



OECD Economics Department Working Papers No. 83

Exchange Rate Policy
in Advanced Commodity-
Exporting Countries: The
Case of Australia and New
Zealand

**Adrian Blundell-Wignall,
Robert G. Gregory**

<https://dx.doi.org/10.1787/566103428800>

OECD
DEPARTMENT
OF ECONOMICS AND STATISTICS

WORKING PAPERS

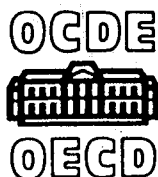
No. 83 EXCHANGE RATE POLICY IN ADVANCED COMMODITY-EXPORTING
COUNTRIES: THE CASE OF AUSTRALIA AND NEW ZEALAND

by

Adrian Blundell-Wignall
Robert G. Gregory

Monetary and Fiscal Policy Division
Australian National University

July 1990



ECONOMICS AND STATISTICS DEPARTMENT

WORKING PAPERS

This series of Working Papers is designed to make available, to a wider readership, selected studies which the Department has prepared for use within OECD. Authorship is generally collective, but main individual authors are named. The Papers are generally available in their original language, English or French, with a summary in the other.

Comment on the Papers is invited, and may be sent to OECD, Department of Economics and Statistics, 2 rue André Pascal, 75775 Paris Cedex 16, France. Additional copies of the Papers on a limited basis can be forwarded on request.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Copyright OECD 1990

The paper examines the desirability of exchange rate management in a commodity-exporting country, in which the terms of trade are driven by the world commodity price cycle. When the authorities are assumed to pursue an inflation objective, the usefulness of managing the rate depends on the relative importance of monetary versus terms of trade shocks. Empirical evidence suggests that floating rate regimes will normally be preferred for countries like Australia and New Zealand, although circumstances can be envisaged in which either leaning-against-the-wind or leaning-with-the-wind policies are required. A review of experience since the Korean War boom suggests that attempts to fix the exchange rate in the face of the commodity cycle are likely to be associated with inflation problems, while labour market asymmetries can lead to resource misallocation and to pressures for the protection of the non-commodity traded goods sector.

Ce papier examine si la gestion du taux de change est désirable pour un pays exportateur de produits de base, dans lequel les termes de l'échange sont commandés par le cycle du prix mondial de ces produits. Si les autorités poursuivent un objectif d'inflation, l'intérêt de gérer le taux de change dépend de l'importance relative des chocs monétaires comparée aux chocs commerciaux. L'analyse suggère qu'un régime de changes flottants sera normalement préféré pour des pays comme l'Australie ou la Nouvelle-Zélande, encore que des circonstances peuvent être envisagées dans lesquelles une politique de taux de change devient nécessaire. L'expérience de la période d'expansion de la guerre de Corée suggère que les tentatives de fixer le taux de change face au cycle des produits de base seront vraisemblablement accompagnées de problèmes inflationnistes, tandis que les assymétries du marché du travail peuvent conduire à une mauvaise allocation des ressources et à des pressions pour protéger le secteur manufacturier et les services.

EXCHANGE RATE POLICY IN ADVANCED COMMODITY-EXPORTING COUNTRIES:
THE CASE OF AUSTRALIA AND NEW ZEALAND

by

Adrian Blundell-Wignall
Robert G. Gregory

The authors, respectively, principal administrator OECD Monetary and Fiscal Policy Division and Professor of Economics at the Australian National University, are grateful to Paul Masson, Steve Grenville, Ian MacFarlane, David Gruen, Paolo Manasse, and Val Koromzay for helpful comments, and to Janice Callaghan-Owens for statistical assistance. The views expressed in this paper are those of the authors and do not necessarily reflect those of their respective employers.

This paper was initially prepared for a conference (sponsored by the International Monetary Fund, MacQuarie University and the Katholieke Universiteit Leuven) in Brussels on 12-14 October 1989, entitled "Exchange Rate Policies in Selected Industrial Economies". This will eventually be published in a volume entitled "Choosing an Exchange Rate Regime: The Challenge for Smaller Industrial Countries".

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	5
II. EXCHANGE RATE FLUCTUATIONS AND MONETARY POLICY	5
A. A brief historical perspective.	5
B. Issues concerning the choice of exchange rate regime.	6
C. Disturbances in a commodity-exporting economy.	8
D. Exchange rate policy in response to disturbances.	12
E. Floating or pegging for Australia and New Zealand?	14
F. Resource allocation versus inflation?	18
III. VOLATILITY ISSUES AND SHORT-RUN EXCHANGE RATE MANAGEMENT	19
IV. AUSTRALIAN AND NEW ZEALAND EXPERIENCES OF TERMS OF TRADE CHANGES	21
V. CONCLUDING REMARKS	24
NOTES	26
TABLES AND CHARTS	28
REFERENCES	42

I. INTRODUCTION

Exchange rate policy in Australia and New Zealand in the 1970s and 1980s was characterised by extremes. During the 1970s and the first half of the 1980s, both countries operated pegged or managed exchange rate regimes while major countries moved to floating rates (see Table 1). They were in good company, in that a numerical majority of relatively small countries (and some large ones) continued to fix or manage their exchange rates. However, in the mid-1980s both moved to freely floating exchange rates (Australia in December 1983 and New Zealand in March 1985). This move occurred shortly before the larger countries began placing greater emphasis on exchange rate stabilisation through policy co-ordination. This paper reviews the experiences of Australia and New Zealand within the context of the international literature on exchange rates and policy.

Two quite different sets of exchange rate policy issues may be distinguished:

- 1) the extent to which the exchange rate should influence the broad settings of monetary policy; and
- 2) the role of day-to-day intervention in the foreign exchange market. Authorities can choose the extent to which these transactions affect domestic monetary conditions through open market operations (that is, the extent to which short-run intervention is sterilised).

The first of these relates to the broad issue of the choice of exchange rate regime (floating or "light" management, as opposed to pegging or "heavy" management). The second relates to strategies for countering excessive volatility and "disorderly" markets. This can be of a very short-term nature involving the central bank giving "tone" and "breadth" to the market. At times the market may be subject to occasional periods of "thinness" -- characterised by few active traders -- leading to erratic swings in the exchange rate as the random arrival of new orders meets little demand. An occasional role for more substantial intervention policies might also arise when markets lack direction and where inefficiencies result in "bubbles" or bandwagon behaviour.

The structure of the paper reflects these broad distinctions. Section II examines fluctuations of exchange rates and the weight that should be attached to these in the broad formulation of monetary policy. Section III examines short-run volatility and the role of intervention in countering disorderly markets. In Section IV, we review some historical episodes concerning exchange rate policy in Australia and New Zealand. Finally, in Section V, we offer some concluding remarks.

II. EXCHANGE RATE FLUCTUATIONS AND MONETARY POLICY

A. A brief historical perspective

Trends in the real and nominal exchange rates of Australia and New Zealand are shown in Chart 1 for March 1970 to December 1988. Two alternative definitions of the real exchange rate are employed, one based on the consumer price index and the other on relative unit labour costs. Each measure is

broken down into its component parts: the nominal exchange rate, and the ratio of the two price indices.

Mussa (1986) pointed out that movements in relative goods prices between most countries is typically smooth, and that short-run variability in the real exchange rate mainly reflects movements in the nominal rate. This pattern is also reflected in the data for Australia and New Zealand, both before and after the floating of exchange rates. In both periods, the variance of the real exchange rate and the nominal rate exceeds that for relative price levels. This is true regardless of whether the consumer price index or unit labour cost definition is used. The trend decline in the ratio of foreign to domestic prices in both countries reflects relatively higher inflation in Australia and New Zealand during most of the period.

The period of generalised floating within the OECD area as a whole, from early 1973 on, was associated with wider fluctuations in nominal and real exchange rates than had been expected by the early advocates of floating (Shafer and Loopesko, 1983). Attempts to manage Australian and New Zealand exchange rates in a more volatile world environment met with only limited success. For both countries, the nominal and real exchange rate has been subject to pronounced and sustained movements that, in broad terms, do not appear consistent with purchasing power parity (PPP). It is also noteworthy that some of the largest exchange rate swings in the two countries are quite similar:

- . Both Australia and New Zealand's nominal and real exchange rates were revalued in the early 1970s, particularly 1972-73, at a time when both countries pegged rates against a single currency.
- . Subsequently, both countries managed to stabilise some definition of the nominal or real exchange rate until the early 1980s. In Australia this was the bilateral real rate against the U.S. dollar. This stability partly reflected the formal arrangement of a crawling peg against the dollar. But it is particularly notable that the real effective exchange rate was not stabilised. This implied sharp movements in Australia's bilateral exchange rates against other major trading partners: in particular, Japan and Europe. New Zealand, on the other hand, stabilised its effective exchange rate. To the extent that exchange rates were adjusted to offset inflation differentials, it appears to have been with consumer price movements in mind. Greater loss of competitiveness on the unit labour cost definition of the real exchange rate in the late 1970s or early 1980s was apparent in both countries.
- . Exchange rates have nevertheless been more volatile -- quarter to quarter -- since the floating of rates in both countries (see Table 1). Real exchange rates fell sharply in the mid-1980s and rose markedly from the second half of 1986 on.

B. Issues concerning the choice of exchange rate regime

Two strands of thought can be distinguished in the literature on choice of an optimal exchange rate regime: one based on the economic characteristics of countries; and one based on the nature of the stochastic shocks faced by different economies.

The first of these is associated with the theory of optimum currency areas and is related to whether fixed or floating rates generate the most efficient allocation of resources. Countries will typically choose to float their exchange rates if they have a large gross domestic product (GDP); a low degree of openness (share of traded goods in GDP); a high inflation differential with other countries; a high degree of integration in international capital markets; and substantial diversification in traded goods (Heller, 1978; and Holden, Holden, and Suss, 1979).

This literature is not particularly useful for considering the optimal exchange rate regime for Australia and New Zealand. While New Zealand may well possess many of the characteristics suited to an optimal currency area arrangement with Australia (1), the situation is unclear for either country vis-à-vis the rest of the world. Having a small GDP, an average degree of openness, and concentration of trade in commodities constitutes a weak case, according to standard resource allocation arguments, for a free float. On the other hand, inflation performance and a high degree of integration in world capital markets do argue for greater flexibility in Australia and New Zealand (2).

However, Australia and New Zealand differ from most other countries in the Organisation for Economic Co-operation and Development (OECD) in their heavy concentration in commodity trade. This has more in common with the structure of a number of non-OECD developing countries. Studies of exchange rate regimes for these countries -- for example, by Dreyer (1978) -- reverse the finding on trade diversification: higher concentration makes it more likely for the country to float its exchange rate. While foreign price disturbances will influence the exchange rate and affect the allocation of resources between tradeable and non-tradeable industries in a presumably "costly" manner (3), there may be macroeconomic inflation considerations that argue against pegging the exchange rate. If macroeconomic considerations do go in the opposite direction -- and if they carry a greater weight with policymakers -- it would not be surprising to find periods in which commodity-exporting countries favoured a greater degree of flexibility of rates regardless of the resource allocation costs.

This brings us to the second strand of the literature: the nature of stochastic disturbances in open-economy macro models. This literature is diverse, with much of it being motivated by the important contribution of Poole (1970) (4). When looked at in the context of the optimal degree of exchange rate management in open economies, however, there are some contrasts in the literature. Boyer (1978) showed that in a model with only traded goods and money:

- . the use of monetary policy to fix the exchange rate is optimal for stabilising output if shocks arise in the money market;
- . the use of fiscal policy is more optimal for output stabilisation if shocks arise only in the goods market; and
- . it will always be optimal to follow a managed float if the economy is subject to both goods and money market shocks.

Frenkel and Aizenman (1982) examine this issue in a model based on the monetarist approach to the exchange rate, which assumes that PPP holds. In their model, the objective is to stabilise the discrepancy between consumption and expected income. They find that the desirability of exchange rate flexibility increases the larger the variances of shocks to the demand for, or supply of, money relative to foreign prices and to PPPs. Frenkel and Aizenman extend this analysis to distinguish an economy that produces traded and nontraded goods, and that is a price-taker in the world market for traded goods. They show that the desirability of exchange rate flexibility diminishes the higher the relative share of nontraded goods in the economy, and the lower the elasticities of demand and supply for the two goods. Lower relative price elasticities imply higher internal price adjustment to return the economy to PPP which, in turn, requires less exchange rate flexibility.

None of these papers, however, deals precisely with an economy that has broad characteristics matching those of Australia and New Zealand:

- . both are commodity-exporting countries (the share of commodities in exports for both countries was about 70 per cent in the late 1980s), and import mainly manufactured goods;
- . both are mainly price-takers on world markets (with the exception of wool in the case of Australia), and hence may be subject to external terms of trade changes between importables and exportables; and
- . neither economy is subject to high price flexibility in the nontraded sector. Neither Boyer nor Frenkel and Aizenman assume sticky price adjustment, for example.

Nor have the above papers dealt explicitly with monetary policy and exchange rate management where the authorities' objective is to stabilise inflation. The issue of optimal exchange rate management in an economy with these characteristics is dealt with in the following section.

C. Disturbances in a commodity-exporting economy

The basic features of a small commodity-exporting country are captured in the following model:

Small-Country Commodity-Exporting Model

Supply

$$y_x = \eta(e + \bar{p}_x - p_n) + \bar{y} \quad [1]$$

$$\bar{Y} = Y_x + Y_n \quad [2]$$

Demand

$$d = (p + \bar{y} - p_d) - \beta R \quad [3]$$

$$d_n = \alpha(e + \bar{p}_m - p_n) + d \quad [4]$$

$$D_m = D - D_n \quad [5]$$

Prices

$$p = \lambda p_n + (1-\lambda)(e + \bar{p}_x) \quad [6]$$

$$p_d = \lambda p_n + (1-\lambda)(e + \bar{p}_m) \quad [7]$$

$$\dot{p}_n = \phi(d_n - y_n) + \dot{p}_n^e, \quad \dot{p}_n^e = \pi \quad [8]$$

Asset markets

$$m - p_d = \gamma(p + y - p_d) - \epsilon R + \bar{m}_0 \quad [9]$$

$$R = \bar{R}^* + \dot{e}^e \quad [10]$$

$$\dot{s}^e = \theta(\hat{s} - s), \quad s \equiv e + p_m - p_n, \quad \dot{s}^e \equiv \dot{e}^e + \dot{p}_m^e - \dot{p}_n^e \quad [11]$$

Reaction function

$$m = m_0 + \pi t + \delta(e_0 - e) \quad [12]$$

Notation

Y_x = the supply of exports

Y_n = supply of nontraded goods

Y = total output

D_n = nontraded goods demand

D = total demand

D_m = import demand

P = the goods price

P_d = the demand deflator

P_n = the price of nontraded goods

P_x = export prices

P_m = import prices in foreign currency (assumed to be always equal to unity in subsequent analysis)

E = the exchange rate (domestic currency per unit of foreign currency)

M = money

R = the interest rate

R^* = the foreign interest rate

π = the constant rate of growth of the money supply (which is assumed to determine inflation expectations exogenously, as underlying or core inflation)

E_0 = a constant nominal exchange rate target

M_0 = a constant term

Lower case letters denote natural logarithms (except for time t)

All parameters are positive

A bar denotes an exogenous variable

A hat denotes an equilibrium value

Constant terms other than those to be used in subsequent analysis (for example, in linearising equation 2 in logarithms) are ignored.

Equations [1] and [2] define the supply of exports and nontraded goods in terms of relative prices. The domestic economy produces one good which is sold on world markets at a fixed price and in the domestic market at a monopoly price. Equation [3] explains overall demand in terms of disposable income and interest rates, while equations [4] and [5] explain the split between nontraded goods demand and import demand in terms of relative prices. Equations [6] and [7] define output and demand prices, where λ is the equilibrium share of nontraded goods in output. Equation [8] explains nontraded goods prices in terms of excess demand. Equations [9], [10], and [11] are standard equations for money demand, asset market equilibrium and real exchange rate expectations. Finally, equation [12] represents the authorities money supply reaction function. If the intervention parameter δ is set at zero, the money supply grows at the constant rate π . As δ approaches infinity, the exchange rate is set at E_0 .

The small commodity-exporting model has an important feature with respect to the relationship between the real exchange rate (defined in terms of the import price index) and the price of nontraded goods. For simplicity we assume initially that $\beta=0$ and that the real exchange rate is normalised by setting $P_m=1$. The assumption that $\beta=0$ is motivated by two considerations: 1) that we are more interested in the international aspects of the analysis, with a primary focus on relative prices and the role of the exchange rate in the transmission of monetary policy; and 2) that recent experience suggests that it may not be a highly unrealistic assumption for economies with deregulated and competitive financial systems, such as Australia and New Zealand (5). The normalisation of import prices to unity implies that terms of trade changes will be equated with export price movements in subsequent analysis -- a realistic feature in light of the more volatile commodity price cycle that drives the latter. The relationship between the terms of trade and the real exchange rate can be seen by considering the steady state of the model, where real money balances and the real exchange rate are constant, domestic inflation grows at the rate π , and the exchange rate depreciates at the rate π (foreign inflation is zero since $P_m=1$).

From equation [8], we see that the steady state requires the goods market to clear ($d_n=y_n$). Substituting equations [1], [2], [3], [4], [6], and [7] into equation [8] and setting domestic inflation equal to π , the equilibrium real exchange rate is given by (6):

$$\hat{s} = \frac{(1-\lambda)(\lambda+\eta)}{\alpha\lambda+(1-\lambda)\eta} \cdot P_x \quad [13]$$

That is, the equilibrium real exchange rate is determined by the terms of trade, given the elasticities of demand and supply for importables and exportables and the share of nontraded goods in the economy (7). If the terms of trade strengthen, the equilibrium value of the real exchange rate must appreciate (competitiveness $s=e-p_n$ falls) and *vice versa*. This, in turn, will have implications for the nominal exchange rate, the supply and demand for nontraded goods, and the domestic rate of inflation, depending on various parameters and speeds of adjustment in the model (8). This result motivates much of the discussion in Section II.

So far the discussion has been in terms of the properties of the deterministic version of the commodity-exporting country model. Two further steps are necessary to explore exchange rate policy in the context of the stochastic shocks literature: 1) the introduction of relevant stochastic shocks into the model's equations; and 2) the specification of an objective for the authorities, who use exchange rate management to minimise the loss function derived from deviations from this objective.

For illustrative purposes the economy is assumed to be subject to stochastic shocks from two sources: changes in the exogenous terms of trade and shifts in the money demand function. The constant term in the money demand equation is assumed to adjust according to:

$$m_0 = \bar{m}_0 + u_1 \quad u_1 \sim N(0, \sigma_1^2) \quad [14]$$

The terms of trade is assumed to adjust according to:

$$p_x = \bar{p}_x + u_2 \quad u_2 \sim N(0, \sigma_2^2) \quad [15]$$

We assume the authorities' objective is to ensure that domestic inflation is in line with their inflation target π , the "normal" rate of monetary growth in the reaction function equation [12]. In this sense, it is the objective function of a central bank charged with containing inflation at some predetermined core rate. The loss function is assumed to be given by (9):

$$L = (\dot{p}_n - \pi)^2 \quad [16]$$

The problem for the authorities can be viewed from the perspective of the base case of the economy moving along a steady-state path, but occasionally being subject to stochastic shocks.

The solution for the divergence of inflation from the target rate π for the two stochastic disturbances to the steady state is (10):

$$\dot{p}_n - \pi = \left[\Lambda_1 - \frac{\Lambda_2}{\psi} \right] u_2 - \frac{\Lambda_3}{\psi} u_1, \quad [17]$$

where

$$\Lambda_1 = \frac{\phi(\lambda + \eta)(1 - \lambda)}{\lambda}$$

$$\Lambda_2 = \frac{\phi[\epsilon\theta(\lambda + \eta) + (\alpha\lambda + (1 - \lambda)\eta)\gamma](1 - \lambda)}{\lambda}$$

$$\Lambda_3 = \frac{\phi[\alpha\lambda + (1 - \lambda)\eta]}{\lambda}$$

$$\psi = \epsilon\theta + (1-\lambda) + \delta.$$

Notice that the value of ψ depends positively on the value of the intervention parameter δ , the degree to which the authorities attempt to achieve their exchange rate objective. The expected value of the loss function (equation [16]) using expression [17] is then:

$$E(L) = \frac{(\Lambda_1\psi - \Lambda_2)^2 \sigma_2^2 + \Lambda_3^2 \sigma_1^2 - 2\Lambda_3(\Lambda_1\psi - \Lambda_2)\rho\sigma_1\sigma_2}{\psi^2}, \quad [18]$$

where ρ is the correlation coefficient between the shocks, denoted by $\sigma_{12}/(\sigma_1\sigma_2)$, and where σ_{12} is the covariance between the shocks. Differentiating expression [18] and setting it equal to zero, we find the optimal value of the intervention term:

$$\psi^* = \frac{\Lambda_2^2 + \Lambda_3^2 \sigma_1^2 / \sigma_2^2 + 2\Lambda_3\Lambda_2\rho\sigma_1/\sigma_2}{\Lambda_1\Lambda_2 + \Lambda_3\Lambda_1\rho\sigma_1/\sigma_2} \quad [19]$$

If the exogenous shocks are independent $\rho=0$, the optimal value of the intervention reduces to

$$\psi^* = \frac{\Lambda_2^2 + \Lambda_3^2 \sigma_1^2 / \sigma_2^2}{\Lambda_1\Lambda_2} \quad [20]$$

Equations [18-20] contain a number of interesting results, the intuitive content of which is worth pursuing further.

D. Exchange rate policy in response to disturbances

The results are easiest to interpret for the case of zero covariance between the shocks ($\rho=0$, that is, equation [20]). It is also important to bear in mind that we are considering the limiting case of a competitive, financially deregulated economy, where the exchange rate is the main transmission mechanism of monetary policy ($\beta=0$). The implications of relaxing this assumption will be touched upon later.

The value of ψ^* varies positively with the ratio of the variance of money demand shocks to the variance of terms of trade shocks. Changes in the stance of monetary policy aimed at stabilising the exchange rate should be stronger when money demand shocks are relatively more important. In the limit, as the variance of terms of trade shocks approach zero, ψ^* approaches infinity, as does the intervention parameter δ , so that fixed rates would be the optimal

exchange rate policy to avoid inflation disturbances. If foreign interest rate shocks are included in the analysis, they would be equivalent to money demand shocks because of the assumption of zero interest elasticity of expenditure in the domestic economy. In this case the impact of the foreign interest rate change on the exchange rate may be offset by altering the stance of domestic monetary policy. Since the exchange rate is the only transmission mechanism of monetary policy, there would be no impact on domestic inflation.

Where the variance of terms-of-trade shocks are relatively more important, the value of ψ^* declines. But it is interesting to note that in the limiting case where the variance of money demand shocks approaches zero, the value of ψ^* remains positive (Λ_2/Λ_1). This may be consistent with zero intervention in the face of terms-of-trade shocks ($\delta=0$), leaning against the wind ($\delta>0$), or what we might call leaning with the wind ($\delta<0$).

To understand this range of possibilities, it is worth exploring how a terms-of-trade shock would lead to an inflation disturbance, and what the optimal policy response might be. Consider the case of a terms-of-trade increase. There are three fundamental mechanisms through which the impact on domestic inflation arises: 1) the direct income effect of the terms-of-trade rise (increase in the purchasing power of domestic income), which increases with the relative size of the traded goods sector ($1-\lambda$); 2) the substitution effect in domestic supply, as more goods are sold on the foreign market and less on the domestic market; and 3) the substitution effect of domestic demand toward imported goods, a potentially offsetting influence that derives from the exchange rate appreciation induced by the shift in the terms of trade, (which also moderates the substitution effect in supply discussed above).

The first two effects are inflationary. The induced appreciation of the exchange rate is deflationary. Indeed, for countries where terms-of-trade shocks are relatively more important, it is this latter mechanism that is at the crux of preferring a floating rate to a pegged exchange rate. A pegged rate would leave the first two effects dominating -- a situation that has posed problems historically for both Australia and New Zealand (see below). If the inflation impact is offset exactly by the deflationary impact of the rising exchange rate, no intervention would be needed to maintain the inflation target (the case of $\delta=0$). However, this would be something of a coincidence. Even if terms-of-trade effects are dominant, it will normally be optimal to manage the exchange rate, at least to some extent, if the monetary authority has an inflation target.

In the case where the inflation impact of the terms of trade is large and the induced appreciation of the exchange rate small, it may pay to lean with the wind: to drive the exchange rate higher than would be the case under pure floating to offset the inflationary effect of the terms of trade (enforced overshooting). The inflationary impact of the terms of trade will be greatest when (11):

- . the share of traded goods in GDP ($1-\lambda$) is high, implying a higher direct income effect and a higher relative importance of the substitution effect in supply, both of which act to increase the demand for and reduce the supply of nontraded goods;
- . the elasticity of substitution in supply η is high, which increases the extent to which the supply of nontraded goods declines; and

the substitution effect in demand (α) induced by any tendency for the exchange rate to appreciate is small.

The appreciation of the exchange rate will be smaller the lower the impact on interest rates of the initial rise in income, that is, the lower the income elasticity of money demand (γ).

Conversely, where the inflation impact of the terms of trade rise is small and the induced overshooting of the exchange rate is large, it would pay to lean against the wind to avoid disturbances to the inflation objective in the downward direction (an unnecessary decline in activity).

If the assumption that $\beta=0$ is relaxed, so that interest rate changes affect private demand directly, the exchange rate is no longer the sole transmission mechanism of monetary policy. We do not focus on this case because complexity diminishes the transparency of the results, and our analysis seeks to show how the parameters of monetary policy might look if the exchange rate were becoming the more dominant transmission mechanism. Nonetheless, the thrust of our earlier results would change in the following ways:

- . The optimal degree of intervention would still depend on the relative importance of terms-of-trade and money demand shocks.
- . Where money demand shocks are dominant, it is not clear that a fixed exchange rate would ever be optimal for achieving an inflation target. This is because the interest rate level necessary to fix the exchange rate in response to a money demand shock would have its own direct impact on the excess demand for nontraded goods in the short term, which may be inconsistent with the inflation target.
- . Similarly, fixing the exchange rate in response to foreign interest rate shocks would no longer avoid inflation disturbances. Higher or lower domestic interest rates necessary to achieve the fixed exchange rate would again have their own impact on domestic demand.
- . Where terms-of-trade shocks are dominant, leaning with or against the wind may still be optimal, but the extent of this intervention would be less than in the case where $\beta=0$.

E. Floating or pegging for Australia and New Zealand?

In this section we explore empirically the broad question of whether, in the cases of Australia and New Zealand, a floating exchange rate (including policies of leaning with or against the wind) is likely to be more appropriate than policies of pegging or heavy exchange rate management. We proceed on the assumption that the stochastic shocks literature is relevant and follow up the earlier theoretical discussion, which suggests that the issue depends on the relative importance of the variance of monetary versus terms-of-trade shocks. We then return to the question of resource allocation criteria for an exchange rate regime.

The optimal approach to exchange rate policy is always likely to be a managed float, where the source of shocks is identified and the optimal degree

of intervention determined according to known trade and other behavioural elasticities. Unfortunately, the actual behaviour of the real exchange rate is more akin to that of a random walk:

$$s(t) = \mu + a.s(t-1) + u(t), \quad H_0: a=1, \quad [21]$$

where $S(t)$ is the real exchange rate in period t , and $u(t)$ an independent and identically distributed error term at time t . If the error term were composed of monetary shocks $u_1(t)$, terms-of-trade shocks $u_2(t)$, as well as other possibilities, the initial problem for the authorities is one of signal extraction. The second task is to determine the optimal degree of intervention (or resistance) to exchange rate movements, given the information about the shocks and the behavioural parameters of the economy.

Neither of these steps is particularly easy in practice, particularly when policy (of necessity) must be conducted on a day-to-day basis. It is important in these circumstances to have a view on the basic nature of real exchange rate dynamics in order to formulate an overall approach to policy: free floating, or leaning with or against the wind, and opposed to heavy management or pegging. Deviations from the basic regime can then be made if signal extraction problems can be solved.

The basis of the theoretical result in the earlier section was that terms-of-trade shifts induced by the commodity price cycle change the equilibrium real exchange rate, whereas monetary shocks do not. Fixing the nominal exchange rate in the face of a commodity price shock leads to prolonged adjustment through (sticky) domestic inflation, which is necessary to ensure that the real exchange moves toward its new equilibrium level. Permitting the exchange rate to float freely in the face of a domestic monetary shock causes a deviation of the real exchange rate from its existing equilibrium (say, purchasing power parity) level. This leads to inflation as a part of the process of reversion to PPP. In choosing a broad exchange rate regime with an inflation objective in mind, it is important to know the likely relative importance of these different types of effects. Is the equilibrium real exchange rate subject to important changes because of the variance of commodity prices, or is the assumption of a constant equilibrium real exchange rate a reasonable guide for policy in practice?

We investigate this issue by testing two simple alternative hypotheses about exchange rate dynamics against the null hypothesis that the real exchange rate follows a random walk, as in equation [21]:

Hypothesis 1: that deviations from PPP are cumulative and there is a tendency toward reversion to a constant equilibrium level.

Hypothesis 2: that the real exchange rate reverts to a moving equilibrium determined by the terms of trade (12).

These hypotheses can be tested with procedures suggested by Engle and Granger (1987). The first is a test of the null hypothesis of no co-integration against the alternative that domestic prices, foreign prices, and the nominal exchange rate are co-integrated. We first pretest to ensure that all the components of the real exchange rate possess a unit root. We then impose the theoretical restrictions suggested by PPP on the co-integrating

vector for these three variables -- hence defining the real exchange rate -- and test the null hypothesis that it possesses a unit root. The augmented Dickey-Fuller (ADF) unit root statistic is employed to test this null hypothesis. Since $u(t)$ can be driven by an ARMA (p,q) process, one estimates:

$$\Delta s(t) = \mu + a.s(t-1) + \sum_{i=1}^n \beta_i \Delta s(t-i) + \nu(t) , \quad [22]$$

where $\nu(t)$ is iid(0, σ^2) and tests the null hypotheses that $a=0$ using critical values reported in Fuller (1976, Table 8.5.2).

Results for tests of the first hypothesis are shown in the first column of Tables 2 and 3, using quarterly data for both Australia and New Zealand. Four lagged innovations are chosen for the results shown in the table, although lags between 1 and 12 were also tested. The rejection region for a one-tailed test of a unit root at the 5 per cent level -- where a constant term is included in the regression -- is given by smaller (more negative) values than -2.9 for most sample periods shown in the tables, and -3.0 for the shorter post-float sample period for Australia. In none of the cases is the t-statistic smaller than the critical value. The results for the ADF statistic suggest that the logarithm of the real effective exchange rate can be characterised as an integrated process of order one. Over both managed and floating exchange rate regimes, the data do not appear to display any tendency for the real exchange rate to revert to a constant PPP equilibrium level in either Australia or New Zealand.

The second hypothesis is a test of the null hypothesis of no co-integration against the alternative that the real exchange rate and the terms of trade are co-integrated or, equivalently, are subject to an error correction process. A simple approximate method is the co-integrating regression Durbin-Watson test (CRDW), shown in the second column of Tables 2 and 3. The co-integrating regression of the real exchange rate and the terms of trade is:

$$s(t) = \mu + c.x(t) + \epsilon(t) , \quad [23]$$

where $x(t)$ is the logarithm of the quarterly terms of trade. If the Durbin-Watson statistic exceeds 0.386 the null hypothesis (of non-co-integration) is rejected in favour of finding co-integration at the 5 per cent level, while the critical value is 0.322 at the 10 per cent level (see Engle and Granger, 1987). For the full sample period using quarterly Australian data, co-integration is almost accepted at the 10 per cent level. For the pre-float and post-float sample periods, co-integration appears to be accepted at the 10 per cent level. In the case of New Zealand, the CRDW test finds co-integration in all cases at the 5 per cent level.

However, given the low power of the CRDW test for a unit root against a highly autoregressive alternative, a related approach is to estimate an error correction mechanism in the dynamic model: error correction and cointegration being broadly equivalent concepts. To establish that the joint distribution of the real exchange rate s and the terms of trade x is an error-correction system, three models were estimated.

First, we estimated an unrestricted vector autoregression (VAR) of the change in the logarithm of the real exchange rate on lags of the dependent variable and changes in the logarithm of the terms of trade, as well as the lagged levels of the real exchange rate and the terms of trade. Results for this model are shown in the third columns of Tables 2 and 3. Four lagged innovations are tested for both Australia and New Zealand (the results not being sensitive to the inclusion of more lags). It is remarkable that the lagged levels of the terms of trade and the real exchange rate were all of the appropriate signs and sizes for an error correction term for both Australia and New Zealand. Individual parameters were significant at the 5 per cent level for both countries.

The second model imposes the error correction restriction (the lagged level of the residual from the co-integrating regression, EC in Tables 2 and 3) and includes all lagged innovations and the constant term (13). These results are shown in the fourth columns of Tables 2 and 3. The third (and final) model includes the error correction term and only those lagged changes that are significant in the second model, while the insignificant constant terms are excluded. These results are shown in the final column of Tables 2 and 3. Once a satisfactory representation of the data generation process has been found in this way, the error correction term can be satisfactorily estimated for both Australia and New Zealand in all cases. If the real exchange rate and the terms of trade were not co-integrated, these estimated coefficients would tend rapidly toward zero. In fact, the error correction term is of the appropriate sign and is significant at the 1 per cent level for both Australia and New Zealand (14).

Support for the error correction model over both fixed- and floating-rate periods demonstrates the fundamental importance of the long-run equilibrium relationship between the terms of trade and the real exchange rate in both Australia and New Zealand. Blundell-Wignall and Thomas (1987) suggest that the exchange rate regime may also matter in the strength of the terms-of-trade effect. This earlier preliminary result was also confirmed with the more general approach adopted here. In the case of Australia, the size of the estimated error correction coefficient virtually doubles in the post-float period.

In summary, there appears to be firm evidence in favour of accepting the null hypothesis of no co-integration, when the alternative hypotheses is PPP (real exchange rate reversion to a constant equilibrium level). However, the null hypothesis of no co-integration is rejected once the terms of trade is included. Indeed, it proved possible to estimate a robust error correction model of the real exchange rate in relation to its long-run equilibrium level dominated by the terms of trade. The evidence is not consistent with the characterisation that monetary shocks (nominal shocks that leave the equilibrium real exchange rates unchanged) are relatively more important than commodity price shocks (real shocks that shift the equilibrium real exchange rate) in generating real exchange rate dynamics in both Australia and New Zealand. In these circumstances, it is difficult to envisage how a pegged exchange rate could ever have been optimal for either Australia or New Zealand. Since there is evidence that adjustment toward the (moving) terms-of-trade-determined equilibrium may be faster under floating rates, this view carries even more force in the late 1980s and beyond.

Chart 2 compares the real exchange rate series for both countries with the terms of trade from the beginning of the 1970s. In the early 1970s, during the fixed-exchange-rate period, there was a strong rise in both the terms of trade and the real exchange rate in Australia and New Zealand. While the exchange rate was revalued in Australia, this action was delayed and relatively small, so that much of the adjustment occurred via inflation. In the case of New Zealand there was little nominal exchange rate response. This period was associated with strong activity and inflation pressure that exceeded that in the rest of the OECD area (see below).

Over the floating-rate period the real exchange rate has been permitted to move more in line with the terms of trade (Chart 2) and, from month to month, with commodity price developments (Chart 3). This is particularly clear in the case of Australia, where commodity prices fell sharply in 1985 and recovered strongly after 1986. The real exchange rate moved in a parallel fashion. In the case of New Zealand the terms of trade and commodity prices declined from 1983 to early 1986, recovered in 1987, and weakened again in late 1988 and early 1989. The real exchange rate again evinces a broadly similar profile. If the authorities have an inflation objective and maintain a broadly floating exchange rate, these fluctuations should be an integral part of the adjustment to goods market equilibrium. Within this environment a commodity-exporting country reduces the risk of compromising the inflation objective, in contrast to a policy of pegging or heavily managing the exchange rate. Inflation risks that arise through domestic monetary shocks can, if signal extraction permits, be reduced by giving exchange rate objectives greater weight when monetary shocks are identified.

Much greater inflation risks arise when resource allocation (real) policy goals become confused with inflation (nominal) policy objectives. This problem is discussed in the following section.

F. Resource allocation versus inflation?

In Section II, we noted that the choice of exchange rate regime could be considered in terms of optimum currency area considerations; these depend on the structural characteristics of countries, as opposed to the nature of stochastic shocks, which has been the main focus of this paper. Fundamentally different policy objectives underlie these alternative approaches: resource allocation goals versus such macro objectives as inflation. The potential for conflict between these objectives is particularly important for commodity-exporting countries. This is because swings in commodity prices drive the real exchange rate to ensure that goods market equilibrium prevails -- but this equilibrating process works through the reallocation of resources between the commodity-exporting and noncommodity sectors.

Consider the case of strong demand in the OECD area together with rising world commodity prices. The exchange rate in the small commodity-exporting country is driven upward to ensure that goods market equilibrium prevails. The income performance of the commodity sector is buffered, since even though the exchange rate is higher, so is the foreign price of exports. The noncommodity sector however is greatly disadvantaged by the rise in the exchange rate. The import-competing sector loses market share, as does the noncommodity export sector. If exchange rate appreciation is severe enough and prolonged, firms

may go out of business and, given set-up costs, may not be able to re-establish themselves quickly when the commodity cycle reverses itself. With respect to investment in new industries, it is difficult to diversify away from the commodity sector because of real competitiveness considerations. At precisely those periods when demand in the OECD area is strongest, the noncommodity sectors are at their greatest relative price disadvantage compared to the industries of other countries.

In the reverse situation of weak OECD demand and falling commodity prices, the income performance of the commodity sector is again buffered. However, the improved competitiveness of the noncommodity sector occurs at a time when OECD demand is likely to be at its weakest, and less encouraging of new investment. Furthermore, if the real exchange rate is significantly more variable than in other countries because of the commodity price cycle, uncertainty effects may further inhibit production and trading possibilities (15). New firms may be unwilling to set up in the belief that improved competitiveness is transitory.

If resource allocation objectives were to be given priority, it is not difficult to see how inflation objectives might be compromised. Excessively easy monetary policy to avoid real exchange rate appreciation in a commodity price boom will reinforce the inflation effects of the latter. Conversely, when the terms of trade decline, policies to resist depreciation may contribute to a slump in the domestic economy. From the viewpoint of a monetary authority with a mandate to contain inflation in a commodity-exporting country, it is difficult to see how exchange rate stabilisation could be given priority in such circumstances. This is not to argue, however, that resource allocation objectives may be unimportant. Rather, it is to suggest that other (real) policies should be used to promote real competitiveness -- competition policy, reduced border protection, work practices, and perhaps other labour market reforms. The importance of a flexible and dynamic noncommodity traded-goods sector capable of developing competitiveness less dependent on relative prices would seem to be the main challenge in these areas.

III. VOLATILITY ISSUES AND SHORT-RUN EXCHANGE RATE MANAGEMENT

The main conclusion of Section II is that a floating exchange rate regime is essential in a commodity-exporting country subject to terms-of-trade shocks if an inflation target is to be achieved. This section focuses on the case for exchange rate management in the face of short-run volatility of the exchange rate under floating -- which may result from market inefficiencies or "thinness" -- in Australia and New Zealand.

The weekly per cent changes in bilateral exchange rates against the U.S. dollar for Japan, the Federal Republic of Germany, the United Kingdom, Canada, Australia, and New Zealand, are shown in Chart 3, for the periods over which the latter two countries were floating. Weekly per cent changes in effective exchange rates -- including for the U.S. dollar -- are shown in Chart 4. The standard deviation for each series is calculated, and the straight horizontal lines reflect one standard deviation on either side of zero.

The following points stand out from an inspection of the charts:

The volatility of the bilateral exchange rates for Japan, Germany, the United Kingdom, and Australia vis-à-vis the U.S. dollar are remarkably similar. On the other hand, the volatility of the bilateral rate for the Canadian dollar is notably smaller than for other countries, while that for the New Zealand dollar is substantially larger.

The volatility of effective exchange rates differs much more widely among countries. That for Germany and Canada is remarkably low -- presumably a consequence of German ties within the EMS and the heavy weight of the United States in Canadian trade. Japan, the United Kingdom, and the United States fall within an intermediate range of effective exchange rate volatility -- presumably the result of not having natural optimum currency area characteristics. Australian and New Zealand effective exchange rate volatility, on the other hand, is substantially greater than elsewhere, with the New Zealand dollar even more volatile than the Australian dollar.

From the analysis in Section II it is not surprising that overall variability (captured by the standard deviation lines in the charts) should be greater for Australia and New Zealand. This is because of the importance of the commodity price cycle in these countries. Volatility can be thought of as the sum of normal volatility about the equilibrium real exchange rate and volatility of the equilibrium rate itself. The latter is likely to be less important in the other countries considered. It is surprising, however, that New Zealand's volatility should exceed that of Australia by substantial margins.

There have been a number of studies using Australian data that attempt to test whether observed short-run volatility is "excessive". Tease (1988) examines speculative efficiency in the foreign exchange market by testing whether the forward rate is an unbiased predictor of the future spot rate, and whether forecast errors are correlated with other freely available information. This is a joint test of informational efficiency and zero (or constant) risk premia. He tests the 15-day, 30-day, and 90-day forward rates sampled at weekly intervals from December 1983 to February 1986. Recognising the unusually large decline in the exchange rate in 1985, the sample period is split in early February of that year. The results suggest a break in forward market behaviour at that time. The joint hypothesis of speculative efficiency and zero or constant risk is rejected for the post-February 1985 period in all of the three markets tested. These results provide some support for the view that authorities can, in principle, intervene successfully to prevent or burst price bubbles or to assist the market to move quickly to a new equilibrium. Such intervention can help to smooth fluctuations in the exchange rate. Lowe and Trevor (1986) also examine whether there is evidence of informational inefficiencies by analysing expectations of exchange rate movements held by financial market dealers. They find that simple extrapolative rules of thumb dominate.

Excessive volatility in the short run may also be endemic to small countries that float in a world where capital markets have become increasingly integrated. "News" about shifts in economic fundamentals -- particularly the

commodity price cycle or the overall stance of monetary policy -- may be quickly translated into portfolio readjustment. The sheer size of international capital market portfolios is such that relatively small readjustments may have large implications for short-run demands on the markets for the Australian dollar and the New Zealand dollar. Large orders to buy or sell the domestic currency at such times may be met with insufficient demand from currently active traders. Since the market for the New Zealand dollar is "thinner" than that for the Australian dollar, these considerations may help explain the greater observed volatility of the former. To the extent that "thinness" is a factor, official intervention may be necessary to ensure that adjustment toward equilibrium values of the real exchange rate is orderly.

Market intervention to combat volatility related to inefficiencies or thinness need not involve changes in the overall stance of monetary policy. It is generally accepted that sterilised intervention has little impact on fundamental exchange rate movements (16). This was the conclusion of the working group set up at the Versailles Summit (Report, 1983). But such intervention may help to give the market more breadth in periods of large portfolio transactions, or more direction in periods when market inefficiencies dominate (provided that intervention objectives are clear to market participants).

In principle there are no major practical problems with this type of exchange rate management. The market can be "tested" with sterilised intervention. If it is ineffective it is likely that more fundamental elements are at work. Practical difficulties are more likely to arise in deciding on the extent to which monetary policy itself should be adjusted in response to fundamental pressures on the exchange rate. Some of these difficulties are illustrated with historical examples in the next section.

IV. AUSTRALIAN AND NEW ZEALAND EXPERIENCES OF TERMS OF TRADE CHANGES

Some of the practical problems of exchange rate policy in commodity-exporting countries are best explored by examining specific episodes characterised by large changes in the terms of trade. For Australia we briefly sketch some of the key features of the Korean War boom and slump (a fixed exchange rate regime), the 1972-75 period (an adjustable exchange rate peg), and the 1985-89 period (a floating exchange rate regime). We try to give some impression of the magnitude of the income effects of terms-of-trade changes that have been associated with inflation pressures in Australia. Some of the resource allocation implications are also touched on. We also look at New Zealand's response to terms-of-trade changes over the last few years.

There are a number of notable features of the Australian experience (see Table 4). First, terms-of-trade shocks are often very large. During the Korean War period the terms of trade increased 46 per cent in 1950-51, only to fall by 50 per cent during 1951-52. Changes during other periods were less sharp, but two-year upswings were of the order of 15 to 30 per cent. The direct contribution of these changes to the real purchasing power of the income generated by domestic production can be measured by revaluing exports by the import price index to calculate a new constant price export series, recalculating constant price GDP data by substituting the new for the old export series and comparing the new "adjusted" GDP (column 3) with actual GDP

(column 2). During 1950-51, for example, the constant-price GDP increased 6 1/4 per cent, but after terms-of-trade adjustment the increase was 15 per cent; this represents approximately three years of strong growth occurring in one year. Changes during other episodes are less spectacular, but terms-of-trade upswings usually add about 50 per cent to GDP growth rates

Second, as suggested in Section II, the manufacturing employment (import-competing) share falls in response to terms-of-trade improvements (column 5). This is especially notable in the first two periods, when the employment share of manufacturing fell 3 1/4 per cent in 1951-52 and 6 per cent in 1973-74. In both episodes quotas were introduced to protect manufacturing, underlining the importance of resource allocation issues. After the Korean War boom, the use of quotas was widespread and these remained in place until the end of the decade. After 1972-75 they were more limited and introduced for footwear, clothing, textiles and motor vehicles. For motor vehicles quotas lasted 12 years, but for other industries they are still in place. During the third period, by which time manufacturing employment had fallen to 16 per cent of total employment, the response was quite small.

Third, what can be said about real exchange rate adjustments under different exchange rate regimes? In each period money growth rates accommodated income gains (column 6) and, regardless of the exchange rate regime, Australia has been unable to escape inflation, which typically peaks one year after the terms of trade (column 8). But as the nominal exchange rate has become more flexible in each episode, the inflation response has been reduced. In the first period, with a fixed nominal exchange rate, the real exchange rate change was achieved through variations in the relative price level between Australia and overseas. From 1950 to 1953 the additional price level increase in Australia, over and above its major trading partners, was about 37 1/2 percentage points; a substantial real exchange rate appreciation. During the second period world inflation again accelerated, but price increases were greater in Australia by an additional 6 1/2 percentage points, even though more of the adjustment was borne by nominal exchange rate appreciation. In the final more recent period, real exchange rate changes were achieved much more by nominal rate changes. Domestic inflation did not accelerate, at least until monetary policy was eased, and the inflation gap between Australia and overseas trading partners narrowed relative to the years immediately preceding the terms-of-trade upswing.

Fourth, although most of this reduced inflation responsiveness to the terms-of-trade changes may be attributed to changes in the exchange rate regime, some of the improved performance is related to labour market changes. Terms-of-trade improvements initially add to Australian real income by increasing export receipts, which usually lead to large changes in income distribution. For example, during the first two periods, workers sought to increase nominal wages substantially to maintain fixed income shares and to enable the rest of the community to share quickly in real income gains. The result was substantial inflation of nominal wages (column 7), real wages (column 9), and an overflow into imports. When the terms of trade fell back to earlier levels, workers were unwilling to reduce nominal wages, and the Australian centralised wage setting system introduced full wage indexation for previous price changes, thus preventing real wage falls. Nominal and real wage asymmetries impart an inflation bias: upward flexibility of nominal wages when the terms-of-trade and income effects are strong reinforce inflation pressures;

downward nominal and real wage rigidity means that these are not reversed to the same extent in periods of weakness and exchange rate depreciation. Asymmetrical real wage adjustment also led to the widespread import quotas after the first period, and to high unemployment after the second.

During the third period, when the unemployment rate was four to five times the average of the 1950s and 1960s, the wage response was very different. The terms of trade fell sharply in 1985-86, and the flexible exchange rate depreciated about 30 per cent in two stages during these years. The centralised wage fixing authority, in co-operation with the trade union movement, did manage to reduce real wages by adopting less than full wage indexation. Social wage considerations and income tax cuts were also important. Employment growth thus remained strong in the face of a slowdown in GDP. The problem for monetary policy was to ensure that the inflation pressures from depreciation were not excessive. Nominal wages were not only rigid in the downward direction, but were likely to be subject to upward pressure through indexation; the extent to which the wage negotiating process could continue to quarantine exchange rate effects from wages was limited. Monetary policy at first leaned heavily into the wind, with the interest differential in Australia's favour rising sharply (Chart 5). However, monetary policy was then eased prematurely in early 1986, that is, while the terms of trade were still falling, which contributed to a further sharp depreciation and to increased inflation pressures. Money market conditions had to be tightened again in the second half of the year.

When the terms of trade improved, adding 1 1/2 per cent to real GDP in 1987-88 and 3 per cent in 1988-89, the exchange rate rose in the manner predicted in Section II, and the labour movement did not respond by demanding excessive real wage increases. The response to the third large upward terms-of-trade shock, therefore, seems to have been more satisfactory in that there was both greater real wage and nominal exchange rate flexibility. There seems to be a growing willingness on the part of the trade union movement to allow income distribution to respond more appropriately over the terms-of-trade cycle. This contributed to improved inflation and employment performance in 1987 and 1988.

However, while the floating rate regime has shown its worth in permitting the exchange rate to rise automatically in response to the terms of trade, thereby offsetting inflation pressures, the recent episode also illustrates problems with policies of leaning against the wind in these circumstances. Since consumer price inflation continued to decline in response to the higher exchange rate, and since a marked reduction in the budget deficit suggested fiscal restriction, the authorities were tempted to ease money market conditions in 1987. The exchange rate rose, but much less than would have been the case if monetary conditions had not been eased. The combination of income effects from rising terms of trade and easier monetary policy contributed to a resurgence of domestic demand and inflation in Australia in 1988. Leaning too heavily against the wind in a commodity price boom contains substantial inflation risks. Monetary policy had to be sharply tightened from April 1988

Finally, given the importance of terms of trade shocks, the question naturally arises as to whether the policy instruments available are appropriate. For example, to the extent that there are nonsymmetric labour market responses, and since employers have been only too willing to pay large

wage claims in boom periods, could a system of taxes and subsidies levied on the export sector to offset income distribution effects be useful? Australia has experimented with this type of system to a minor degree (coal export levies and a wool marketing authority to smooth price fluctuations are examples), but there are two practical problems with it. First, taxes and subsidies should only be used to moderate temporary terms-of-trade variations. But it is difficult, in advance, to distinguish between temporary and permanent changes. Second, the government may find it difficult to save receipts when the terms of trade are strong and to fund subsidies when they are weak. Any scheme must thus be self-financing. Furthermore, as short-run export supply elasticities are low, a policy to smooth exchange rate fluctuations would need to be accompanied by a scheme to invest tax receipts overseas when the exchange rate was high in response to terms-of-trade improvements, and to repatriate the revenue in the reverse situation.

We now turn to a discussion of the New Zealand experience during the 1987-88 terms-of-trade cycle, which seems to have been less inflationary than in Australia. In both countries the real exchange rate responded to the terms-of-trade cycle. But relative to past inflation trends, the New Zealand economy seems to have absorbed more of the adjustment by permitting the nominal exchange rate to appreciate, dampening demand pressures, than was the case in Australia. There appear to be three reasons for this:

- (1) New Zealand's monetary policy has recently been more firmly directed against inflation. The interest differential in New Zealand's favour vis-à-vis Australia during 1987 and early 1988 led to a stronger exchange rate and less demand pressure there (Chart 5). There was less attempt to lean against the wind than in Australia. Consequently, although there was considerable suppressed inflation in New Zealand at the beginning of the terms-of-trade cycle, owing to previous wage and price controls, the tight monetary policy has been quite successful at reducing the inflation rate over the last two years.
- (2) When Australia began to tighten monetary policy and narrow the interest differential between the two countries from April 1988, the New Zealand terms of trade had already "levelled off" -- thus reducing income effects and the upward pressure on the real exchange rate.
- (3) The Australian institutional wage-setting process since 1983 adopted close to full wage indexation for past price changes in most decisions. Although wage policy succeeded in achieving considerable real wage reductions at times, any system with indexation over long periods of time inevitably makes winding back inflation more difficult, unless there are downward price shocks.

V. CONCLUDING REMARKS

This paper has sought to identify key problems of exchange rate policy in commodity-exporting countries, both from a theoretical and empirical perspective. The issues have been addressed in the context of deregulated and competitive domestic financial systems and highly integrated world capital markets. In this environment the exchange rate may have become a more

important transmission mechanism for monetary policy, relative to the channel of direct interest rate effects on domestic demand. The major focus has been from the perspective of a monetary authority with responsibility for an inflation objective, although it was explicitly recognised that optimal exchange rate policy within this framework could well conflict with resource allocation goals and that other policies might be required to address these.

The analysis of the paper suggests that the world commodity price cycle may be a major influence on exchange rate dynamics in small countries with export concentration in commodities. Specifically,

- . commodity prices play a central role in determining the equilibrium real exchange rate in a small country importables/exportables model:
- . when tested on Australian and New Zealand data, this influence was found to be important in practice: and
- . these findings have strong implications for exchange rate policy in these economies.

In general terms small commodity-exporting countries should exhibit greater exchange rate volatility relative to other industrial countries. But it is not clear that this volatility (over very short horizons) should be a concern for monetary policy. Intervention that is fully sterilised can be used to promote orderly behaviour when markets are particularly thin or lack direction. These issues are of secondary importance in comparison to the need to decide on the weight that should be attached to the exchange rate in the broad formulation of monetary policy.

The choice of a broadly floating exchange rate is essential for low-inflation monetary policy in a commodity-exporting country. Nevertheless, some form of exchange rate management is always likely to be necessary for effective monetary policy. This management should be strongest at times when monetary shocks can be identified. But even when movements in the equilibrium real exchange rate are dictated by terms-of-trade shifts, it is not clear that the optimal policy is to permit the exchange rate to find its own level with no response from the monetary authorities. Practical experience suggests that excessive concern with declining competitiveness may pose problems for achieving an inflation target when the terms of trade and the exchange rate are strengthening -- leaning against the wind is risky, and it may even be necessary to lean with the wind. Conversely, when the terms of trade and the exchange rate decline, labour market rigidities may improve the case for leaning against the wind.

NOTES

1. The issue of whether New Zealand should peg its exchange rate to the Australian dollar is not taken up explicitly in this paper
2. To this could be added the lack of geographical proximity or an obvious third currency against which to peg.
3. The influences would take the form of transaction costs and the effects of uncertainty in decision-making processes.
4. Other seminal contributions include Mundell (1969) and Fischer (1977).
5. This assumption makes the model more analytically tractable and transparent, and for this reason it is commonplace in the literature. It may not be unrealistic in the case of Australia and New Zealand because these economies have highly deregulated financial systems with relaxed liquidity constraints. The Cross Committee (see Bank for International Settlements, 1986) has argued that an important effect of deregulation on innovation is to weaken the direct transmission of monetary policy on economic activity via interest rates and to strengthen the transmission through the exchange rate. In Australia, in particular, the economy has appeared to be considerably more insensitive to higher interest rate levels in recent years. Nevertheless, some comments will be offered on the implications of relaxing this assumption at a later stage.
6. Equation [2] is linearised in logarithms by using the first terms in a Taylor's series expansion about the steady state. For simplicity, it is assumed that in the steady state the share of exports in output and the share of imports are both equal to λ . Thus it can be shown that

$$\dot{y} = \text{constant terms} + \lambda y_n + (1-\lambda)y_x$$
7. Similar findings may be found in Dornbusch (1980) and, in an intertemporal model context, in Ostry (1989), Edwards (1987), Edwards (1987a), and Neary (1988). In the case of Australia the idea that competitiveness might be linked to the performance of the commodity-exporting sector is found in Gregory (1976), who explored implications of minerals discoveries. The present focus on relative prices is a more general application.
8. Expression [13] is substituted into equation [11], and is used in the solution of the model below. The expected change in the real exchange rate therefore has a forward-looking aspect. We leave open the question of whether the value of θ ensures consistent expectations, an issue not directly of interest to the problem at hand.
9. By choosing domestic inflation as the objective, we assume the authorities take account of exchange rate effects only to the extent that they are reflected in excess supply or demand for nontraded goods. This reduces the probability of "leaning against the wind" in the subsequent discussion. Excessive focus on the consumer price index when

the terms of trade and exchange rate are rising can lead to more ingrained inflation problems if the authorities ease monetary policy in the belief that the consumer price index is favourably affected, as recent Australian experience has shown. We wish to focus on these domestic demand issues in the subsequent analysis.

10. The model may also be solved for disturbances to foreign interest rates, the supply of money, and the supply of output. By and large, foreign interest rate and money supply shocks can be treated as similar to a money demand shock, with qualifications related to the value of the interest elasticity of domestic expenditure discussed further below. Output shocks will be similar to terms-of-trade shocks. The two shocks chosen are thought to be more representative in practice.
11. These relationships are best seen from the expression for the optimal intervention parameter δ^* in the case where:

$$\rho=0 \text{ and } \sigma_1^2 \rightarrow 0.$$

$$\delta^* = - (1-\lambda) + (\lambda\alpha+(1-\lambda)\eta)\gamma/(\lambda+\eta)$$

It is lower and possibly negative the higher $(1-\lambda)$, and the lower α and γ . The size of η is ambiguous and likely to be of small importance, since the two substitution effects (in response to p_x and e) offset each other.

12. The empirical work in this section is a more general treatment of the econometric issues than the earlier work of Blundell-Wignall and Thomas (1987).
13. This restriction is tested with the chi-square statistic based on the log-likelihood values. The restriction is accepted at the 5 per cent level in most cases and at the 1 per cent level for the quarterly post-float model for Australia.
14. As these tests are valid asymptotically, data covering longer periods than here would help to verify the robustness of the results. Given the relatively small number of observations, the post-float regressions for Australia should be treated with particular caution. They are presented only as a preliminary indication of how the relationship might be affected by a change in the exchange rate regime.
15. Resource allocation costs of exchange rate variability are surveyed in International Monetary Fund (1984). Subsequent studies include Akhtar and Hilton (1984); Gotur (1985); Kenen and Rodrik (1986); Bailey, et al. (1987); Cushman (1986), (1988) and (1988a). A number of studies have found some costs of exchange rate variability for international trade.
16. It is also possible that sterilised intervention may destabilise adjustment towards steady-state inflation as in Blundell-Wignall and Masson (1985).

Table 1

EXCHANGE RATE REGIMES AND EXCHANGE RATE VARIABILITY
(Variance of quarterly percentage change)

	Bilateral US dollar exchange rate	Effective exchange rate
<u>Australia</u>		
- Pegged to a single currency with periodic realignment (sterling until Nov. 1971 and the U.S. dollar until Sept. 1974)	10.28	6.12
- Fixed to a basket of currencies (Sept. 1974 to Nov. 1976)	13.89	13.25
- Crawling peg vis-à-vis the U.S. dollar (Nov. 1976 to Dec. 1983)	6.86	6.16
- Overall pre-float (to Dec. 1983)	11.66	9.30
- Floating (Dec. 1983 to present)	37.51	38.39
<u>New Zealand</u>		
- Pegged to a single currency (sterling until Nov. 1971 and the U.S. dollar to July 1973)	5.04	0.75
- Fixed to a basket of currencies with periodic step adjustments (July 1973 to June 1979)	19.35	9.67
- Crawling peg vis-à-vis a basket of currencies (June 1979 to June 1982)	5.99	0.66
- Fixed to a basket of currencies with periodic step adjustments (June 1982 - March 1985)	41.47	28.78
- Overall pre-float (to March 1985)	19.77	9.81
- Floating (March 1985 to present)	38.86	28.05

Table 2

REGRESSIONS OF REAL EXCHANGE RATES AND THE TERMS OF TRADE

Australia

Dep. Var	Δs	s	Δs	Δs	Δs
(Full sample period 1970 Q1 - 1988 Q4)					
x	-	1.05 (11.55)	-	-	-
x(-1)	-	-	0.05 (2.7)	-	-
s(-1)	-0.07 (-1.7)	-	-0.04 (-3.1)	-	-
EC(-1)	-	-	-	-0.044 (-3.1)	-0.046 (-3.5)
$\Delta s(-1)$	0.52 (1.0)	-	0.07 (0.6)	0.08 (0.7)	-
$\Delta s(-2)$	0.38 (0.7)	-	0.00 (0.0)	0.02 (0.2)	-
$\Delta s(-3)$	0.11 (1.8)	-	0.18 (1.3)	0.21 (1.6)	0.21 (1.8)
$\Delta s(-4)$	-0.37 (-0.6)	-	-0.12 (-0.8)	-0.09 (-0.7)	-
$\Delta x(-1)$	-	-	0.00 (0.0)	0.00 (0.1)	-
$\Delta x(-2)$	-	-	0.00 (0.6)	0.00 (0.7)	-
$\Delta x(-3)$	-	-	-0.15 (0.3)	-0.00 (-0.30)	-
$\Delta x(-4)$	-	-	0.00 (0.1)	-0.00 (-0.1)	-
const.	0.31 (1.6)	4.55 (452.0)	0.20 (3.1)	0.00 (0.1)	-
σ	0.04195	0.07968	0.00901	0.00896	0.00854
DW	1.95	0.30	1.95	1.95	1.84
(Sub-sample period 1970 Q1 - 1983 Q4)					
x	-	0.63 (8.44)	-	-	-
x(-1)	-	-	0.03 (2.0)	-	-
s(-1)	-0.12 (-1.9)	-	-0.06 (-2.8)	-	-
EC(-1)	-	-	-	-0.055 (-2.8)	-0.063 (-3.6)
$\Delta s(-1)$	0.54 (0.8)	-	0.04 (0.27)	0.04 (0.3)	-
$\Delta s(-2)$	0.73 (1.1)	-	0.05 (0.36)	0.05 (0.4)	-
$\Delta s(-3)$	1.28 (1.8)	-	0.22 (1.4)	0.21 (1.5)	0.25 (1.9)
$\Delta s(-4)$	-0.66 (-0.9)	-	-0.13 (-0.8)	-0.13 (-0.9)	-
$\Delta x(-1)$	-	-	0.00 (0.9)	0.00 (0.9)	-
$\Delta x(-2)$	-	-	0.00 (0.4)	0.00 (0.4)	-
$\Delta x(-3)$	-	-	0.00 (0.5)	-0.00 (0.5)	-
$\Delta x(-4)$	-	-	0.00 (0.0)	-0.00 (-0.0)	-
const.	0.54 (1.9)	4.60 (517.7)	0.25 (2.8)	0.001 (0.8)	-
σ	0.02981	0.04939	0.00619	0.00612	0.00578
DW	1.96	0.38	2.02	2.02	1.85

Table 2 (continued)

REGRESSIONS OF REAL EXCHANGE RATE AND THE TERMS OF TRADE

Australia

Dep. Var	Δs	s	Δs	Δs	Δs
(Full sample period 1984 Q1 - 1988 Q4)					
x	-	1.44 (4.7)	-	-	-
x(-1)	-0.17 (-1.5)	-	0.22 (2.1)	-	-
s(-1)	-	-	-0.11 (-2.6)	-	-
EC(-1)	-	-	-	-0.10 (-2.6)	-0.10 (-3.3)
$\Delta s(-1)$	0.60 (0.5)	-	0.11 (0.4)	0.17 (0.6)	-
$\Delta s(-2)$	0.33 (0.3)	-	-0.33 (-0.9)	-0.16 (-0.5)	-
$\Delta s(-3)$	0.96 (0.8)	-	-0.89 (-0.3)	0.11 (0.3)	-
$\Delta s(-4)$	-0.27 (-0.2)	-	-0.32 (-0.9)	-0.26 (-0.8)	-
$\Delta x(-1)$	-	-	-0.00 (-0.2)	-0.00 (-0.5)	-
$\Delta x(-2)$	-	-	0.00 (1.3)	0.00 (0.6)	-
$\Delta x(-3)$	-	-	0.00 (0.2)	-0.00 (-0.2)	-
$\Delta x(-4)$	-	-	0.00 (0.7)	0.00 (0.7)	-
const.	0.76 (1.5)	4.51 (175.3)	0.49 (2.6)	-0.002(-0.4)	-
σ	0.06733	0.09459	0.01471	0.01469	0.01173
DW	2.03	0.34	2.27	2.29	2.09

Note: t-values in parenthesis.

- s (quarterly) for Australia is the logarithm of the nominal effective exchange rate deflated by the domestic relative to trade-weighted foreign consumer price index.
- x (quarterly) is the logarithm of the terms of trade, National Accounts deficit, for Australia.
- x (monthly, commodity price version) for Australia is the logarithm of the Reserve Bank of Australia Commodity Price Index, defined in terms of SDRs, total index rural and non-rural components.

Source: OECD Balance of Payments Division.

Table 3

REGRESSIONS OF REAL EXCHANGE RATE AND THE TERMS OF TRADE

New Zealand

Dep. Var	Δs	s	Δx	Δs	Δs	Δs
(Full sample period 1970 Q1 - 1988 Q3)						
x	-	0.42 (7.9)	-	-	-	-
x(-1)	-	-	0.03 (3.3)	-	-	-
s(-1)	-0.13 (-1.7)	-	-0.05 (-2.6)	-	-	-
EC(-1)	-	-	-	-0.055 (-3.1)	-0.06 (-3.4)	-
$\Delta s(-1)$	0.47 (0.8)	-	0.26 (2.1)	0.29 (2.4)	0.27 (2.3)	-
$\Delta s(-2)$	0.37 (0.6)	-	-0.21 (-1.6)	-0.16 (-1.2)	-	-
$\Delta s(-3)$	0.41 (0.7)	-	0.23 (1.8)	0.26 (2.1)	0.26 (2.2)	-
$\Delta s(-4)$	-1.25 (-2.2)	-	-0.39 (-3.1)	-0.34 (-2.8)	-0.36 (-3.4)	-
$\Delta x(-1)$	-	-	-0.0009 (-3.0)	-0.001 (-2.8)	-0.001 (-2.5)	-
$\Delta x(-2)$	-	-	0.0007 (2.2)	0.0007 (2.2)	0.0005 (1.8)	-
$\Delta x(-3)$	-	-	-0.0006 (-2.0)	-0.0005 (-1.8)	-0.0005 (-1.7)	-
$\Delta x(-4)$	-	-	-0.00 (-1.0)	-0.00 (-1.0)	-	-
const.	0.61 (1.8)	4.59 (599.1)	0.22 (2.5)	-0.004 (-0.4)	-	-
σ	0.03819	0.05512	0.00709	0.00717	0.00715	-
DW	1.86	0.46	1.93	1.88	1.79	-
(Sub-sample period 1970 Q1 - 1985 Q1)						
x	-	0.37 (7.4)	-	-	-	-
x(-1)	-	-	0.03 (3.2)	-	-	-
s(-1)	-0.08 (-1.0)	-	-0.05 (-2.5)	-	-	-
EC(-1)	-	-	-	-0.058 (-2.9)	-0.066 (-3.5)	-
$\Delta s(-1)$	0.98 (1.4)	-	0.19 (1.4)	0.26 (1.8)	0.20 (1.6)	-
$\Delta s(-2)$	-0.85 (-1.2)	-	-0.23 (-1.6)	-0.14 (-1.1)	-	-
$\Delta s(-3)$	1.57 (1.8)	-	0.19 (1.0)	0.27 (1.5)	-	-
$\Delta s(-4)$	-0.80 (-0.9)	-	-0.21 (-1.1)	-0.11 (-0.6)	-	-
$\Delta x(-1)$	-	-	-0.00 (-0.5)	-0.00 (-0.2)	-	-
$\Delta x(-2)$	-	-	-0.00 (-0.0)	0.00 (0.1)	-	-
$\Delta x(-3)$	-	-	0.00 (0.6)	0.00 (0.7)	-	-
$\Delta x(-4)$	-	-	-0.00 (-1.8)	-0.00 (-1.6)	-	-
const.	0.35 (0.9)	4.59 (612.4)	0.24 (2.5)	-0.001 (-0.7)	-	-
σ	0.03225	0.04881	0.00644	0.00655	0.00644	-
DW	1.91	0.41	1.84	1.85	2.00	-

Note: s (quarterly) for New Zealand is the logarithm of the nominal effective exchange rate deflated by the domestic relative to trade-weighted foreign consumer price index.

x (quarterly) is the logarithm of the terms of trade, National Accounts definition, for New Zealand.

Source: OECD Balance of Payments Division.

Table 4

TERMS OF TRADE SHOCKS AUSTRALIA: SELECTED ECONOMIC INDICATORS
1949-50 - 1952-53; 1971-72 - 1974-75; 1984-85 - 1988-89

Year	Terms of trade index	Percent change GDP	Percent change adjusted GDP	Col 3-Col 2	Percent change employment share manufact.	Percent change M3	Percent change average weekly earnings	Percent change consumer prices	Percent change real wages	Percent change nominal exchange rate	Percent inflation gap Australia/overseas	Real exchange rate
1	2	3	4	5	6	7	8	9	10	11	12	
I												
1949-50	100	7.8	-	0.4	14.3	9.6	7.9	1.7	0.0	9.6	109.6 (2)	
1950-51	146	6.2	15.1	-1.1	18.9	19.6	13.2	7.4	0.0	10.0	120.5	
1951-52	92	2.5	-6.5	-3.2	-1.0	22.4	22.8	-0.4	0.0	14.0	137.3	
1952-53	100	-0.8	0.3	2.2	9.1	9.2	9.0	0.2	0.0	4.0	142.7	
II												
1971-72	100	4.9	4.6	-1.9	10.5	10.1	6.8	3.3	-0.4	0.7	100.3	
1972-73	120	3.9	6.8	-0.4	25.7	9.0	5.9	3.1	5.7	1.3	107.3	
1973-74	130	4.9	6.0	-5.9	14.5	16.2	13.1	3.1	9.9	1.7	119.7	
1974-75	122	2.0	0.5	-3.7	15.4	25.4	16.7	8.7	-6.2	2.7	115.5	
III												
1984-85	100	5.5	5.0	-2.1	17.5	7.6	5.8	1.8	-7.2	1.7	94.5	
1985-86	91	4.3	2.8	-4.0	13.0	6.2	8.4	-2.2	-17.6	5.1	82.7	
1986-87	87	2.8	2.0	-3.0	12.8	7.1	9.3	-2.2	-13.6	6.8	77.1	
1987-88	95	4.4	5.8	0.6	13.3	6.2	7.3	1.1	1.9	4.3	81.9	
1988-89	100	3.3	6.1	-0.6	26.7	7.2	7.4	0.2	12.4	4.0	95.3	

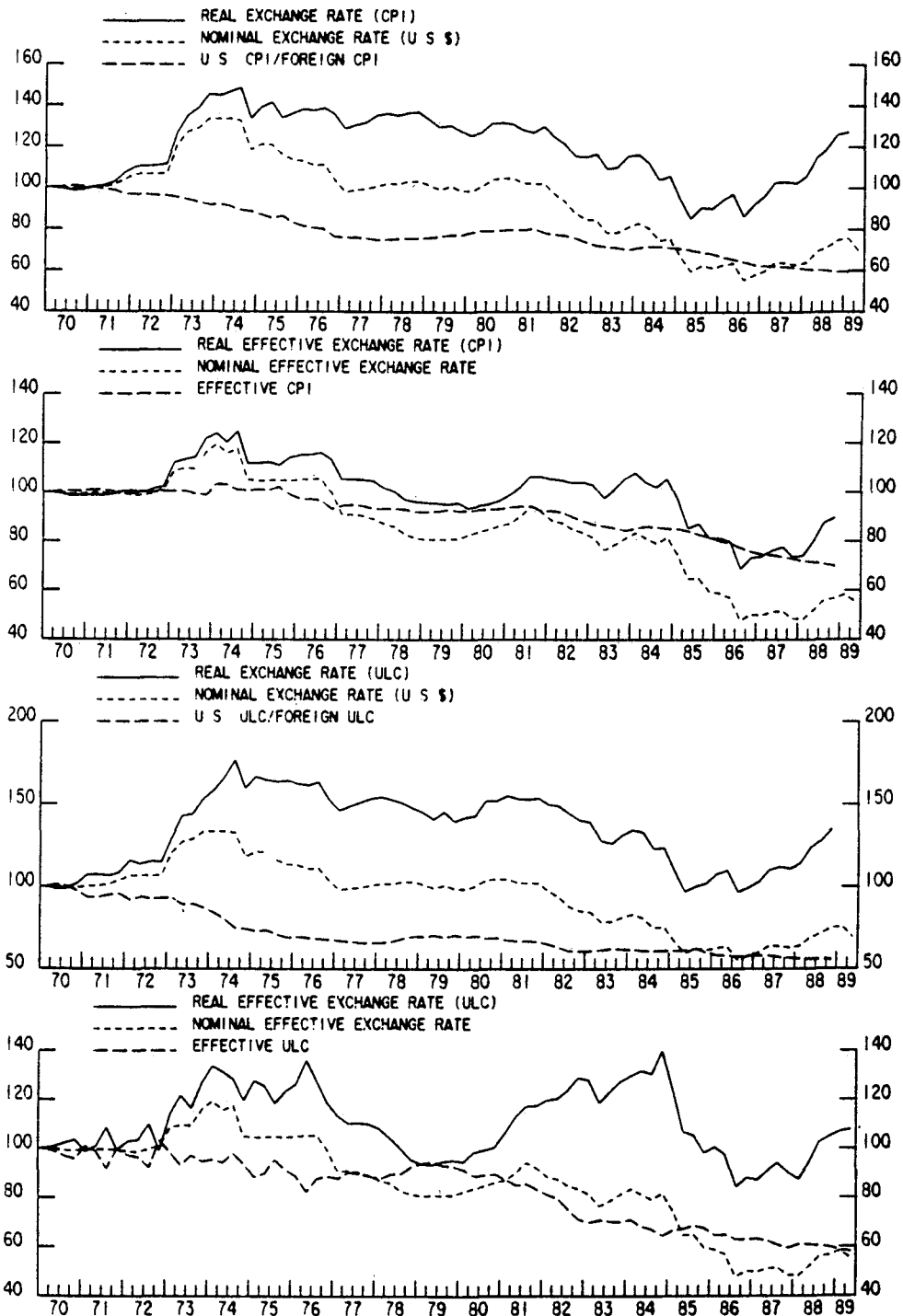
Notes: 1: Mean of inflation rates of the United Kingdom, the United States, Germany and Canada (I), the United Kingdom, the United States, Germany, Canada, Japan (II), eight major trading partners, trade weighted (III).

2: Nominal exchange rate adjusted by differential inflation.

Sources: Australian Economic Statistics, 1949-50 to 1986-87, W.E. Norton and C.P. Aylmer, Occasional Paper No. 8A, Reserve Bank of Australia, and Economic Round-Up, October 1989, The Treasury, AGPS, Canberra.

Chart 1

AUSTRALIA

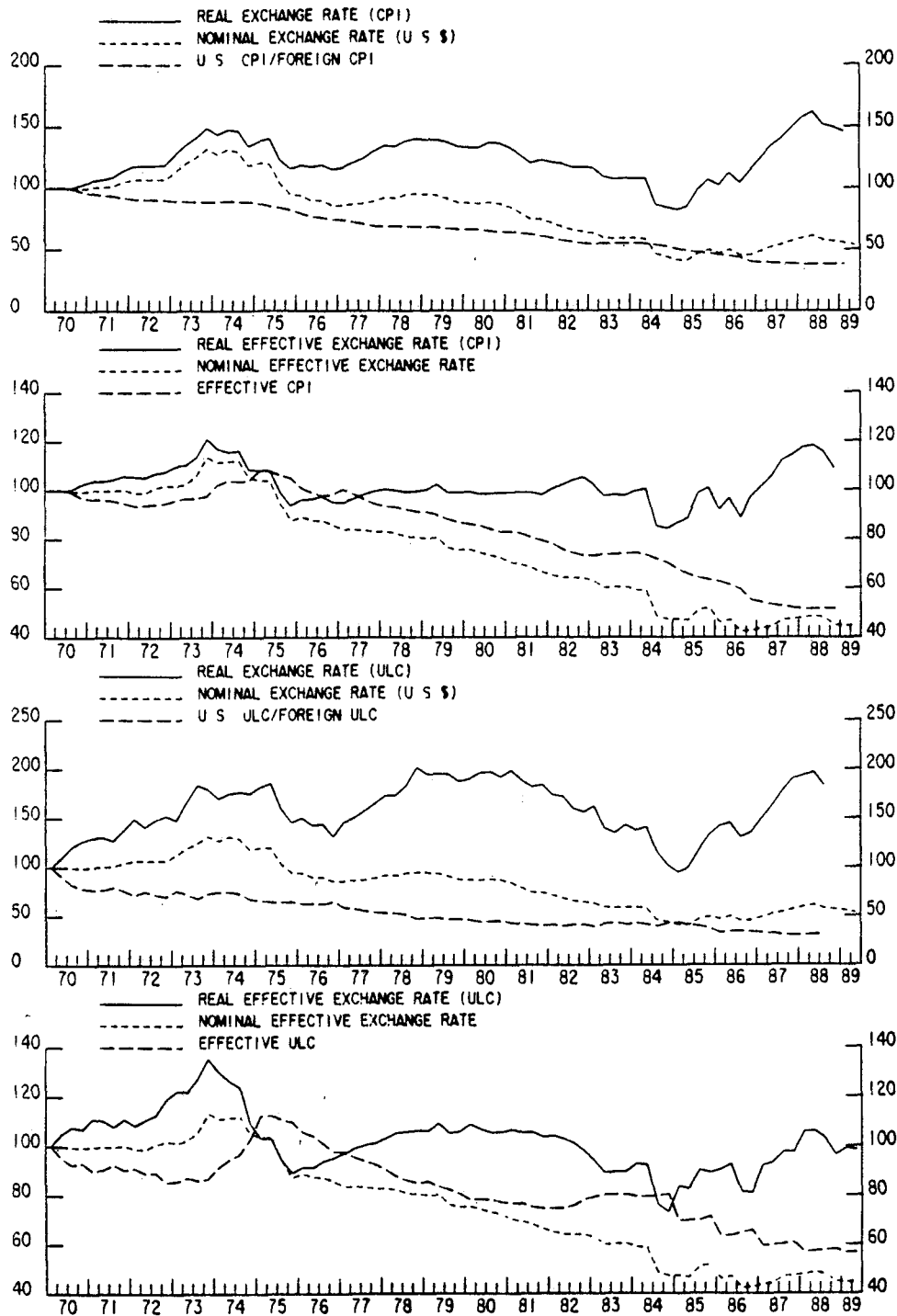


Note: The first panel shows the bilateral exchange rate against the U.S. dollar, domestic consumer and U.S. consumer price index. The second panel shows the effective exchange rates and domestic and weighted foreign consumer price indexes. The third panel is as in the first panel, except domestic relative to U.S. unit labour costs are used to deflate the real exchange rate. The fourth panel is as in the second panel, except domestic relative to trade-weighted foreign unit labour costs are used.

Source: OECD Balance of Payments Division.

Chart 1 (continued)

NEW ZEALAND

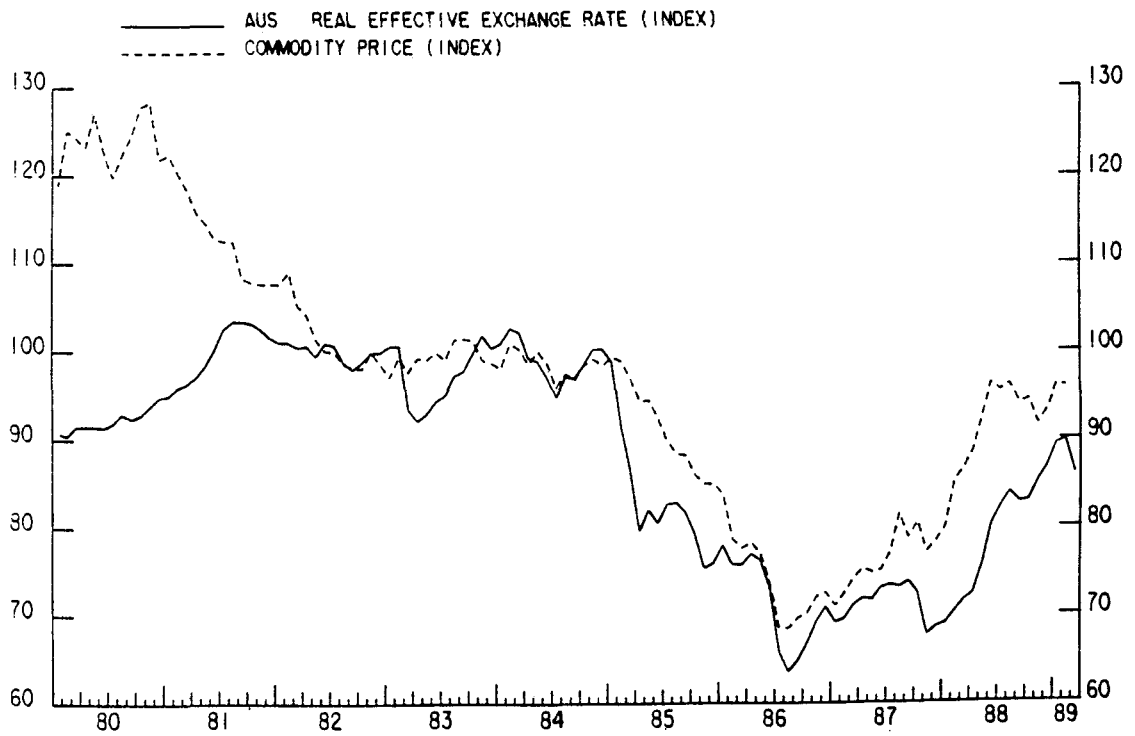
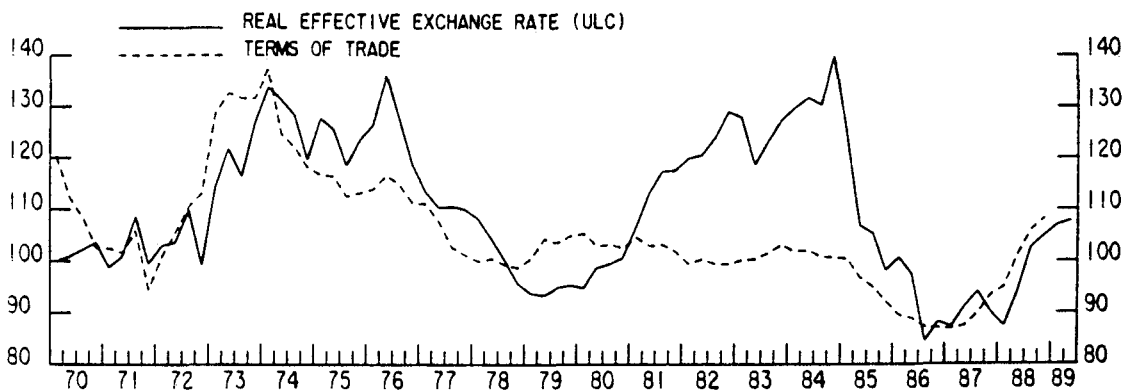
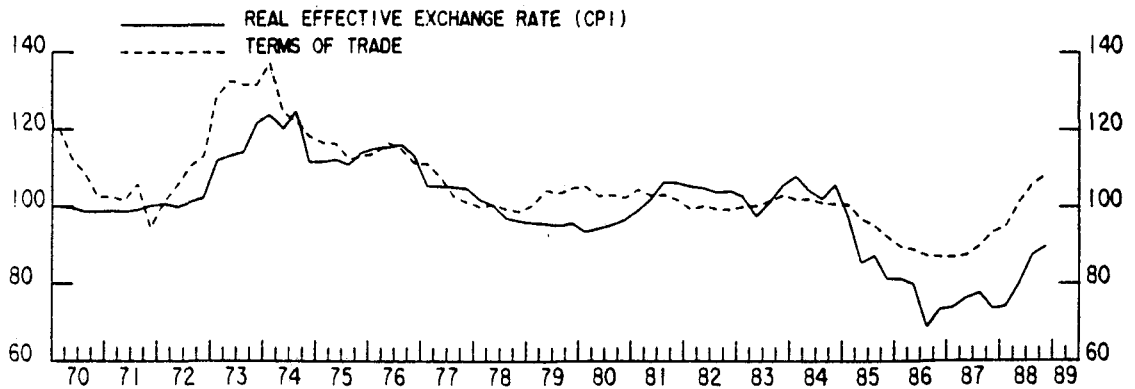


Note: The first panel shows the bilateral exchange rate against the U.S. dollar, domestic consumer and U.S. consumer price index. The second panel shows the effective exchange rates and domestic and weighted foreign consumer price indexes. The third panel is as in the first panel, except domestic relative to U.S. unit labour costs are used to deflate the real exchange rate. The fourth panel is as in the second panel, except domestic relative to trade-weighted foreign unit labour costs are used.

Source: OECD Balance of Payments Division.

Chart 2

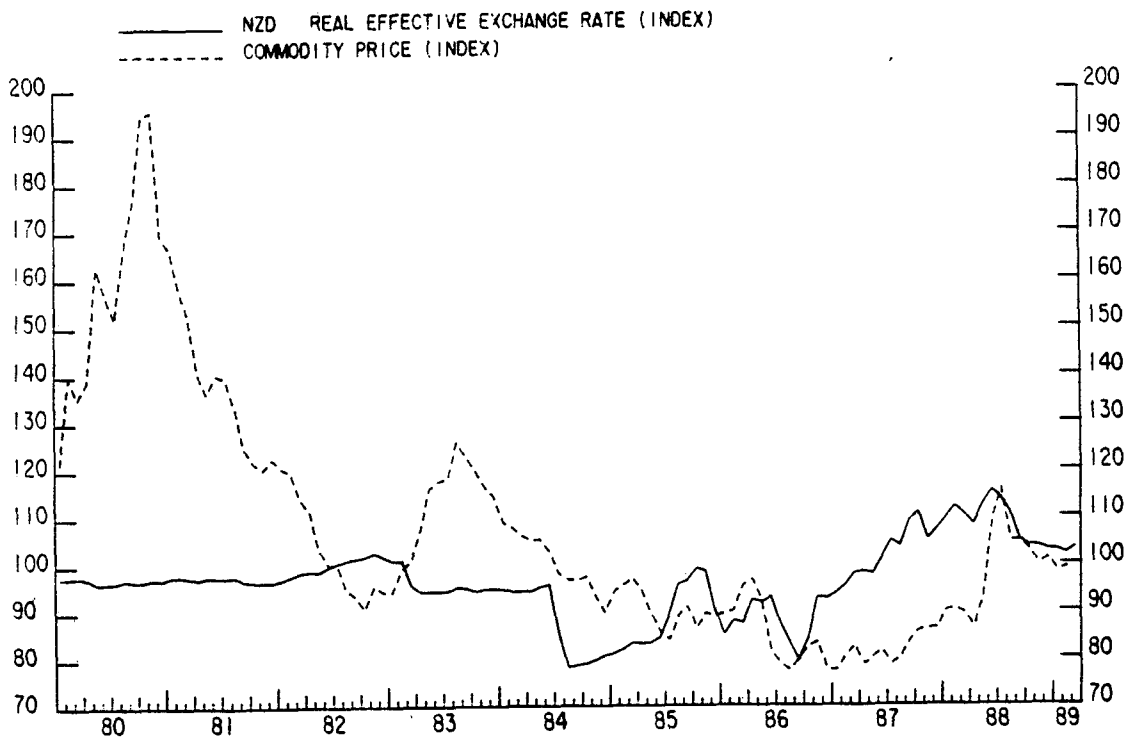
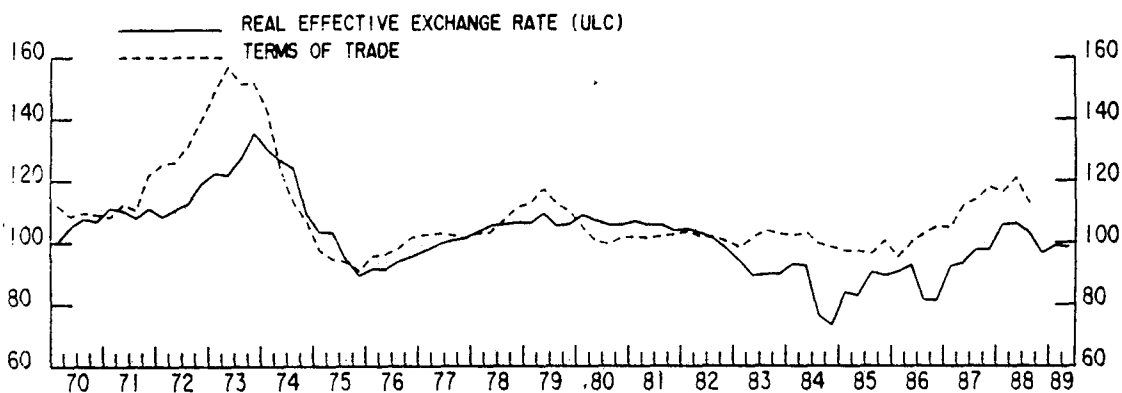
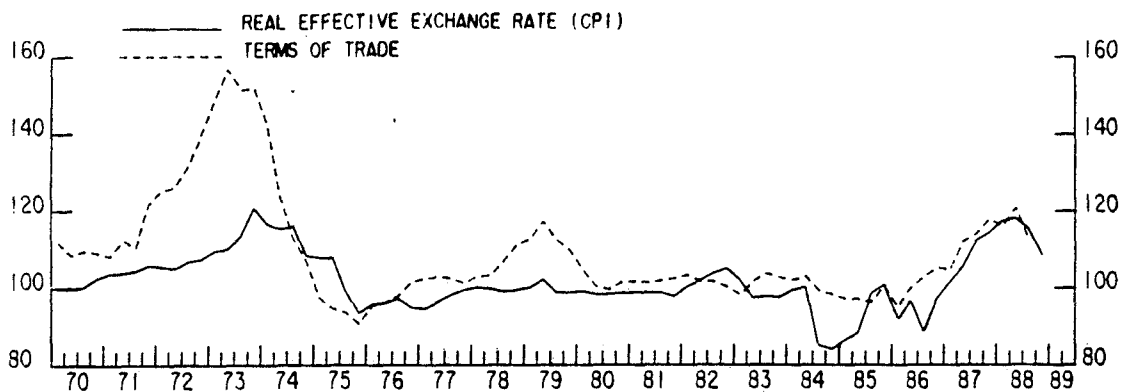
AUSTRALIA



Note: As defined in Tables 2 and 3 and in Chart 1.

Chart 2 (continued)

NEW ZEALAND

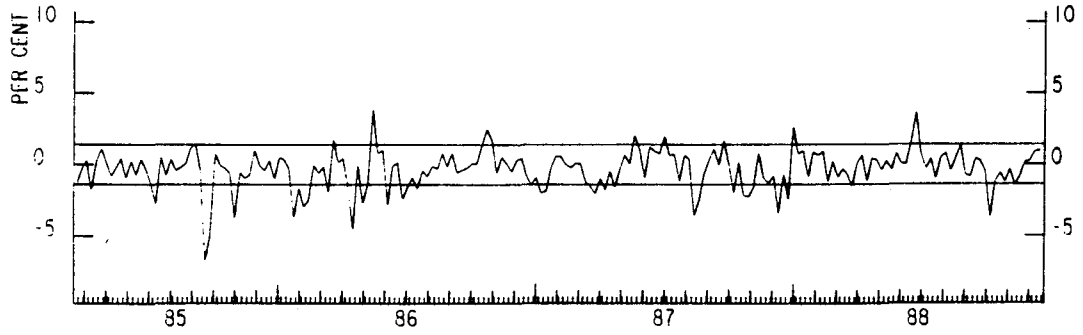


Note: As defined in Tables 2 and 3 and Chart 1:

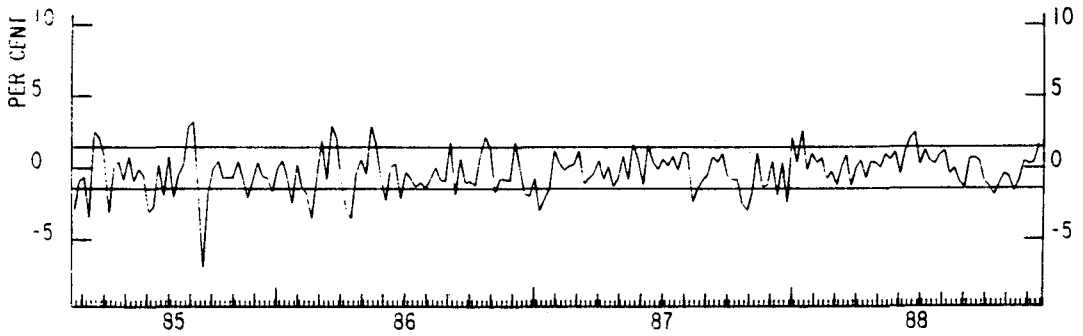
Chart 3

WEEKLY BILATERAL EXCHANGE RATE
(% CHANGE)

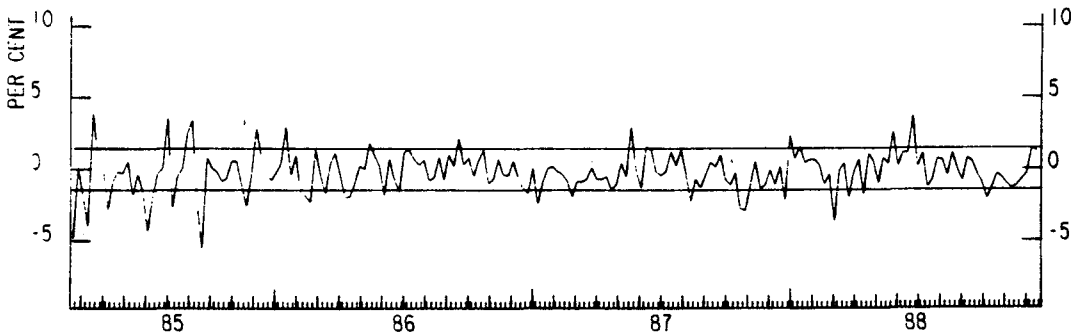
JAPAN



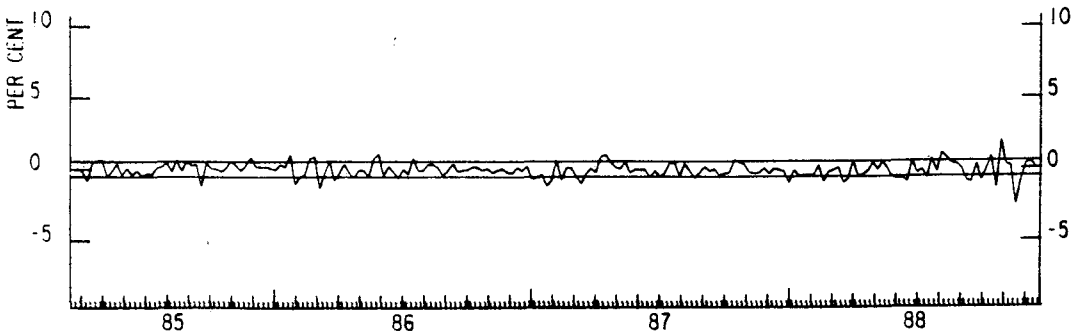
GERMANY



UK



CANADA

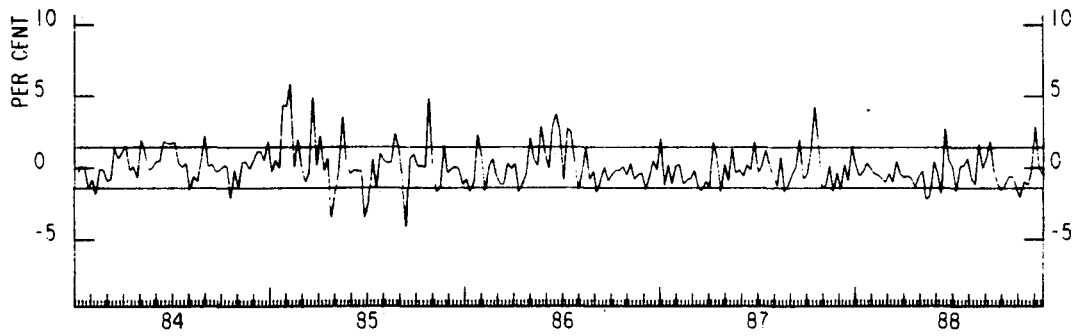


Note: As defined in Tables 4 and 5.

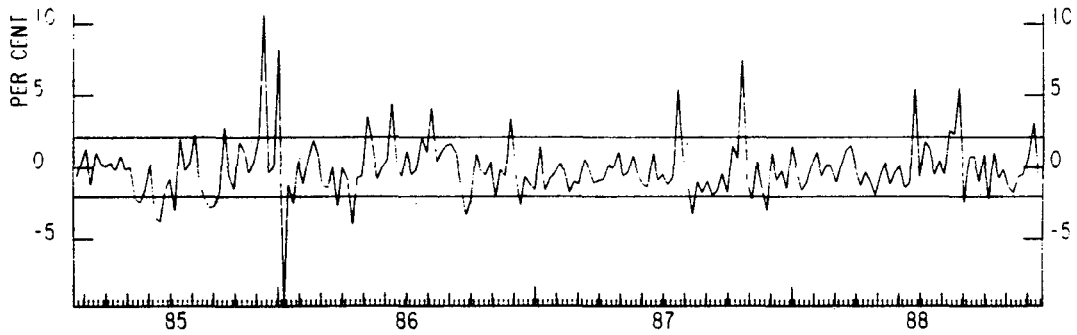
Chart 3 (continued)

WEEKLY BILATERAL EXCHANGE RATE
(% CHANGE)

AUSTRALIA



NEW ZEALAND

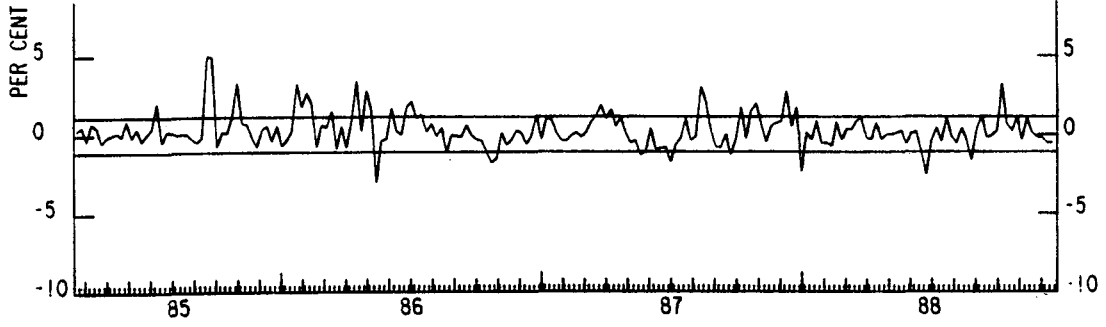


Note: As defined in Tables 4 and 5.

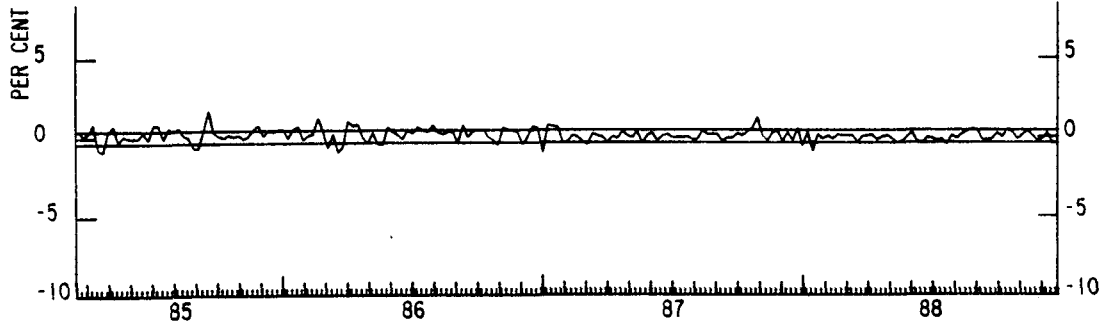
Chart 4

WEEKLY EFFECTIVE EXCHANGE RATE
(% CHANGE)

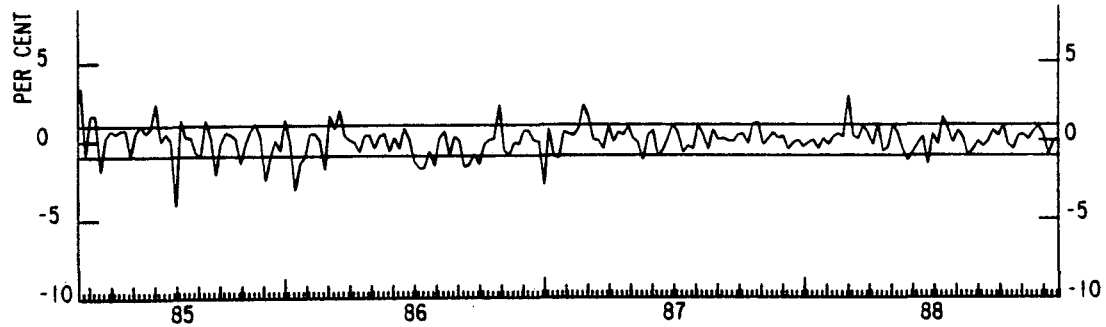
JAPAN



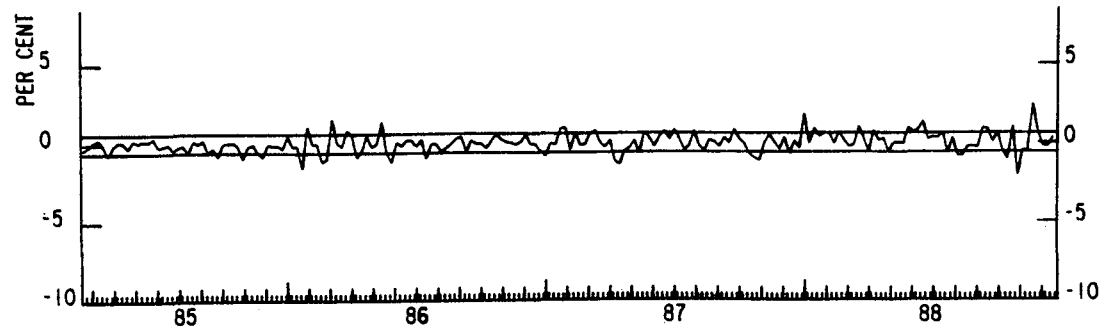
GERMANY



UK



CANADA

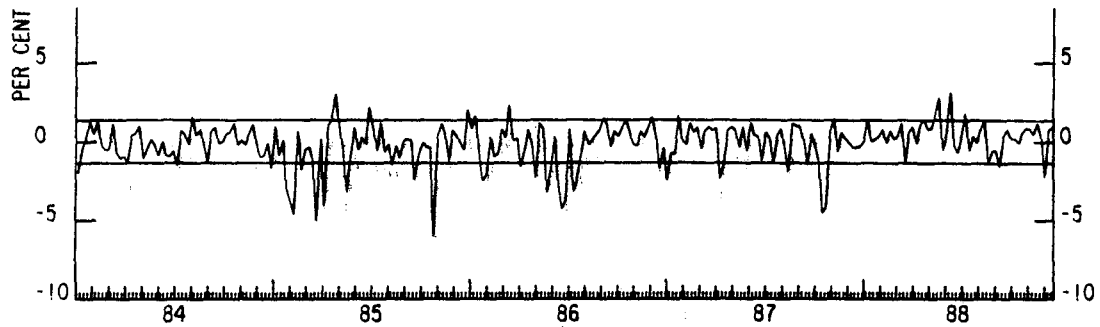


Note: As defined in Tables 4 and 5.

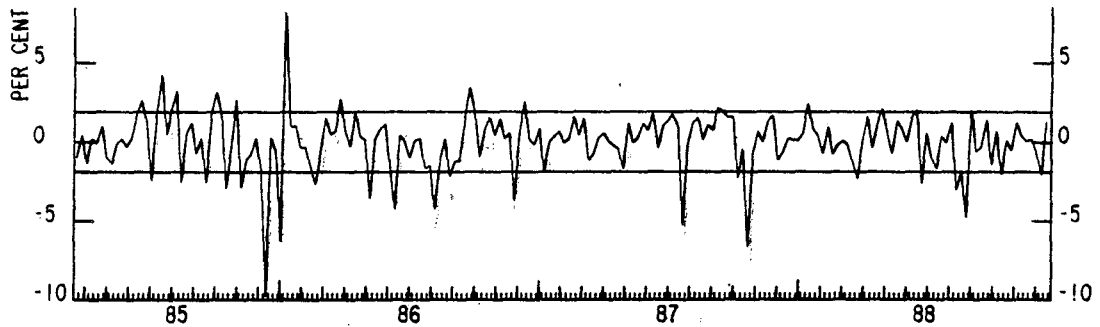
Chart 4 (continued)

WEEKLY EFFECTIVE EXCHANGE RATE
(% CHANGE)

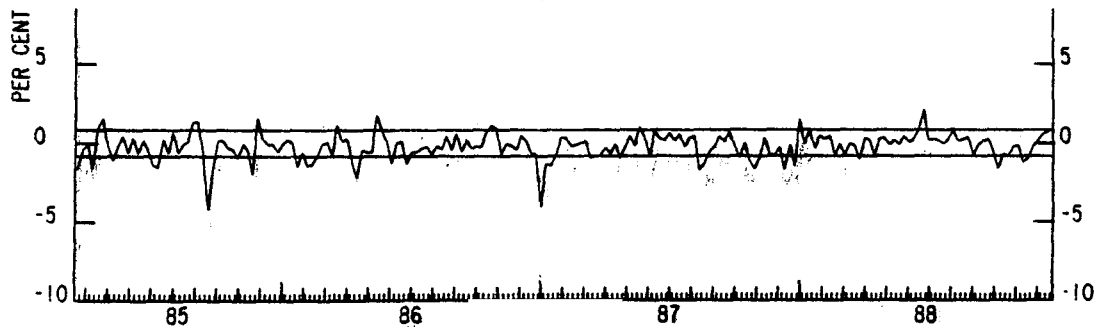
AUSTRALIA



NEW ZEALAND



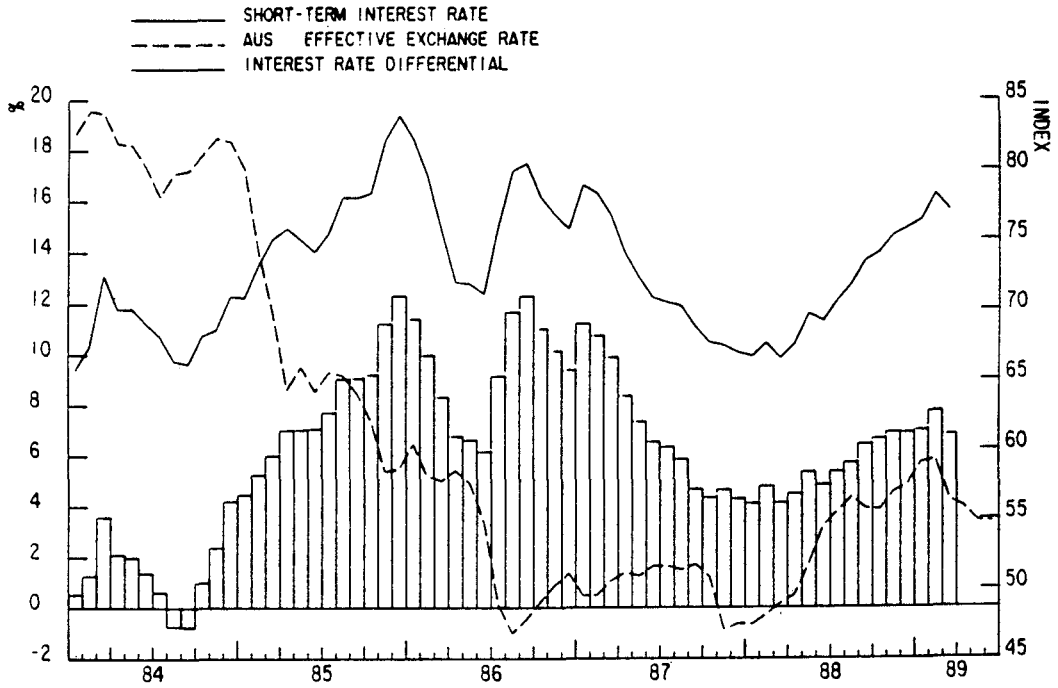
USA



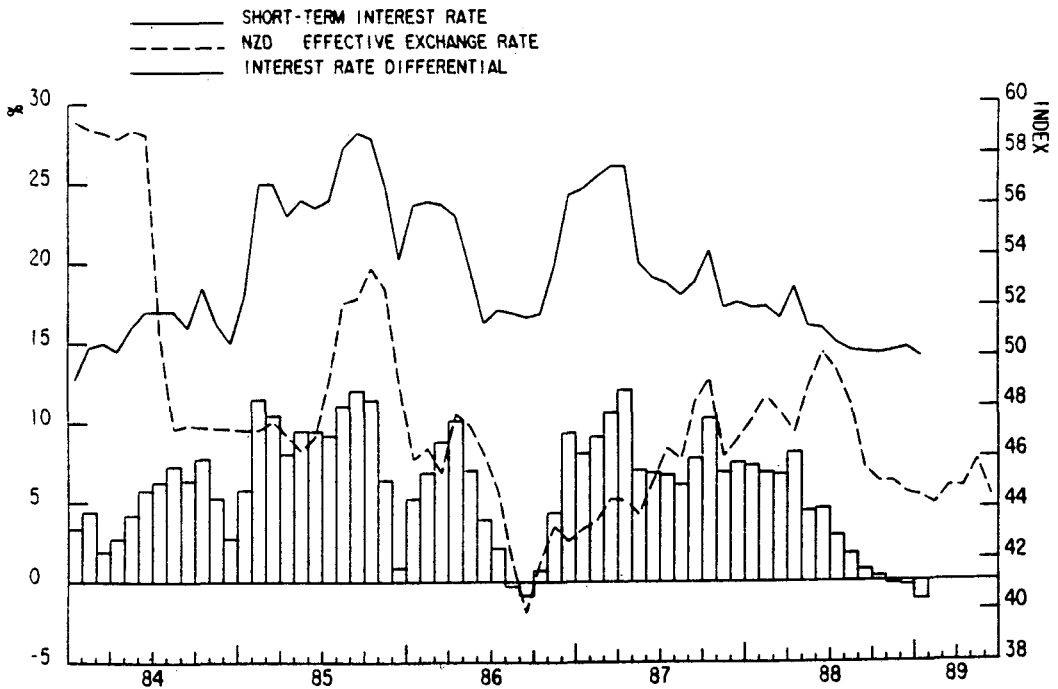
Note: As defined in Tables 4 and 5.

Chart 5

AUSTRALIA



NEW ZEALAND



Note: Exchange rates as defined above. Interest rates for Australia and New Zealand refer to 90-day commercial bills and three-month Treasury bills, respectively. The Australian interest differential takes the rate on the U.S. 90-day commercial paper as the foreign rate. The New Zealand interest differential is vis-à-vis Australia.

REFERENCES

- Akhtar, M.A., and R. Spence Hilton (1984). "Effects of Exchange Rate Uncertainty on German and U.S. Trade." Federal Reserve Bank of New York Quarterly Review, No. 9, New York, (Spring).
- Bailey, M.J., et al. (1986). "Exchange Rate Variability and Trade Performance. Evidence From the Big Seven Industrial Countries." Weltwirtschaftliches Archives, No. 122, Tubingen.
- Bank for International Settlements (1986). Recent Innovations in International Banking, Basel: BIS.
- Blundell-Wignall, Adrian and Marilyn Thomas (1987). "Deviations from Purchasing Power Parity: The Australian Case," Reserve Bank of Australia Discussion Paper No. 8711, Sydney.
- Blundell-Wignall, Adrian and Paul Masson (1985). "Exchange Rate Dynamics and Intervention Rules." International Monetary Fund Staff Papers, Vol. 32, No. 1. Washington: IMF, (March).
- Boyer, Russel S. (1978), "Optimal Foreign Exchange Market Intervention." Journal of Political Economy, Vol 86, No. 6, Chicago.
- Cushman, David O. (1986), "Has Exchange Risk Depressed International Trade? The Impact of Third-Country Exchange Risk." Journal of International Money and Finance, Vol. 5, Guildford, England, (September).
- Cushman, David O. (1988), "U.S. Bilateral Trade Flows and Exchange Risk During the Floating Period," Journal of International Economics, Vol. 24, Amsterdam, North Holland, (May).
- Cushman, David O. (1988a). "The Impact of Third-Country Exchange Risk. A Correction," Journal of International Money and Finance, Vol. 7, Guildford, England, (September).
- Dornbusch, Rudiger (1980). Open Economy Macroeconomics. New York, Basic Books
- Dreyer, Jacob S. (1978). "Determinants of Exchange Rate Regimes for Currencies of Developing Countries: Some Preliminary Results." World Development, Vol. 6. London, Pergamon.
- Edwards, Sebastian (1987), "Tariffs, Terms of Trade, and the Real Exchange Rate in an Intertemporal Optimizing Model of the Current Account." National Bureau of Economic Research Working Paper No. 2175. Cambridge, Massachusetts: NBER, (March).
- Edwards, Sebastian (1987a), "Anticipated Protectionist Policies. Real Exchange Rates and the Current Account." National Bureau of Economic Research Working Paper No. 2214, Cambridge, Massachusetts: NBER, (April).
- Engle, Robert F., and C.W.J. Granger (1987). "Cointegration and Error Correction: Representation, Estimation and Testing." Econometrica, Vol. 55, No. 2, Chicago: University of Chicago Press, (March).

Fischer, Stanley (1977), "Stability and Exchange Rate Systems in a Monetarist Model of the Balance of Payments," in The Political Economy of Monetary Reform, edited by R.Z. Aliber, London: Macmillan.

Frenkel, Jacob A. (1982), and Joshua Aizenman, "Aspects of the Optimal Management of Exchange Rates," Journal of International Economics, Vol. 13, Amsterdam, North Holland

Fuller, Wayne A (1976). Introduction to Statistical Time Series, New York: John Wiley

Gotur, Padma (1985). "Effects of Exchange Rate Volatility on Trade: Some Further Evidence." International Monetary Fund Staff Papers, Vol 32, Washington: IMF. (September)

Gregory, Robert G. (1976). "Some Implications of the Growth of the Minerals Sector." The Australian Journal of Agricultural Economics, Vol. 20, No 2, Sydney.

Heller, H. Robert (1978). "Determinants of Exchange Rate Practices." Journal of Money, Credit and Banking, Vol 10. Columbus, Ohio: Ohio State University Press, (August).

Holden, Paul, Merle Holden, and Esther Suss (1979), "The Determinants of Exchange Rate Flexibility: An Empirical Investigation." Review of Economics and Statistics, Vol. 61, Cambridge, Massachusetts, (August).

International Monetary Fund (1984). Exchange Rate Volatility and World Trade, Washington: IMF. (July).

Kenen, Peter B., and Dani Rodrik (1986). "Measuring and Analysing the Effects of Short-Term Volatility in Real Exchange Rates." Review of Economics and Statistics, Vol. 68, Cambridge, Massachusetts, (May).

Lowe, Phillip, and Robert Trevor (1986). "The Performance of Exchange Rate Forecasts," Reserve Bank of Australia Discussion Paper, No. 8609.

Mundell, Robert A. (1969). "Towards a Better International Monetary System," Journal of Money, Credit and Banking, Vol. 1, No. 3, Columbus, Ohio: Ohio State University Press. (August).

Mussa, Michael (1986). "Nominal Exchange Rate Regimes and the Behaviour of Real Exchange Rates: Evidence and Implications". Carnegie-Rochester Conference Series on Public Policy, Vol. 25. Amsterdam, North Holland. (Autumn).

Neary, Peter (1988). "Determinants of the Equilibrium Real Exchange Rate," American Economic Review, Vol 78, No. 1, Nashville, Tennessee. (March).

Ostry, Jonathon D. (1989). "The Balance of Trade, Terms of Trade, and Real Exchange Rate." International Monetary Fund Staff Paper, Vol. 35, No. 4, Washington: IMF

Poole, William (1970), "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model." Quarterly Journal of Economics, Vol 84. Cambridge, Massachusetts. (May)

"Report of the Working Group on Exchange Market Intervention." (1983). Washington: Board of Governors of the Federal Reserve System.

Shafer, Jeffrey R., and Bonnie Loopesko (1983), "Floating Exchange Rates After Ten Years," Brookings Papers on Economic Activity, No 1. Washington: The Brookings Institution.

Tease, Warren (1988), "Speculative Efficiency and the Exchange Rate: Some Evidence Since the Float." Economic Record, Vol. 64. No 184. Australia. (March).

ECONOMIC AND STATISTICS DEPARTMENT

WORKING PAPERS

In April 1983, the Economics and Statistics Department initiated a new series of economic studies entitled ESD Working Papers.

The following titles have been circulated.

1. Use of Demand Elasticities in Estimating Energy Demand (out of print)
Utilisation des élasticités de la demande dans l'estimation de la demande de l'énergie

Axel Mittelstädt

2. Capital, Energy and Labour Substitution: The Supply Block in OECD Medium-Term Models
Substitution du capital, de l'énergie et du travail : le bloc de l'offre dans les modèles à moyen terme de l'OCDE (épuisé)

Patrick Artus

3. Wage Formation in France. Sectoral Aspects (out of print)
Formation des salaires en France : aspects sectoriels (épuisé)

Patrick Artus

4. Service Lives of Fixed Assets (out of print)
Durée de vie utile des actifs fixes (épuisé)

Derek Blades

5. Resource Prices and Macroeconomic Policies: Lessons from Two Oil Price Shocks
Prix des ressources naturelles et politique macro-économique : les enseignements de deux chocs pétroliers (épuisé)

John Llewellyn

6. Output Responsiveness and Inflation: An Aggregate Study
Souplesse de la production et inflation : étude globale

David T. Coe and Gerald Holtham

7. The Determinants of Exchange Rate Movements (out of print)
Les déterminants des mouvements des taux de change (épuisé)

Graham Hacche

8. Simulated Macroeconomic Effects of a Large Fall in Oil Prices (out of print)
Simulation des effets macro-économiques d'une forte baisse des prix pétroliers
Flemming Larsen and John Llewellyn

9. Medium-Term Financial Strategy: The Co-ordination of Fiscal Monetary Policy (out of print)
Stratégie financière à moyen terme . la coordination des politiques monétaire et budgétaire (épuisé)
Jean-Claude Chouraqui and Robert Price

10. Price Dynamics and Industrial Structure: A Theoretical and Econometric Analysis (out of print)
Dynamique des prix et structure industrielle une analyse théorique économétrique (épuisé)
David Encaoua (with collaboration from Paul Geroski and Riel Miller)

11. Evidence on Income Distribution by Governments (out of print)
L'Action exercée par l'Etat sur la redistribution du revenu
Peter Saunders

12. Labour Force Participation: An Analysis with Projections
Taux d'activité : analyse et projections
James H. Chan-Lee

13. The Demand for Money and Velocity in Major OECD Countries (out of print)
La demande de monnaie et la vitesse de circulation dans les grands pays de l'OCDE
A. Blundell-Wignall, M. Rondoni and H. Ziegelschmidt

14. The Conduct of Monetary Policy in the Current Recovery
La conduite de la politique monétaire dans la phase actuelle de reprise économique
Paul Atkinson and Jean-Claude Chouraqui

15. Structural Budget Deficits and Fiscal Stance (out of print)
Déficits budgétaires structurels et orientation de la politique budgétaire (épuisé)
Patrice Muller and Robert W.R. Price

16. Monetary Policy in the OECD INTERLINK Model
La politique monétaire dans le modèle INTERLINK
A. Blundell-Wignall, M. Rondoni, H. Ziegelschmidt and J. Morgan

17. Real Gross Product in OECD Countries and Associated Purchasing Power Parities (out of print)
Produit brut réel et parités de pouvoir d'achat dans les pays de l'OCDE (épuisé)
Peter Hill

18. The OECD Compatible Trade and Production Data Base (out of print)
Base de données compatibles sur le commerce et la production de l'OCDE
Derek Blades and Wendy Simpson

19. Nominal Wage Determination in Ten OECD Economies
Détermination des salaires nominaux dans dix économies de l'OCDE
David T. Coe and Francesco Gagliardi

20. Profits and Rates of Return in OECD Countries
Profits et taux de rendement dans les pays Membres de l'OCDE
James H. Chan-Lee and Helen Sutch

21. Real Interest Rates and the Prospects for Durable Growth
Taux d'intérêt réels et perspectives de croissance durable
Paul Atkinson and Jean-Claude Chouraqui

22. Energy Prices: Trends and Prospects
Les prix de l'énergie : évolution et perspectives
Axel Mittelstädt

23. Changes in the Composition of Output and Employment
Changements dans la composition de la production et de l'emploi
Axel Mittelstädt and Françoise Correia

24. Labour Market Flexibility and External Price Shocks
Flexibilité du marché du travail et chocs extérieurs sur les prix

F. Klau and A. Mittelstädt

25. Discrepancies Between Imports and Exports in OECD Foreign Trade Statistics (out of print)
Ecart entre les importations et les exportations dans les statistiques du commerce extérieur de l'OCDE

Derek Blades and Marina Ivanov

26. Aggregate Supply in INTERLINK: Model Specification and Empirical Results

John Helliwell, Peter Sturm, Peter Jarrett and Gérard Salou

27. Commodity Prices in INTERLINK

Gerry Holtham, Tapio Saavalainen, Paul Saunders and Helen Sutch

28. Exchange Rates and Real Long-Term Interest Rate Differentials: Evidence for Eighteen OECD Countries

David T. Coe and Stephen S. Golub

29. Method of Calculating Effective Exchange Rates and Indicators of Competitiveness (out of print)

Martine Durand

30. Public Debt in a Medium-Term Context and its Implications for Fiscal Policy

Jean-Claude Chouraqui, Brian Jones and Robert Bruce Montador

31. The OECD Compatible Trade and Production Data Base 1970-1983

Anders Brodin and Derek Blades

32. The Formulation of Monetary Policy: A Reassessment in the Light of Recent Experience

Paul Atkinson and Jean-Claude Chouraqui

33. Mécanismes de transmission et effets macro-économiques de la politique monétaire en France : les principaux enseignements économétriques
Marc-Olivier Strauss-Kahn
34. Pure Profit Rates and Tobin's q in Nine OECD Countries
James H. Chan-Lee
35. Wealth and Inflation Effects in the Aggregate Consumption Function
G.H. Holtham and H. Kato
36. The Government Household Transfer Data Base
Rita Varley
37. Internationalisation of Financial Markets: Some Implications for Macroeconomic Policy and for the Allocation of Capital
Mitsuhiro Fukao and Masaharu Hanazaki
38. Tracking the US External Deficit, 1980-1985: Experience with the OECD INTERLINK Model
Pete Richardson
39. Monetary Policy in the Second Half of the 1980s: How Much Room For Manoeuvre?
Kevin Clinton and Jean-Claude Chouraqui
40. Tax Reform in OECD Countries: Economic Rationale and Consequences
Bob Hagemann, Brian Jones and Bruce Montador
41. A Revised Supply Block for the Major Seven Countries in INTERLINK
Peter Jarrett and Raymond Torres
42. OECD Economic Activity and Non-Oil Commodity Prices: Reduced-Form Equations for INTERLINK
Gerald Holtham and Martine Durand

43. Import and Export Price Equations for Manufactures
Richard Herd
44. Price Determination in the Major Seven Country Models in INTERLINK
Ulrich Stiehler
45. International Investment-Income Determination in INTERLINK: Models for 23 OECD Countries and Six Non-OECD Regions
David T. Coe, Richard Herd and Marie-Christine Bonnefous
46. Recent Developments in OECD's International Macroeconomic Model
Pete Richardson
47. A Review of the Simulation Properties of OECD's INTERLINK Model
Pete Richardson
48. The Medium-Term Macroeconomic Strategy Revisited
Jean-Claude Chouraqui, Kevin Clinton and Robert Bruce Montador
49. Are Commodity Prices Leading Indicators of OECD Prices?
Martine Durand, Sveinbjörn Blöndal
50. Private Consumption, Inflation and the "Debt Neutrality Hypothesis"
The case of Eight OECD Countries
Giuseppe Nicoletti
51. The Effects of Monetary Policy on the Real Sector: An overview of Empirical Evidence for Selected OECD Economies
Jean-Claude Chouraqui, Michael Driscoll and Marc Olivier Strauss-Kahn
52. The So-Called "Non-Economic" Objectives of Agricultural Policy
L. Alan Winters

53. Alternative Solution Methods in Applied General Equilibrium Analysis
Richard G. Harris
54. Tests of Total Factor Productivity Measurement
A. Steven Englander
55. Quantifying the Economy-Wide Effects of Agricultural Policies: A General Equilibrium Approach
Jean-Marc Burniaux, François Delorme, Ian Lienert, John P. Martin and Peter Hoeller
56. On Aggregation Methods of Purchasing Power Parities
J.R. and M. Cuthbert
57. An International Sectoral Data Base for Thirteen OECD Countries
F.J.M. Meyer-zu-Schlochtern
58. Empirical Research on Trade Liberalisation with Imperfect Competition: A Survey
J. David Richardson
59. Eliminating the US Federal Budget Deficit by 1993: the Interaction of Monetary and Fiscal Policy
R. Herd and B. Ballis
60. Compatible Trade and Production Data Base 1970-1985
Claude Berthet-Bondet, Derek Blades and Annie Pin
61. Ageing Populations: Implications for Public Finances
Robert P. Hagemann, Giuseppe Nicoletti
62. The Economic Dynamics of an Ageing Population: the Case of Four OECD Economies
Alan J. Auerbach, Laurence J. Kotlikoff, Robert P. Hagemann, Giuseppe Nicoletti

63. Modelling Housing Investment for Seven Major OECD Countries
Thomas Egebo and Ian Lienert
64. Revised Groupings for non-OECD Countries in OECD's macroeconomic model INTERLINK
Paul O'Brien, Laure Meuro, Arthur Camilleri
65. A Post Mortem on OECD Short-Term Projections from 1982 to 1987
Byron Ballis
66. Potential Output in the Seven Major OECD Countries
Raymond Torres and John P. Martin
67. Saving Trends and Behaviour in OECD Countries
Andrew Dean, Martine Durand, John Fallon and Peter Hoeller
68. The Impact of Increased Government Saving on the Economy
Richard Herd
69. The Information Content of the Terms Structure of Interest Rates: Theory and Practice
Frank Browne and Paolo Manasse
70. On the Sequencing of Structural Reforms
Sebastian Edwards
71. Modelling Business Sector Supply for the Smaller OECD Countries.
Raymond Torres, Peter Jarrett and Wim Suyker

1990

72. The Role of Indicators in Structural Surveillance

73. The Saving Behaviour of Japanese Households
Kenichi Kawasaki
74. Industrial Subsidies in the OECD Economies
Robert Ford and Wim Suyker
75. Measuring Industrial Subsidies: Some Conceptual Issues
Prof. Neil Bruce
76. The Dollar Position of the Non-U.S. Private Sector, Portfolio Effects, and the Exchange Rate of the Dollar.
Bixio Barenco
77. Monetary Policy in the Wake of Financial Liberalisation (forthcoming)
Adrian Blundell-Wignall, Frank Browne and Paolo Manasse
78. Indicators of Fiscal Policy: A Re-examination
Jean-Claude Chouraqui, Robert P. Hagemann, Nicola Sartor
79. Suggestions for a new set of Fiscal Indicators
Prof. Olivier Blanchard (MIT and NBER)
80. Fiscal Indicators
Prof. Edward Gramlich, University of Michigan
81. Financial Liberalisation and Consumption Smoothing (forthcoming)
Adrian Blundell-Wignall, Frank Browne, Stefano Cavaglia
82. Economics in the Environment
Jon Nicolaisen, Peter Hoeller

