1977-78; and third, is the size of the real exchange rate movements in line with predictions that could plausibly come out of the macroeconomic model.

Even if it is possible to account for the broad pattern of the real exchange rate by appealing to the anticipation of future fiscal correction the problem of accounting for the size of the movement in the real exchange rate remains.

The equilibrium approach has not tried to offer a concrete explanation for the real exchange rate movements of the 1980s. The new classical school and the macroeconomic model emphasize fiscal policy. For the new classical school (e.g. Frenkel and Razin (1987)) the explanation is no more than episodic. But the demonstration has not gone far enough for the macroeconomic approach either. The broad pattern of real exchange rates can be explained, but the explanation does not cover the relation between interest differentials and exchange rate depreciation which is a central part of the model. This is a decisive reason, as we shall now see, to question the macroeconomic approach as a full explanation, also.

When exchange rate movements are small any theory can offer a plausible explanation, and few can be decisively rejected. But when movements are extremely large, as was the case in the US 1980s, there is a firm test for any theory. The events were too large and the reversal too sharp and complete to allude to mystical shifts in tastes and technology. Thus equilibrium theories fail to explain what happened and are therefore found wanting. We turn next to the link between interest rates and exchange rates to show that the macroeconomic model is also unable to explain the experience of the 1980s.

3. Interest Rates and Depreciation

Equation (8) in the macroeconomic model laid out above assumes that investors are risk neutral. A discrete time, rational expectations version of (8) is:

$$E(e_{t+1}) = e_t + i_t - i_t^* \qquad (13)$$

With the assumption of rational expectations the realized level of the exchange rate is equal to the expected level plus a white noise error term. The theory predicts that we should observe the following relationship:

$$e_{t+1} - e_t = i_t - i_t^* + \eta_{t+1} = i_t - i_t + \text{"news"} \qquad (14)$$

where the error term η_{t+1} is orthogonal to the interest differential and thus can be referred to as "news".

A simple test of this model is shown in Table 3. The model suggests that on average interest differentials should be matched by realized depreciation on average. The table shows annual averages of the three-month interest differential as well as the depreciation rate during the year. It is apparent that the divergences are so large that one does not need a lot of econometrics to see that interest rates fail to forecast depreciation.

Table 3 Interest Differential and Depreciation
(Percent per year)

	UK-US		GERMANY-US		JAPAN-US	
	Diff.	Dep.	Diff.	Dep.	Diff.	Dep.
1981	-2.55	25.5	-4.98	14.3	-12.14	8.3
1982	-0.71	17.7	-4.67	5.4	-6.3	7.3
1983	0.46	11.0	-4.12	14.6	-3.15	0
1984	-0.92	25.8	-5.41	15.6	-4.15	8.1
1985	3.85	-20.1	-3.06	-21.8	-1.72	-20.2
1986	4.11	- 1.7	-2.22	-21.1	-1.66	-10.6
1987	2.62	-21.2	-3.12	-18.3	-2.92	-22.3

Note: diff is the interest differential between a country and the US. Dep measures the exchange rate of as country's currency relative to the dollar.

If the path of the real exchange rate in the 1980s is to be explained by anticipated behavior of the structural budget (first an expansion, then a contraction), the interest rate pattern must be consistent with that explanation. Interest differentials were, in fact, far smaller than the realized rate of depreciation. To rescue a macroeconomic approach, one would have to appeal to a sequence of "fiscal contraction" news. It is difficult to document this news and certainly it is not possible to establish it in the joint behavior of the dollar and longterm interest rates.

The evidence from interest differentials and exchange rate depreciation goes much further than rejecting a particular exchange rate model. In fact, there is no model that can give a satisfactory empirical explanation of exchange rate behavior. Meese and Rogoff (1983) have made this point, and Frankel and Meese (1987) have offered a painstaking review of every testable implication. They report that in virtually every respect exchange rate behavior

remains a mystery. Specifically, asset market models with risk neutrality do evidently fail to explain exchange rate patterns.

The attention has therefore shifted to the possibility of a risk premium as an additional factor. With the inclusion of a risk premium, the relationship between the interest differential and expected depreciation becomes:

$$E(e_{t+1}) = e_t + i_t - i_t^* + R + \text{"news"} \qquad (15)$$

But inclusion of a risk premium fails equally, as does work that includes time varying risk premia. There is, in perhaps as many as 100 studies, only one message: a resounding rejection of the basic models.

Alternative Models: In response to the very unsatisfying explanatory power of received asset market models, some researchers are exploring entirely different approaches to the determination of exchange rates. Frankel and Froot (1986 a,b,c), De Grauwe (1988) and Goodhart (1987) have emphasized that the evidence from market participants does not bear out the rational asset market model. Frankel and Froot have shown extensive evidence of large discrepancies among forecasts gathered from market surveys, forward premia, and realized depreciation. Table 4 shows some of their data for the case of the dollar/sterling exchange rate. It is apparent that forecast averages differ widely from forward rates and from realized depreciation.

Table 4 Frankel-Froot Dollar-Yen Data
(Percent per year, sample average)

Period	Horizon	Actual	Survey	Forward Discount
10/84-2/86	1 month	10.1	-11.91	-3.85
6/81-12/85	3 months	- 6.43	3.66	-0.06
6/81-12/85	12 months	-9.47	3.38	0.36

Note: The 1 month forecasts are from one survey, the 3 and 12 months forecasts from a different survey.
Source: Frankel and Froot (1986a)

Frankel and Froot (1986a,b) have explored alternative expectations formation mechanisms to determine whether simple processes such as adaptive expectations are consistent with the survey data. They conclude that the models differ with the sample period. They note that a suitable model of expectations formation would have to include actors with heterogeneous expectations.

As a first empirical implementation of their lessons, Frankel and Froot (1986b,c) have proposed a model where forecast errors are made systematically. A "portfolio manager" forms exchange rate forecasts drawing on two sources: chartist predictions which extrapolate the current rate of depreciation and "fundamental" predictions, which would be based on a theory such as the current account model where real appreciation leads to unsustainable deficits. The weighting is updated in Bayesian fashion based on the recent relative forecasting performance of the two kinds of prediction. This model generates extended cycles in the real exchange rate.

Although suggestive, their model has two difficulties. First, it involves blatant statistical forecast errors and as such is probably too crude

to be a reasonable description of the market process. Second, it involves a very smooth peaking of the real exchange rate. But, as Figure 4 above shows, the peaking is far from smooth. It more nearly reflects an abrupt shift in expectations.

Summary: Equilibrium theory has failed to offer persuasive evidence to explain the large recessions or the large movements in real exchange rates. Standard macroeconomic models do well in the goods and labor markets, in that the stickiness of some wages and prices is a stylized fact. But they do poorly, along with the other two approaches, in explaining the price movements of long-term assets. In the exchange market, just as in all other asset markets the question is why long-term, stabilizing speculation is not more pervasive.

The message from the exchange market is then one of full solidarity. The evidence from the exchange market argues for a research strategy that seeks to explain the joint behavior of long-term asset prices rather than isolated attention on stocks, bonds or foreign exchange.

III. EXCHANGE RATE REGIMES

We saw that the equilibrium approach the claim that the behavior of real exchange rates is invariant to the nominal exchange rate regime. Pioneering research by Stockman (1983, 1988b) and Mussa (1986) bears on this question. They show persuasively that the variability of (bilateral) real exchange rates among the main industrial countries and the US is far higher under flexible exchange rates than under fixed rates. Figure 5 and 6 make this

point for the real exchange rate between the US and Germany.[7] The former figure shows the level and the latter shows the monthly percent change of the real exchange rate. Table 5 shows the increased variability for various bilateral real exchange rates with the United States.

Table 5 Variability of Real Exchange Rates
(Coefficient of Variation)

	1958-72	1973-87
US Effective Real Rate	0.04	0.11
US-Germany	0.07	0.21
US-Japan	0.14	0.15
US-UK	0.05	0.14
US-France	0.10	0.19
US-Sweden	0.08	0.21

Note: Variability is measured by the Coefficient of Variation of the real exchange rate. The real exchange rate is the ratio of consumer prices measured in a common currency.

Although the increased real exchange rate variability in Figure 6 and Table 5 coincides with the flexible exchange rate period (and does so for all industrialized countries), equilibrium theorists would claim that this does not constitute proof of regime dependence. Stockman (1987, 1988b), for example, makes two points: First, real shocks in the 1970s and 1980s may well have been different from those in previous periods. The oil shocks would be a case in point. Second, the exchange rate regime itself may condition policies. Specifically the flexible exchange rate regime may have changed the constraints perceived by policy makers and hence their policies.

---

[7] See Dornbusch and Giovannini (1988) for further evidence.

If policies do change equilibrium relative prices a different time series behavior of real exchange rates emerges. Stockman (1988b) advances an explanation of policy differences: under pegged exchange rates, governments use balance of payments restrictions, under flexible exchange rates, they do not. The expectation of such policies is shown to stabilize the real exchange rate when the nominal exchange rate is pegged. This theory still requires testing.

A separate area of research originated by Baxter and Stockman (1988) investigates the behavior of macroeconomic aggregates under different exchange rate regimes. This question is a natural counterpart to the observed increase in the volatility of the real exchange rate. Strikingly, Baxter and Stockman conclude (with some caveats about detrending procedures) that there is little evidence for changes in the behavior of macroeconomic aggregates--consumption, exports, industrial production. They note:

> "A large class of theoretical models implies that the exchange rate system has important effects on a number of macroeconomic quantities; however, we have found little evidence of quantities for which the exchange rate system is an important determinant."

This finding is interesting because it may constitute evidence against the equilibrium approach. If real exchange rate changes reflect changes in <u>equilibrium</u> prices, how is it possible that these equilibrium prices are so much more volatile than quantities? One possible explanation is that monetary and fiscal policies have real effects (contrary to the implications of the equilibrium approach) and that their effects are regime dependent. Some very tentative evidence supporting this view is shown in Table 6. The table shows correlations among realized real 3 month interest rates, the full employment

budget, the real effective exchange rate and the price-earnings ratio on stocks for the US.

Table 6 Correlations of U.S. Macroeconomic Variables Under Alternative Exchange Rate Regimes

	1958-72			1973-1987		
	1.	2.	3.	1.	2.	3.
1.Real Interest Rate	1			1		
2.F.E. Budget	0.17	1		-0.35	1	
3.Real Exchange Rate	0.31	0.31	1	0.57	-0.50	1
4.P/E Ratio for Stocks	-0.09	0.2	0.12	-0.06	-0.52	0.02

Note that in Table 6, the size and sign of correlations is very different in the fixed and flexible exchange rate periods. Including policy variables and prices in the range of variables to be studied may solve the Baxter-Stockman puzzle.

IV. DESTABILIZING SPECULATION AND EXCHANGE RATE POLICY

The basic message from the work of Frankel and Froot (1986a,b,c, 1987), de Grauwe (1988), Garber (1987) and Goodhart (1987) is that asset markets are not rational, or at least not in ways identifiable in terms of the models we use and believe.

The message is to look for alternative models of exchange rate expectations formation and speculation which are not necessarily closed by consistency of short and longterm speculation. They should respond to the most striking feature singled out by asset market participants, namely the dominance of short horizon speculation. The basic fact of life in asset markets is that

the average professional thinks he or she can liquidate a position before a major turn in the market. Speculation can lead to the possibility of trading on noise which may generate cumulative exchange rate movements out of thin air, taking the real exchange rate far away from fundamentals. Unless there is strong, offsetting speculation on fundamentals, these trips away from fundamentals need to be neither small nor of short duration.

Of course, what is said here of the exchange market applies equally to markets for real estate, stocks or longterm bonds. Nurkse (1946), Shiller (1986a,1986b) and Summers (1986,1988) have been very vocal and persuasive in arguing this point. The more diffuse the fundamentals, the more room there is for dominance of short-run speculation and for asset prices to depart from fundamentals.

None of this is new. Keynes (1934, chapter 12) offers a description of the difference between "speculation" which is geared to making capital gains from uncovering the shifting psychological moods of the market versus "enterprise" which seeks to earn income from the long-term holding of an asset. He notes the markets' pursuit of short-term capital gains rather than long-term holding yields:

> "It might have been supposed that competition between expert professionals, possessing judgment and knowledge beyond that of the average private investor, would correct the vagaries of the ignorant investor left to himself. It happens, however, that the energies and skill of the professional investor and speculator are mainly occupied otherwise. ..They are concerned, not with what an investment is really worth to a man who buys it "for keeps", but with what the market will value it at, under the influence of mass psychology, three months or a year hence...
> The battle of wits to anticipate the basis of conventional valuation a few months hence, rather than the prospective yield of an investment over a long term of years, does not require gulls amongst the public to

> feed the maws of the professional --it can be played by professionals amongst themselves."

Even though exchange rate behavior is not well understood, there is a live policy issue. Should exchange rates be allowed to float freely or should they be closely managed?

Policy:

For many observers extreme exchange rate volatility and persistent misalignments in the $-DM-Yen triangle calls for a move toward a better international monetary system. Naturally, participants in that debate follow the principle "the neighbors' grass is greener": given that we have flexible rates now, they urge a return to fixed exchange rates. Two kinds of remedies specifically address this problem. One is target zones , the other is the introduction of a comprehensive financial transactions taxes as suggested by Tobin (1982). But there is another direction: maintaining a flexible exchange rate system but discouraging destabilizing speculation by a financial transactions tax.

The target zone proposal, advocated by by Williamson and Miller (1987), rests on the premise that longterm speculation is supported if market participants know that the authorities have a firm commitment to limit the size of exchange rate fluctuations. Moreover, even if the market does not provide the stabilizing speculation, policy makers bring it about by their own intervention and by policy changes in support of the band. The arguments against such proposals are well-known and have failed to convince the proponents of the scheme: First, that in the absence of fiscal coordination the

support of target zones may lead to an undesirable use of interest rate policy. Second, that target zones may be too sticky to deal effectively with the need for changes in equilibrium real exchange rates.

If most of the shortcomings of our exchange rate experience stem from excessive, overly volatile capital mobility, a way to cope with excess capital mobility is to use a dual exchange rates, thus separating commercial transactions from the vagaries of the capital market. An alternative system is a worldwide financial transactions tax. A moderate, worldwide tax on all financial transactions would force asset markets to take a long run view of the assets they price. Tobin (1982) has suggested such a tax for all foreign exchange transactions, but the logic can be carried to all financial transactions. The attraction of the Tobin tax is that when levied at a very moderate rate it still creates a tax on shortterm (round trip) transactions, while leaving the profitability of longterm investment virtually unaffected.

But a critical question then is whether a reduction in short-term speculation increases stability of the exchange rate. If short-term speculation is the main source of the cumulative departures from fundamentals today then reduced shortterm speculation and hence relatively stronger longterm speculation might well limit the extent of exchange rate fluctuations. But that point still has not been demonstrated.

The major objections to the Tobin tax are two. One is the resource cost of implementing yet another tax. That cost would have to be compared to the costs of large exchange rate misalignment and the resulting resource cost. On that basis, it presumably comes out to be small. The second is the argument

that with the tax implemented in only one or a few locations, business would merely shift to offshore centers. Tobin recognized that point in arguing for a worldwide foreign exchange transactions tax.

IV. REAL EXCHANGE RATES IN DEVELOPING COUNTRIES

In this part of the paper, we investigate problems of real exchange rates in developing countries. One concerns the interaction of the world capital market which a country faces, capital accumulation, real wages and the standard of living. The simple point of the model we develop is highlights the asymmetry between the mobility of real capital and the immobility of labor. Policies that reduce the profitability of capital ultimately reduce the standard of living of labor.

1. Capital and the Real Wage

In this section, we set out a simple model of a small open economy. The model is readily recognized as a variation on work by Kouri (1979, 1982).

The Model: There are three sectors: home goods, exportables and a capital installation industry. The export sector produces with constant returns, using capital and labor. Firms can sell output at the exchange rate e and hence have profits equal to:

$$V_E = eF(K,L_E) - WL_E \qquad (16)$$

which gives rise to the labor demand equation

$$L_E = f(w)K \; ; \; f'<0 \tag{17}$$

where w= W/E is the wage in dollars. In the home goods sector, output is produced with a constant unit labor requirement (of one) and no capital. Demand for home goods is a fraction a of labor income plus government demand, denoted G:

$$D_N = \theta(p)WL/P_N + G \tag{18}$$

where $p = P_N/e$ is the relative price of home goods. The home goods price is given by unit labor costs, $P_N = W$. Accordingly, labor demand in the home goods sector is

$$L_N = \theta(p)L + G \tag{19}$$

where L denotes the level of employment.

The capital goods installation industry sells installed capacity at a price Q. Installation requires an increasing marginal input requirement of imported goods. Thus profits of the installation industry are

$$V_I = QI - \xi(I)e; \quad \xi', \xi'' > 0 \tag{20}$$

Optimization gives the optimal rate of production of installed capacity:

$$I = I(q); \qquad I_q > 0 \tag{21}$$

where $q = Q/e$ is Tobin's real price of installed capacity.

The labor market equilibrium condition is given in (22):

$$L = [f(w)K + G]/[1-\theta(w)] \tag{22}$$

Note the employment multiplier $1/[1-\theta(w)]$ to which we return presently.

The equilibrium real wage is therefore a function of the capital stock and government spending on home goods.

$$w = w(K,L,G) \qquad w_K > 0,\ w_L < 0,\ w_G > 0 \tag{23}$$

The sign pattern assumed for the equilibrium wage functions requires that $\theta'(w)$ be negative or at least not too positive. This assures that a rise in the wage, w, reduces labor demand. In fact, if $\theta'(w)$ is positive it is possible that very large real wage cuts are required to reduce labor demand.

Capital accumulation is defined by the difference between investment and depreciation:

$$\dot{K} = I(q) - \delta K = \dot{K}(q,K) \tag{24}$$

where δ is the rate of depreciation.

The model is closed by an equation relating the return on domestically installed capital to the rate of return that can be obtained in the world market, i*:

$$\dot{q}/q = i^* - \phi(w)/q = h(q,K;i^*,G) \qquad (25)$$

where $\phi(w)$ is the marginal product of capital in the traded goods sector. The equation states that capital gains must make up the difference between the world interest rate and the domestic dividend yield of capital.

Substituting (23) in (25) yields the conventional phase diagram (Figure 7) which shows the dynamics of the capital stock and the real price of capital. The path JJ is the unique stable trajectory. The subsidiary equations which already have been used to derive these paths, give the behavior of real wages and the allocation of labor between sectors.

Three Applications: The first application of this model is to show that increased home demand by the government, via the crowding out effect in the labor market, reduces the profitability of capital. This must lead to a decline in the real price of capital and hence to a gradual decline in the capital stock.

The increase in government spending raises the equilibrium wage and hence raise the capital intensity in the export sector. In Figure 7, the resulting reduction in the yield of capital must be offset by a fall in the real price of assets. The $\dot{q}$=0 schedule therefore shifts downward. The forward

looking asset price declines immediately. Over time, the capital stock declines until a new equilibrium is reached.

The net effect of this adjustment on wages will be positive. Thus labor gains, and that gain is achieved at the expense of capital. The initial gain in real wages is subsequently dampened by a decline in the capital stock, but labor is ahead even in the new long run equilibrium.

Of course, that strong conclusion overshadows the question of how the expenditure policy is financed. Typically the real appreciation involves trade and budget deficits, both financed by external loans. The adverse effects of the policy on the export sector are part of the trade deficit, while the other part is the increase in imports that occurs as a result of income and substitution effects. The example illustrates the policy disturbances that led in many Latin American countries, specifically Mexico, to the debt crisis. Figure 8 shows Mexico's real exchange rate in the past forty years. The recurrent episodes of massive real appreciation, such as 1976 or 1982 are associated with election year spending sprees. They are invariably followed by massive real depreciation when the external constraint becomes binding.

The asymmetry in the adjustment is worth noting. When the overvaluation episode has lasted for a while capital will have been decumulated and, as a result, the equilibrium level of real wages at a balanced budget will be below the level at which the overvaluation episode started. A recurrent policy of overvaluation thus leads, over time, to a declining sustainable real wage. This is, of course, the pattern observed in many Latin American countries as shown in Table 7.

Table 7 Real Exchange Rates in Latin America
(Index 1980-82 = 100)

	Argentina	Brazil	Chile	Mexico
1982	77	113	97	83
1983	72	86	89	79
1984	80	86	90	92
1985	71	85	80	90
1986	61	74	69	65
1987	53	74	65	67
1988:III	64	81	61	81

Source: Morgan Guaranty

The real wage effects are further aggravated, as is apparent from (22), by the employment multiplier, which tends to be very high, and the fact that the government budget tends to have a high domestic employment content.

The second application deals with international risk premia. Suppose that a country, because of poor policy performance Peru-style has scared off international investors. The result is an increase in the cost of capital. Investors will hold assets in this country only if they receive a margin over the world rate of return sufficient to compensate for the perceive risks. In terms of the model this corresponds to an increase in the cost of capital from i^* to i^*+R. The $\dot{q}=0$ schedule will shift down. There will be an immediate decline in asset prices and, just as discussed above, the capital stock will decline over time. This time, the long run effect is unquestionably adverse, even leaving aside the balance of payments crisis. The decumulation o capital implies that the long run sustainable wage has fallen. Falling out of favor with the world capital market thus implies a lowering of the standard of living.

The long run consequences of policies that raise the cost of capital are worth noting because of a temptation to take only the short run view. It is true that physical capital is in fixed supply, in the short run and is earning rents. But, because of depreciation, capital is ultimately mobile, and a period of negative net investment is entirely conceivable. Argentina in the 1980s is a case in point as is Peru.

The third application concerns an overvaluation imposed by an increase in the real wage above the market clearing level. Let w' be the real wage fixed by unions and the government. Suppose also that the immediate unemployment effects from such a policy are offset by increased government spending. The focus here is on the long-term employment effects. With a real wage $w' > w(K,G)$, capital intensity in the traded goods sector increases immediately and profitability of capital is reduced. Accordingly, as shown in Figure 9, the $\dot{q}=0$ schedule now becomes horizontal at a level q^o, defined by the equation $q^o(i^*+\delta)=\phi(w')$. There is an immediate decline in the real price of capital from E to E'. At this point, workers have increased purchasing power and unchanged total employment. but capitalists have already suffered capital losses.

The next stage is an inevitable decapitalization of the economy. At the reduced price of capital, investment has fallen, and thus the capital stock declines until the economy reaches point E^*. It is conceivable that the government increases its demand for goods, thus stabilizing employment. But sooner or later there is an inevitable payments crisis. Once again, because of the decapitalization the equilibrium real wage will have to fall far below the

initial level. The decline is larger when the real wage cutting itself reduces the demand for labor in the home goods sector.

Concluding Remarks

The variety of topics reviewed in this selective survey represents some of the diverse directions of current research of exchange rates. Two thrusts are dominant. One is the rationality of asset markets and the resulting question about resource allocation guidsed by disequilibrium real exchange ratres. The other is an increased focus on microeconomic effects of real exchange rate changes. We have sketched here a model of capital and employment, but there is an equally important direction of research emphasizing hysteresis effects as developed in Krugman's (1988) highly original work.

REFERENCES

Baxter, M. and A. Stockman (1988) "Business Cycles and the Exchange Rate System: Some International Evidence," Unpublished manuscript, University of Rochester.

Calvo, G.(1983) "Staggered Contracts and Exchange Rate Policy" in J.Frenkel (ed.) Exchange Rates and International Macroeconomics, U. of Chicago Press and NBER.

--------(1985) "Currency Substitution and the Real Exchange Rate: the Utility Maximizing Approach," Journal of International Money and Finance,2.

--------(1988) "Idiosyncratic Expectations and Economic Fluctuations" Unpublished manuscript, University of Pennsylvania.

Cumby, R. and M.Obstfeld.(1984) "International Interest Rate and Price Level Linkages Under Flexible Exchange Rates. A Review of Recent Evidence." in J. Bilson and R. Marston (eds.) Exchange Rate Theory and Practice, U. of Chicago Press and NBER.

de Grauwe, P. (1988) "Long Swings in Real Exchange Rates- Do They Fit Our Theories?," Monetary and Economic Studies (Bank of Japan), May 1988.

Diaz Alejandro,C. (1963) Exchange Rate Devaluation in a Semi Industrialized Country. MIT Press.

Dornbusch, R.(1971) "Money, Devaluation and Nontraded Goods," American Economic Review, December.

--------(1976) "Expectations and Exchange Rate Dynamics," Journal of Political Economy, December.

--------(1983) "Exchange Rate Risk and the Macroeconomics of Exchange Rate Determination" in R.Hawkins et al. (eds) Research in International Business and Finance, Vol 3, JAI Press.

---------(1986a)"Flexible Exchange Rates and Excess Capital Mobility," BPEA, 1.

---------(1986b) Dollars, Debts and Deficits, MIT Press.

Dornbusch,R. and A. Giovannini (1988) "Money in the Open Economy," forthcoming in F.Hahn and B.Friedman (eds.) Handbook of Monetary Economics, North-Holland.

Dornbusch,R. and J.Frankel (1987) "The Flexible Exchange Rate System: Experience and Alternatives," NBER Working Paper 2464.

Dornbusch,R., S.Fischer and P.A.Samuelson (1977) "Comparative Advantage, Trade and Payments in a Ricardian Model with a Continuum of Goods," American Economic Review, December.

Drazen,A. and E.Helpman (1987) "Stabilization with Exchange Rate Management," Quarterly Journal of Economics, November.

Eichengreen,B. (1988) "Real Exchange Rate Behavior Under Alternative international Monetary Regimes," European Economic Review, 363-371.

Feldstein,M. (1987) "The Budget Deficit and the Dollar," NBER Macroeconomics Annual.

Frankel,J. (1982)"In Search of the Exchange Risk Premium: A Six Currency Test Assuming Mean-Variance Optimization," Journal of International Money and Finance, 1.

-------(1986)"The Implications of Mean-Variance Optimization for Four Questions in International Finance," Journal of International Money and Finance, March

Frankel, J. and K.Froot (1986a) "Three Essays Using Survey Data of Exchange Rate Expectations," Unpublished manuscript, University of California, Berkeley, Nov.

----------(1986b) "Understanding the US Dollar in the Eighties: The Expectations of Chartists and Fundamentalists," Economic Record (Supplement)

----------(1986c) "The Dollar as an Irrational Speculative Bubble: A Tale of Fundamentalists and Chartists," The Marcus Wallenberg Papers ion International Finance, No.1.

----------(1987) "Using Survey Data to Test Standard Propositions Regarding Exchange Rate Expectations," American Economic Review, March

Frankel,J. and R. Meese (1987) "Are Exchange Rates Excessively Variable?," NBER Macroeconomics Annual.

Frenkel,J. (ed.)(1988) Fiscal Policy in the Open Economy. University of Chicago Press.

---------- and A.Razin (1986) "The International Transmission and Effects of Fiscal Policy," American Economic Review (Papers and Proceedings), May.

---------(1987) Fiscal Policies and the World Economy, MIT Press

Frenkel,J.A. and H.G. Johnson (1978) (eds.) The Economics of Flexible Exchange Rates, Addison-Wesley.

Frenkel,J. and A. Razin (1987) Fiscal Policies and the World Economy, MIT Press.

Friedman, M.(1953) "The Case for Flexible Exchange Rates," in his Essays in Positive Economics U. of Chicago Press.

Froot, K. (1988) "Currency Speculation: Is It Destabilizing? mimeo, Massachusetts Institute of Technology.

-------- and T.Itoh (1988) "On the Consistency of Short run and Long run Exchange Rate Expectations," Unpublished manuscript, MIT.

Helpman,E. (1981) "An Exploration in the Theory of Exchange Rate Regimes," Journal of Political Economy, December.

------and A.Razin (1979) "Towards a Consistent Comparison of Alternative Exchange Rate Systems," Canadian Journal of Economics, August.

----------(1982) "Dynamics of a Floating Exchange Rate Regime," Journal of Political Economy, August/September.

----------(1987) "Exchange Rate Management: Intertemporal Tradeoffs" American Economic Review, March.

Garber,P. (1987) "The Dollar as a Bubble," Unpublished manuscript, Brown University.

Gavin,M. (1987) "The Dollar as a Speculative Bubble 1984-1985," Unpublished manuscript, Columbia University.

Goodhart,C. (1987) "The Foreign Exchange Market: A Random Walk with a Dragging Anchor," LSE Financial Market Group, Discussion Paper No. 0001.

Huizinga,J. (1987) "An Empirical Investigation of the Long Run Behavior of the Real Exchange Rate," Carnegie Rochester Conference Series, Vol. 27.

Johnson, H. G. (1973)"The Case for Flexible Exchange Rates:1969," in his Further Essays in Monetary Economics Harvard U. Press.

Kravis,I.(1986) " The Three Faces of the International Comparison Project," Research Observer, January.

Keynes,J.M. (1934) The General Theory of Employment, Interest and Money, London: Macmillan

Kouri, P. (1979) "Profitability and Growth in a Small Open Economy," in A.Lindbeck (ed.) Inflation and Employment in Open Economies, North Holland

--------(1982) " Profitability and Growth," Scandinavian Journal of Economics, 2.

Krugman,P. (1985) "Is the Strong Dollar Sustainable?," Federal Reserve Bank of Kansas City The US Dollar- Recent Developments, Outlook and Policy Options.

---------(1987) "Target Zones and Exchange Rate Dynamics," NBER Working Paper No. 2481.

--------(1988) Exchange Rate Instability Cambridge: MIT Press.

Krugman, P. and Taylor,L.(1981) "The Contractionary Effects of Devaluation," Journal of International Economics, September.

Lucas,R. (1982) "Interest Rates and Currency Prices in a Two-Country World," Journal of Monetary Economics.

Meese,R. and Rogoff,K. (1983) "Empirical Exchange Rate Models in the Seventies. Do They Fit Out of Sample?," Journal of International Economics, May.

Miller,M. and J. Williamson (1987) "The International Monetary System: An Analysis of Alternative Regimes," Unpublished manuscript, University of Warwick.

Miller,O. and N.Wallace,(1985) "International Coordination of Macroeconomic Policies: A Welfare Analysis," Federal Reserve Bank of Minneapolis Quarterly Review, Spring.

Mussa,M. (1979) "Empirical Regularities in the Behavior of Exchange Rates and Theories of the Foreign Exchange Market," Carnegie Rochester Conference Series,

-------(1982) "A Model of Exchange Rate Dynamics," Journal of Political Economy, February.

-------- (1984)"The Theory of Exchange Rate Determination," in J.Bilson and R. Marston (eds.) Exchange Rate Theory and Practice, U. of Chicago Press and NBER.

--------(1986) "Nominal Exchange Rate Regimes and the Behavior of Real Exchange Rates: Evidence and Implications," Carnegie Rochester Conference Series.

Nurkse, R. (1946) International Currency Experience in the Interwar Period, Geneva: League of Nations. Reprinted by Arno Press.

Obstfeld, M. and A. Stockman(1985) "Exchange Rate Dynamics," in R.Jones and P.Kenen (eds.) Handbook of International Economics, Vol. 2, North-Holland.

Persson,T. "Credibility of Macroeconomic Policy: An Introduction and a Broad Survey," European Economic Review, 519-532.

Samuelson,P. (1964) "Some Theoretical Notes on Trade Problems," Review of Economics and Statistics,

Serven,L.(1986) "The Effects of Devaluation," chapter from an unpublished Ph.D. dissertation, MIT.

Shiller, R. (1986a) "Stock Prices and Social Dynamics," Brookings Papers on Economic Activity, 2.

----------(1986b) "Fashions, Fads and Bubbles in Financial Markets," Unpublished manuscript, Yale University.

Stockman,A.(1980) "A Theory of Exchange Rate Determination," Journal of Political Economy, December

----------(1983) "Real Exchange Rates under Alternative Nominal Exchange Rate Regimes," Journal of International Money and Finance, 2.

----------(1987) "The Equilibrium Approach to Exchange Rates," Federal Reserve Bank of Richmond Economic Review, March/April.

----------(1988a) "Fiscal Policies and International Financial Markets," in

----------(1988b) "Real Exchange Rate Variability Under Pegged and floating Nominal Exchange Rate Systems: An Equilibrium Theory," NBER Working Paper No. 2565.

------- and L.Svensson (1987) "Capital Flows, Exchange Rates and Investment," Journal of Monetary Economics, March.

Summers,R.(1986) "Does the Stock Market Rationally Reflect Fundamental Values?," Journal of Finance, July.

--------(1988) "What is Memorable in Empirical Macroeconomics?," Unpublished manuscript, Harvard University.

Svensson,L.(1985a) Currency Prices, Terms of Trade, and Interest Rates: A General Equilibrium, Asset-Pricing, Cash in Advance Approach," Journal of International Economics, January.

---------(1985b)"Money and Asset Prices in a Cash in Advance Economy," Journal of Political Economy, December.

---------(1986) "International Fiscal Policy Transmission," unpublished manuscript, University of Stockholm.

Svensson,L. and S. van Wijnbergen (1986) "International Transmission of Monetary Policy," Unpublished manuscript, University of Stockholm.

Svensson, L. and A.Razin.(1983) "The Terms of Trade, Spending, and the Current Account: The Harberger-Laursen-Metzler Effect," Journal of Political Economy, February.

Tobin, J.(1982) "A Proposal for International Monetary Reform," in his Essays in Economics, MIT Press,chapt. 20

van Wijnbergen.S.(1985) "Trade Reform, Aggregate Investment and Capital Flight: On Credibility and the Value of Information," Economic Letters, 19.

Williamson,J. (1983) The Exchange Rate System Institute for International Economics.

Williamson,J. and M.Miller (1987) A Blueprint for International Monetary Reform. Institute for International Economics.

Wilson, C.(1979) "Exchange Rate Dynamics and Anticipated Disturbances," Journal of International Economics, June.

FIGURE 1

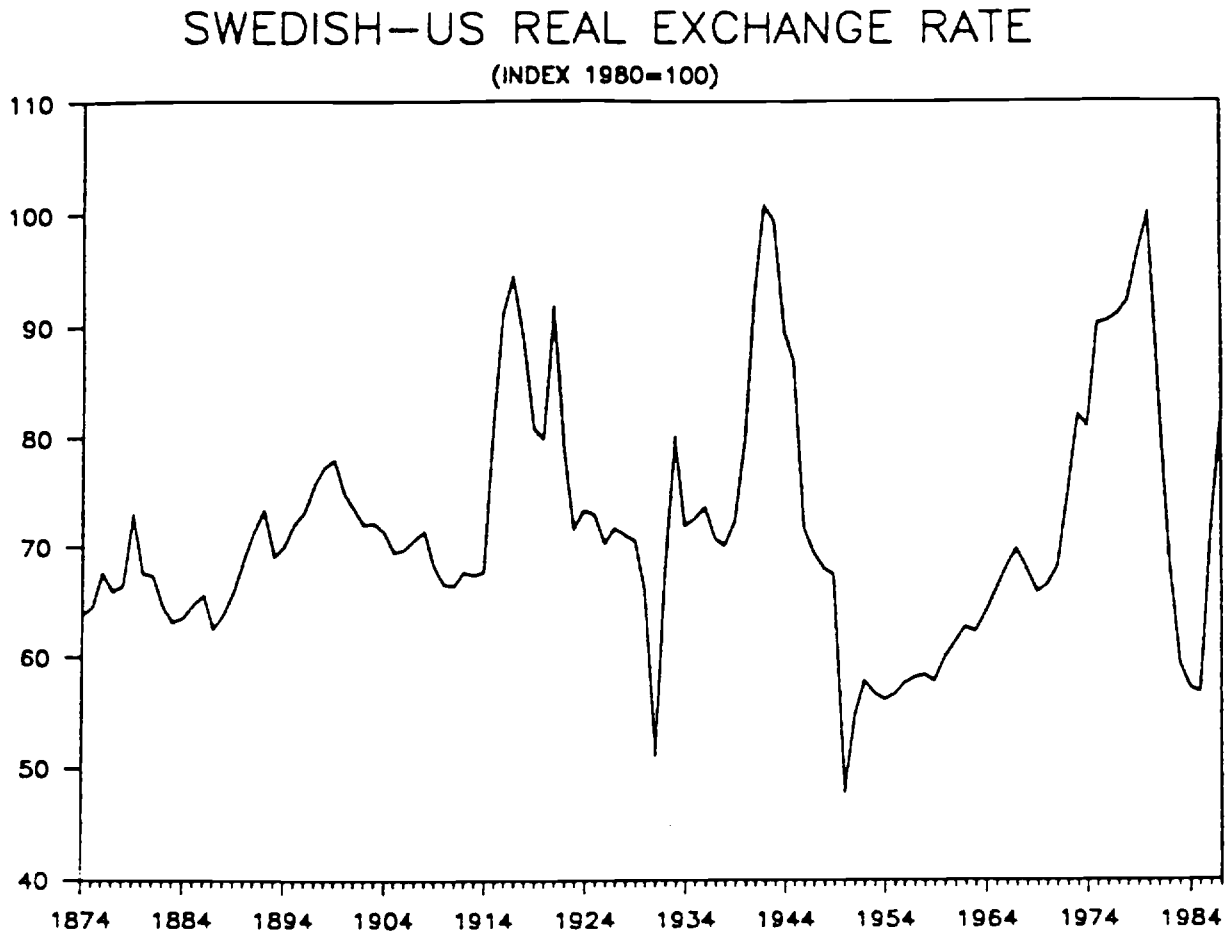

SWEDISH–US REAL EXCHANGE RATE
(INDEX 1980=100)
110
100
90
80
70
60
50
40
1874
1884
1894
1904
1914
1924
1934
1944
1954
1964
1974
1984

FIGURE 2

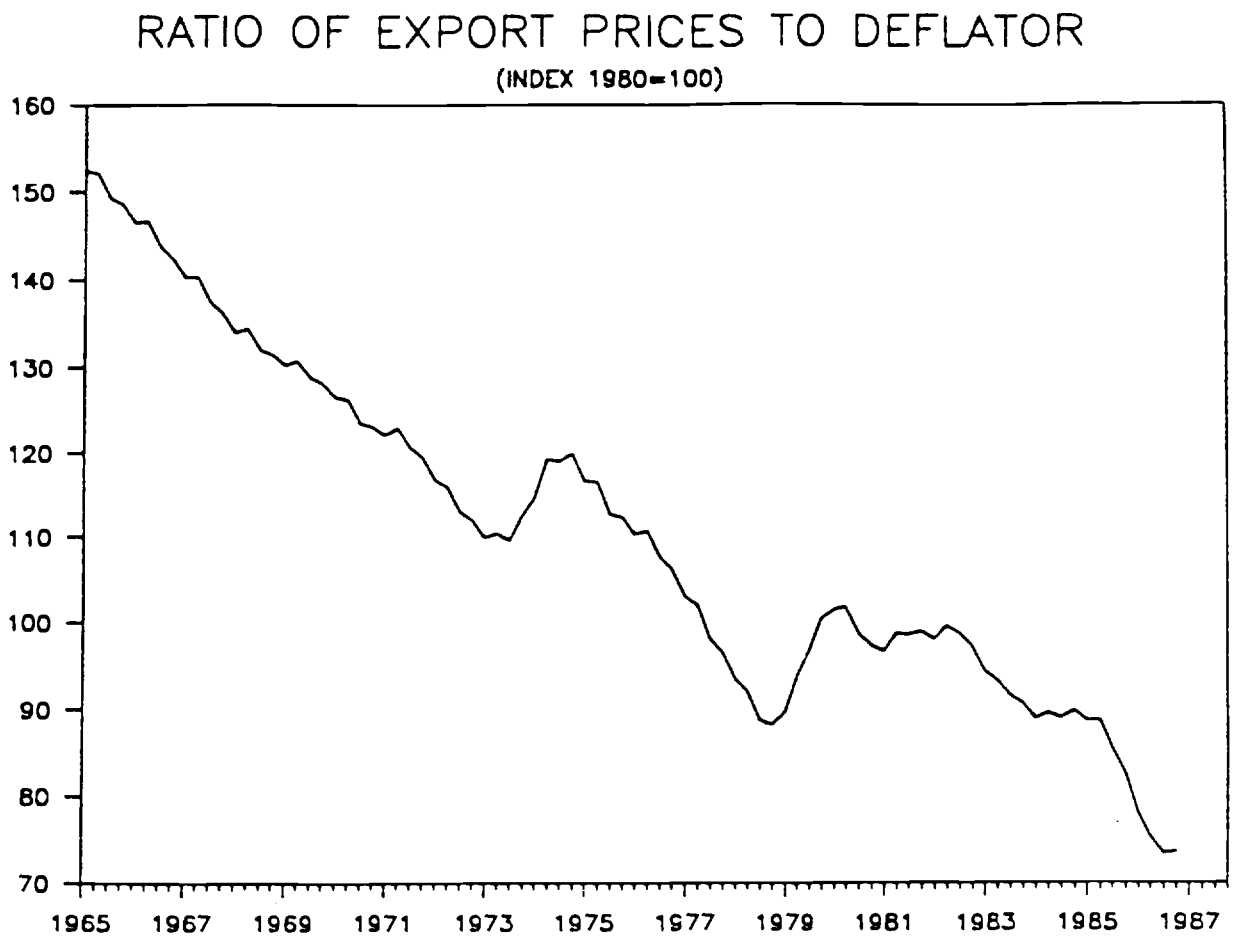

RATIO OF EXPORT PRICES TO DEFLATOR
(INDEX 1980=100)
160
150
140
130
120
110
100
90
80
70
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987

FIGURE 3

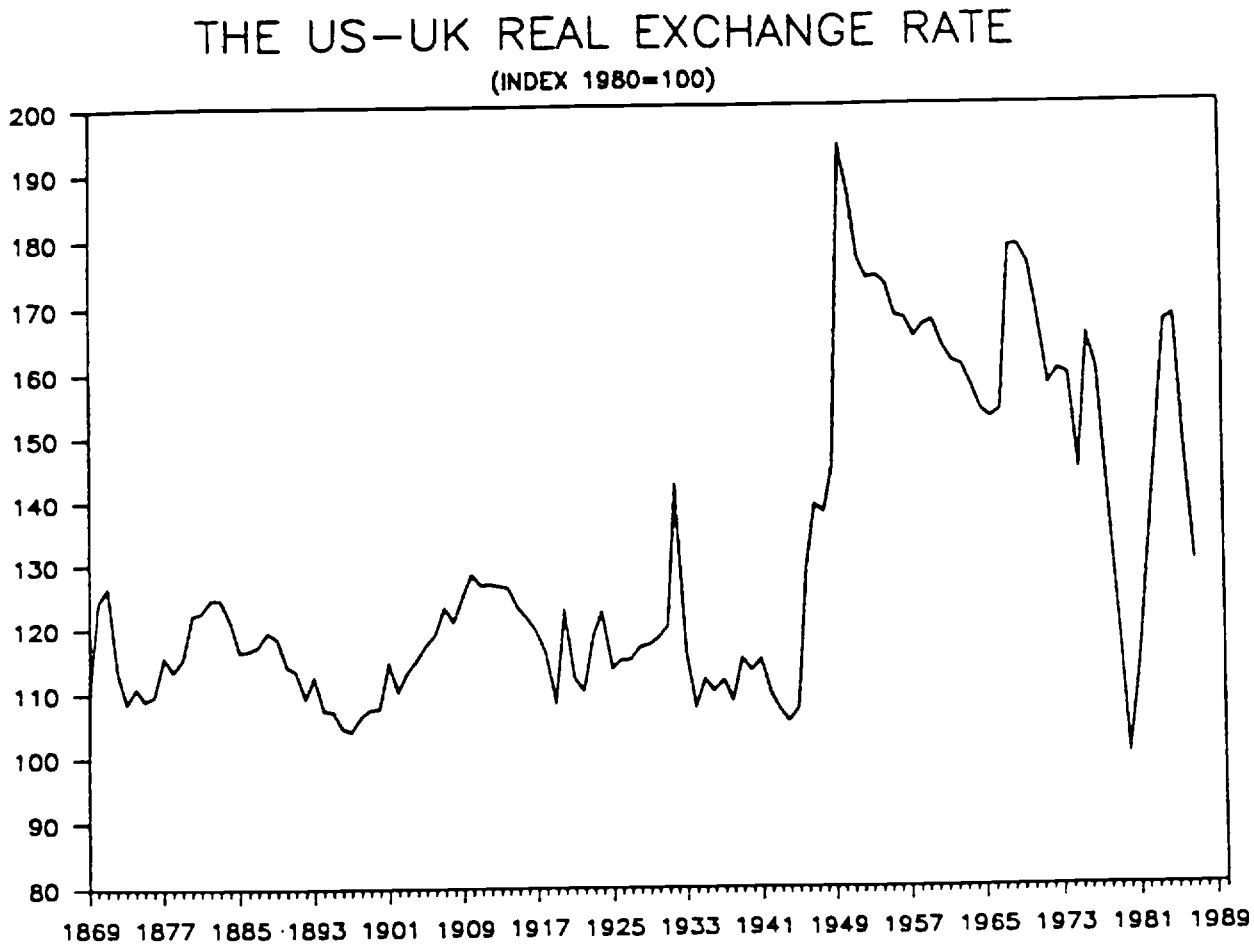

THE US–UK REAL EXCHANGE RATE
(INDEX 1980=100)
200
190
180
170
160
150
140
130
120
110
100
90
80
1869 1877 1885 1893 1901 1909 1917 1925 1933 1941 1949 1957 1965 1973 1981 1989

FIGURE 4

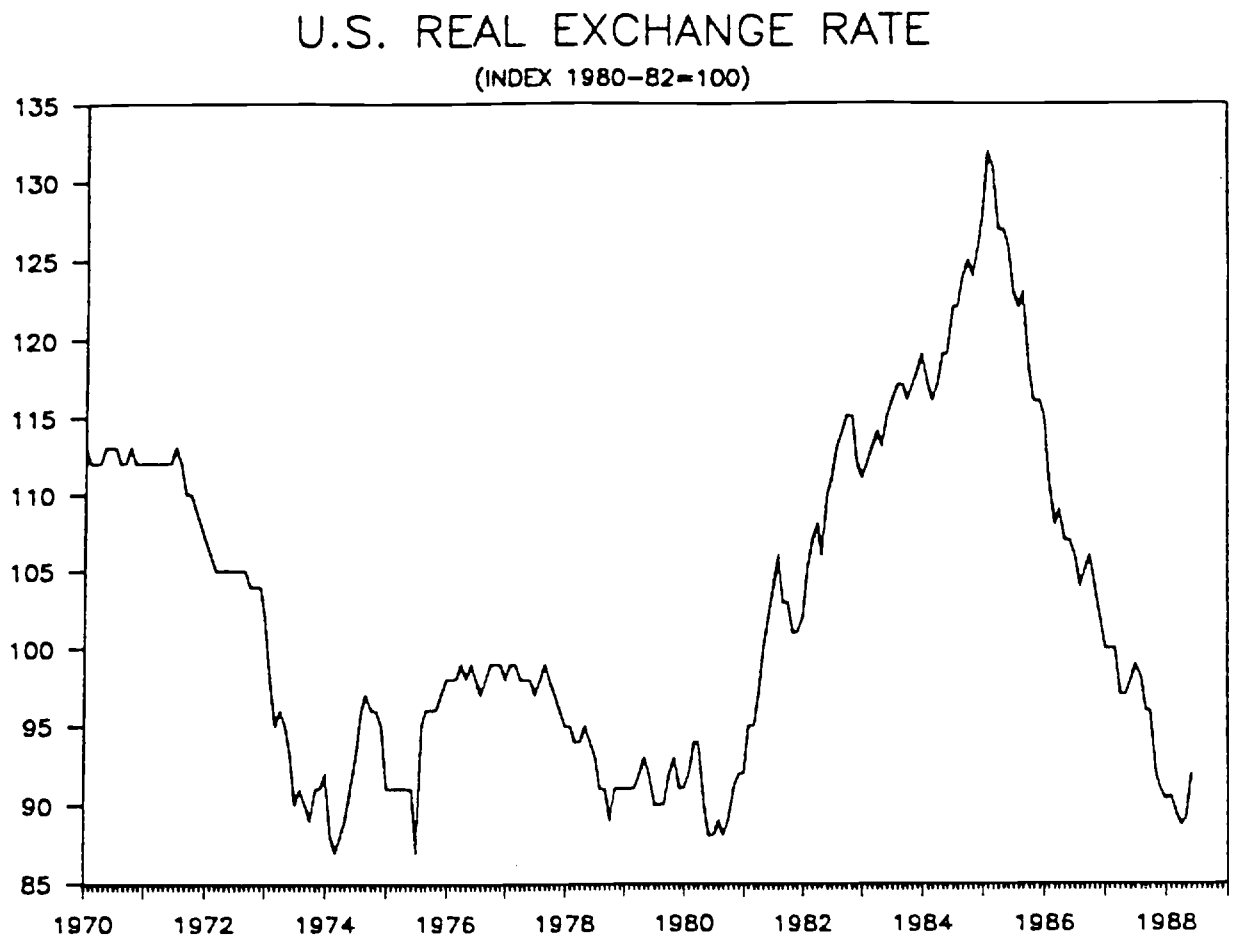

U.S. REAL EXCHANGE RATE
(INDEX 1980-82=100)
135
130
125
120
115
110
105
100
95
90
85
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988

FIGURE 5

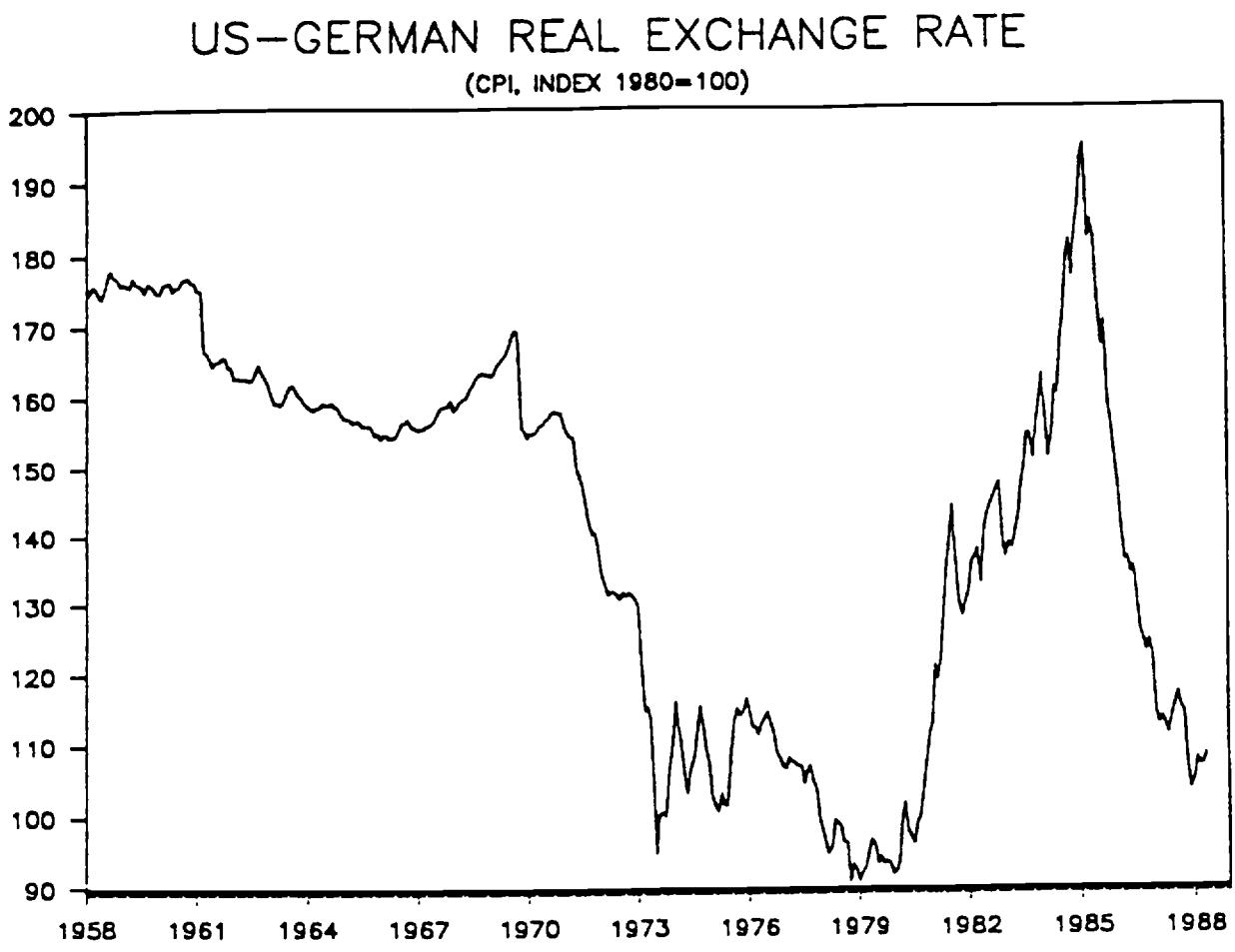
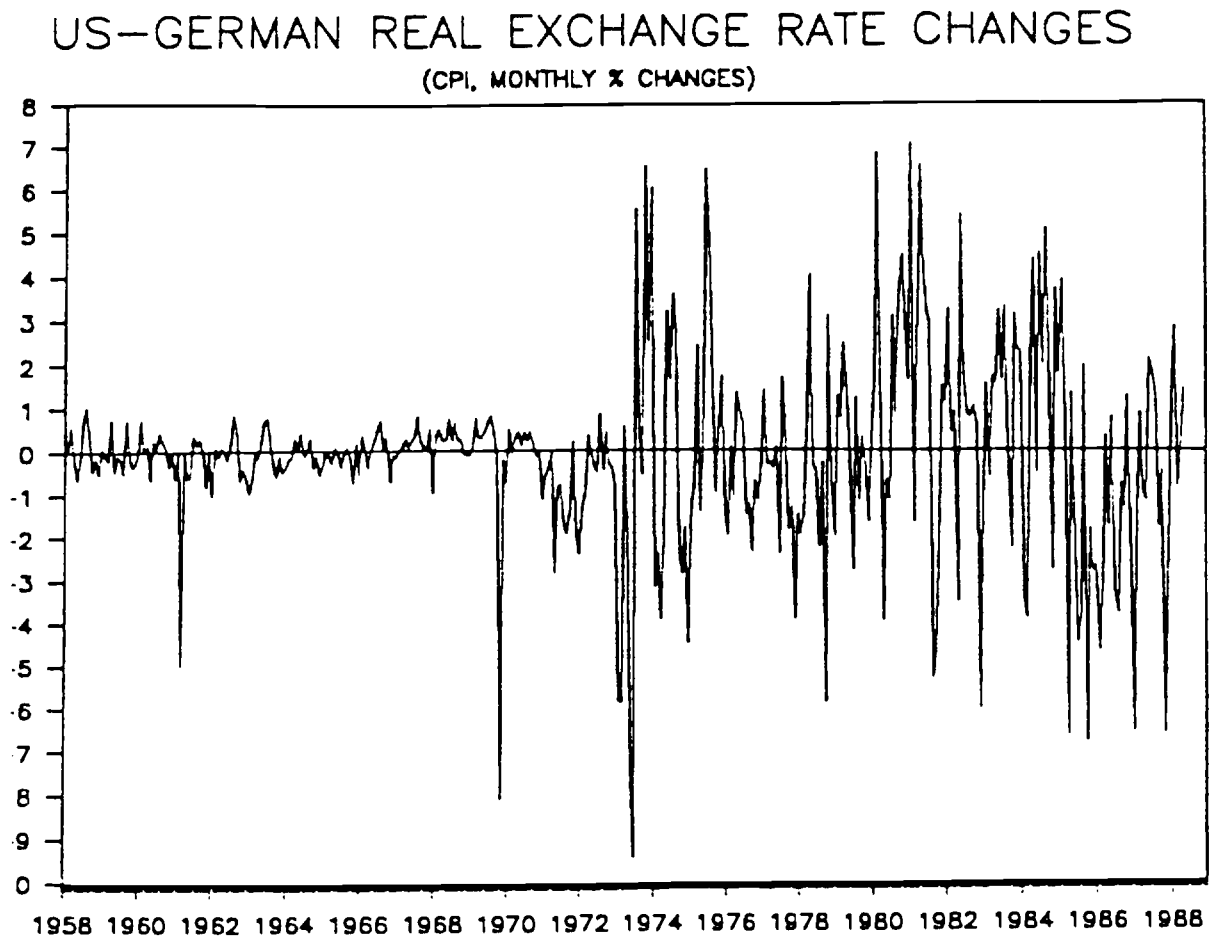

US–GERMAN REAL EXCHANGE RATE
(CPI, INDEX 1980=100)
200
190
180
170
160
150
140
130
120
110
100
90
1958
1961
1964
1967
1970
1973
1976
1979
1982
1985
1988

FIGURE 6


US–GERMAN REAL EXCHANGE RATE CHANGES
(CPI, MONTHLY % CHANGES)
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
1958 1960 1962 1964 1966 1968 1970 1972 1974 1976 1978 1980 1982 1984 1986 1988

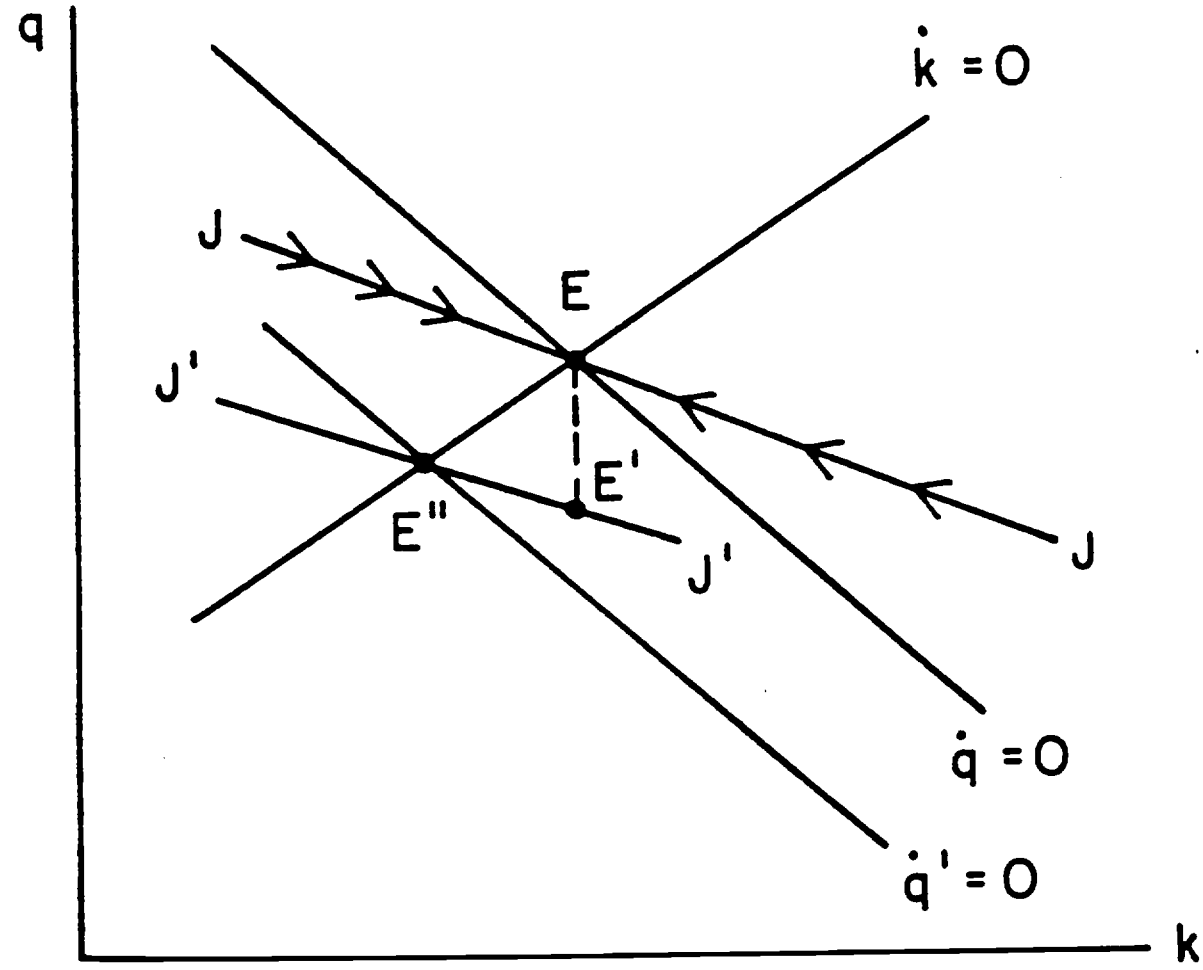
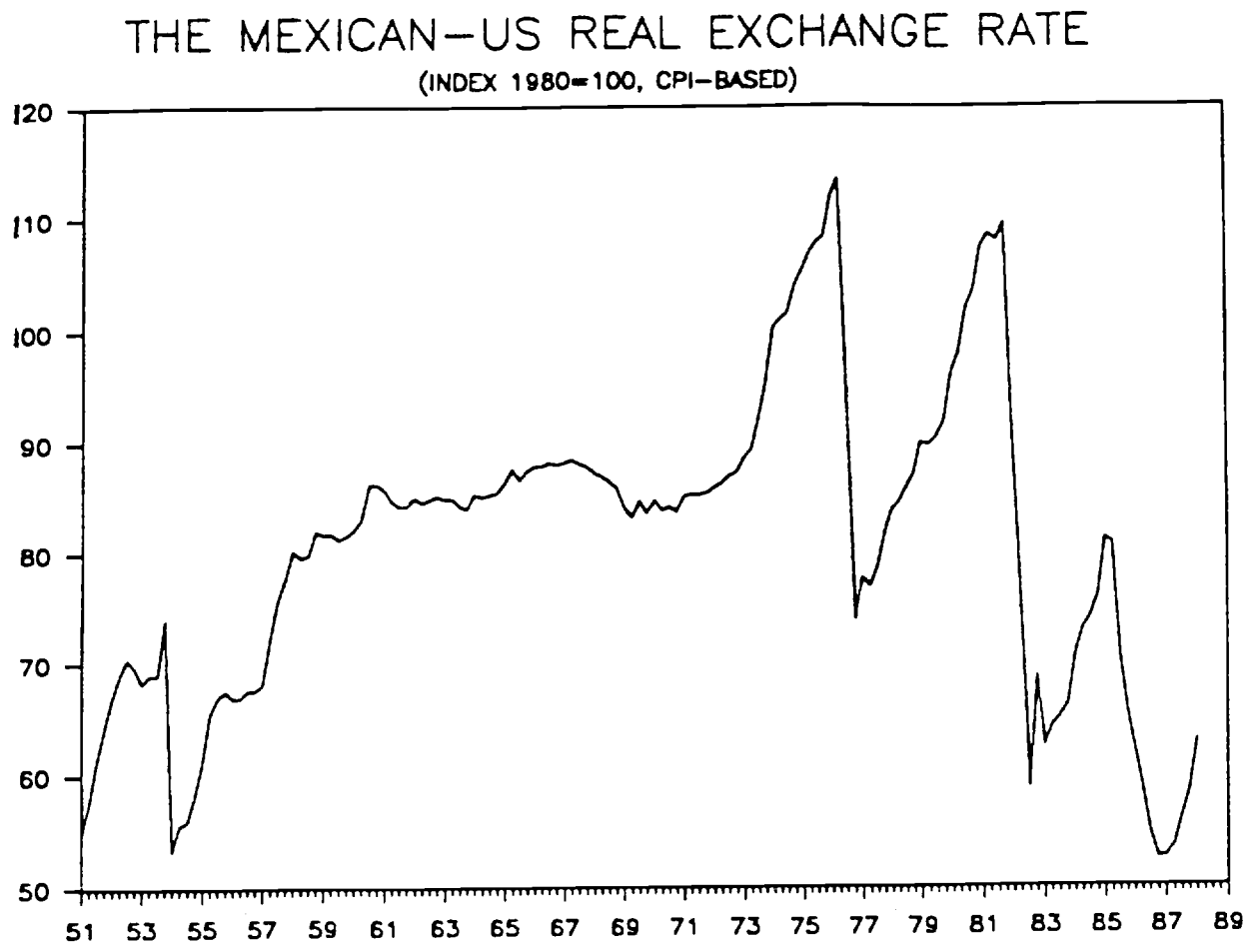
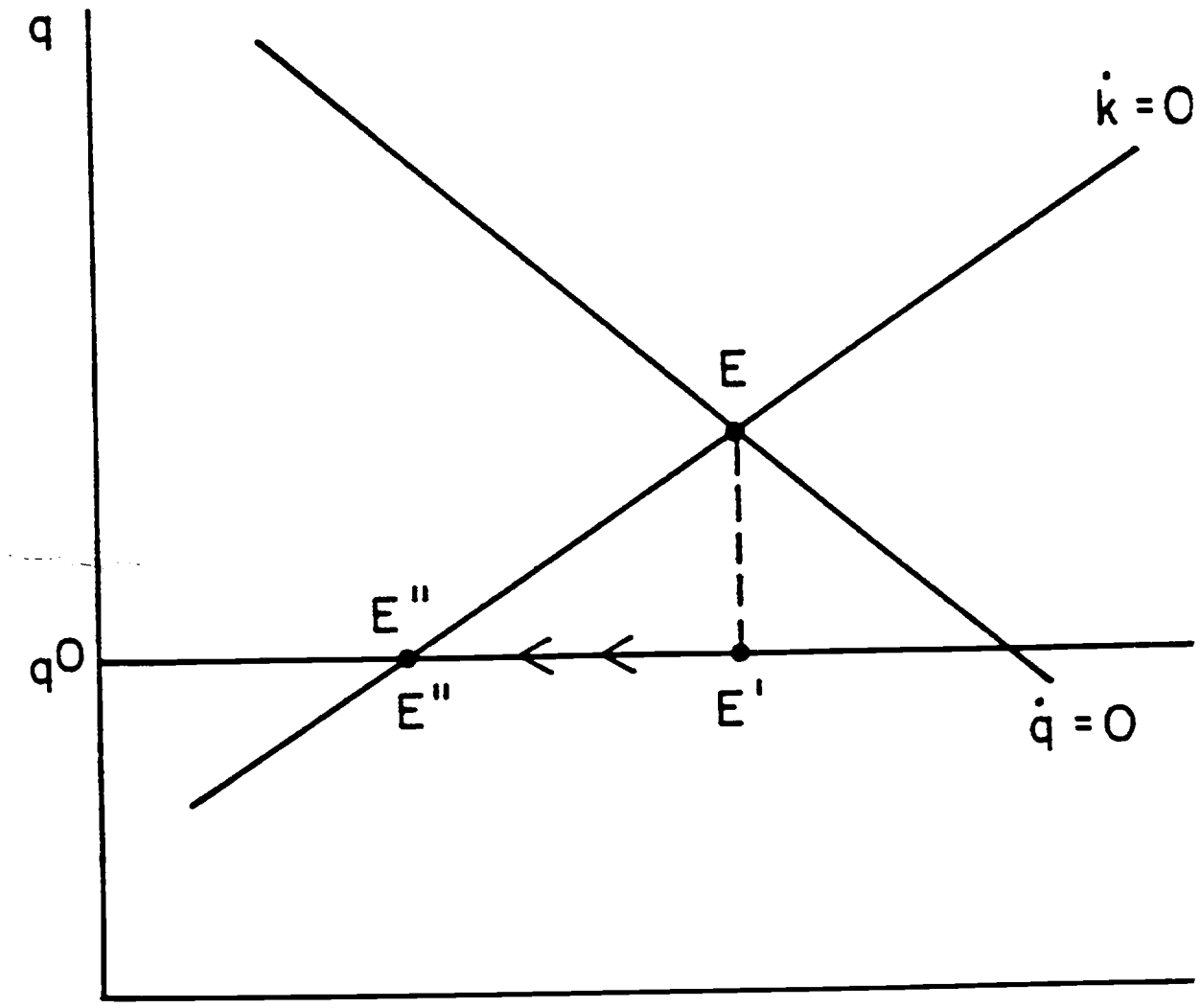

q
k
$\dot{k} = 0$
$\dot{q} = 0$
$\dot{q}' = 0$
J
J'
E
E'
E''
J'
J

FIGURE 8


THE MEXICAN–US REAL EXCHANGE RATE
(INDEX 1980=100, CPI–BASED)
120
110
100
90
80
70
60
50
51
53
55
57
59
61
63
65
67
69
71
73
75
77
79
81
83
85
87
89


q
$\dot{k} = 0$
E
E''
q_0
E''
E'
$\dot{q} = 0$