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AN ANALYSIS OF THE WELFARE IMPLICATIONS OF ALTERNATIVE
EXCHANGE RATE REGIMES: AN INTERTEMPORAL MODEL WITH AN APPLICATION

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Abstract

We construct a two-period model of an open economy and use the model to analyze the welfare implications of fixed and floating exchange regimes. Consumers have perfect foresight and save by holding domestic and foreign bonds, which are chosen according to relative interest rates, deflated by the rate of devaluation of the domestic currency. The government produces a pure public good and finances its deficits by issuing money, domestic bonds, and by foreign borrowing. The government's bonds compete with private investment, which is entirely debt financed. Foreign exchange, i.e., foreign bonds, is made available via the current account, endogenous private borrowing, and exogenous public borrowing. The government, in turn, acts as a passive auctioneer, trading foreign currency at market prices, and the exchange rate is defined as the domestic price of foreign bonds.

The parameters of the model are estimated for Australia, and two counterfactual simulations have been carried out. In the first of these, a fixed exchange regime has been imposed upon 1983-84, when the exchange rate was actually allowed to float. Assuming that all exogenous parameters remain constant, the welfare implications of the two regimes are compared. The floating regime is found to be welfare superior for both categories of domestic consumers. Similar results are derived in a simulation in which the floating regime is imposed upon 1981-82, when a fixed exchange regime was actually in place. Our initial conclusion would be that, from the point of view of consumer welfare, floating exchange rates are superior to fixed rates in this Australian case.

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I. INTRODUCTION

The analysis of fixed and floating exchange rate systems has attracted considerable attention in recent years. There are a number of reasons for the interest, among which is the belief that the choice of regime may have significant implications for the real economy, and thus, for consumer welfare. The analysis is of considerably more than theoretical interest, as a number of countries have recently been confronted with the necessity of choosing between the two regimes. For example, in 1984 and early 1985, one industrial country and five developing countries opted to move to freely floating exchange rate systems. Australia, the example of our empirical analysis, switched from a fixed rate to a free float in 1983. In this paper we construct an intertemporal macroeconomic model that is intended to be able to incorporate both fixed and floating exchange rate regimes, and apply the model to Australia. We use a numerical solution method to compare both types of regimes in two periods: 1981-82 when the country had a fixed rate regime, and 1983-84 when it had a floating system. Our results, although not necessarily having any absolute significance for the comparison of exchange rate regimes in general, may be taken as an example of the way in which a comparison of regimes might be carried out for a particular country.

Comparisons of exchange rate regimes have typically taken one of three alternative approaches. The first approach asks which regime leads to greater exchange rate variance. The analysis relies on the fact that, ultimately, fixed exchange rate regimes are not sustainable and are hence subject to periodic realignments. A general consensus has emerged that, at least for the major industrialized countries, variability under floating rates has been much greater than under fixed rates. Moreover, much of the changes have been unexpected. ^{1/} However, proving that one regime leads to greater variability does not mean it leads to lower welfare. A decrease in exchange rate variability due to fixing the exchange rate might lead to an increase in the variability of other prices. Using partial equilibrium frameworks, large amount of econometric work has been focused on whether exchange rate variability hampers international trade. Only minimal evidence that this is so has been found. ^{2/}

Along with the effect exchange rate variability itself can have on individual agents, exchange rates can influence the effect of internal and external shocks on the domestic economy. Thus, the second approach attempts to answer the question: which system leads to greater stability of real and nominal variables in a small open economy in the face of such shocks? Welfare analysis in this literature is implicit;

^{1/} See, for example, IMF (1984).

^{2/} See Cushman (1983), de Grauwe and de Bellefroid (1986), Hooper and Kohlhagen (1978), IMF (1984), Kenen and Rodrik (forthcoming) and Thursby and Thursby (1981).

the regime which yields greater stability is deemed superior. In general, the results indicate that the choice of regime depends upon the nature and origin of the stochastic shocks affecting the economy. For example, Fischer (1977) and Mundell (1973) find the economy will be better insulated from foreign shocks under flexible exchange rate and, conversely, in the face of real domestic shocks, fixed exchange rates would provide greater stability as the shocks are more easily "exported" abroad. Conclusions from this literature are, however, highly dependent on certain assumptions made. In particular, it is common to ignore private capital flows. Clearly, if capital is mobile, many of the insulation properties of flexible exchange rates will be lost. ^{1/}

The third approach to comparing exchange rate regimes, of which this paper is an example, attempts to answer the question: which system better facilitates international trade in goods and services? This is the approach taken, for example, by Helpman and Razin (1979) ^{2/}, and necessarily involves intertemporal utility maximization subject to a budget constraint. Welfare conclusions in this approach are derived explicitly from the intertemporal utility function, and that regime is preferable which offers the wider choice of consumption possibilities over time. Clearly, the framework must allow capital flows under flexible exchange rates in order to permit the desired consumption

^{1/} Other papers analyzing the question with emphasis on the origin and nature of the shocks are Enders and Lapan (1979), Flood (1979) and Frenkel and Aizenman (1982).

^{2/} Other examples of this approach are Hause (1966) and Helpman (1981).

stream to be attained. Indeed, Helpman and Razin indicate that flexible exchange rates are preferable to fixed rates, as flexible rates allow the country to conduct an independent interest rate policy, and hence to fully exploit the benefits of money.

This paper contributes to the literature in two ways. First, none of the previous literature has analyzed the distributional effects of alternative exchange rate systems. This paper does this by considering the utility of two representative consumers who differ both in preferences, and hence are affected by relative price changes, and in factor endowments, and hence are affected by changes in returns to labor and capital.

Second, there has been very little attempt to present an equilibrium empirical analysis of the problem. Jager (1982) estimated a model for the Netherlands in which the optimal exchange regime minimizes a postulated loss function, but the loss function, depends on deviations of macro variables from trend, and thus is not derived from individual preferences. To our knowledge, there have been no empirical studies explicitly analyzing utility of consumption under differing exchange rate regimes in an intertemporal framework.

Computational general equilibrium models offer apparent possibilities for empirical comparisons of exchange regimes, given their disaggregated nature. Previously, however, virtually all such models, as described in Shoven and Whalley (1984), have either assumed a fixed exchange regime, or have not allowed the existence of financial assets, thereby requiring equilibrium in the current account and precluding the

possibility of capital flows. In addition, models that deal with trade generally do not have a time dimension, so that savings, and hence portfolio choice decisions cannot be analyzed. In the paper presented here, investors save home or foreign bonds and money. Consumers live for two periods and allocate consumption optimally between the two periods.

The results of this paper indicate that, if in 1981-82, Australia had floated rather than fixed its exchange rate, utility of one of the higher income representative consumers would have been lower in the short run due to a capital loss associated with increased domestic interest rates. Fixing, however, leads to an unsustainable trade deficit, and therefore, without a significant initial devaluation, would not have been a viable option. This result is not surprising, since Australia's exchange rate in 1981 was substantially overvalued relative to the equilibrium floating rate we simulate. In our model a floating regime leads to a rate that is 53 percent lower than the fixed rate. In order to induce investors to hold Australian dollars the interest rate is much higher than under floating and import prices are higher as well. Eventually the higher savings, as compared to the fixed regime, would result in higher output, employment, and consumption, but this would occur beyond the time horizon of the model.

Our model does not indicate, however, that in the short run it is better to fix the exchange rate. One important factor in determining which regime is better in the short run seems to be how overvalued the fixed regime is. We suppose that instead of fixing the Australian

dollar at $US\$/A\$ = 1.13$ in 1981, the authorities fixed it at $US\$/A\$ = 0.94$, a rate much closer to the simulated equilibrium rate. In this cases, a comparison of short-run utility levels under alternative regimes reveals that floating would have been better in the short run. Moreover, end-of-period stocks of foreign reserves and capital are higher, suggesting that long-run utility would be higher as well. Similar results were obtained from a simulation in which a fixed exchange regime is imposed on 1983-84, when the rate was actually permitted to float.

The next section will describe the analytical framework of our model, while section III will give data estimates for Australia. Section IV presents the results of counterfactual simulations, designed to compare exchange regimes, while the final section is a conclusion.

II. THE MODEL

Our model has two periods and all agents have perfect foresight. We will describe the various parts of the model.

Production

The production technology in our model follows that described in Feltenstein (1985). Output of the N intermediate and final goods is produced using these goods, as well as capital and labor, as inputs. It would be possible to use any standard representation of the production technology; however since we wish to empirically apply the model we employ a structure that allows us to use available data. We assume that intermediate and final good production is represented by an $N \times N$ input-output matrix so that there are fixed coefficients and no joint production. At least in the short run, this probably resembles the actual technology. In order to combine the inputs of intermediate and final goods into output it is necessary to use capital and labor. This value added is accomplished via Cobb-Douglas production technologies. For the j th sector the time- t value added is

$$v_{jt} = K_{jt}^{\delta_{jt}} L_{jt}^{1-\delta_{jt}} \quad 1 > \delta_{jt} > 0; j=1, \dots, N; t=1, 2. \quad (1)$$

Denote the cost-minimizing amounts of capital and labor needed to produce one unit of good j output by K_{jt} and L_{jt} , let p_{Kt} and w_t be the time- t rental rates for capital and labor, and let γ_{Kt} and γ_{wt} be the ad valorem taxes on capital and labor. Then the

cost of using capital and labor in the production of one unit of time- t good- j output is

$$C_{jt} = p_{Kt}(1 + \gamma_{Kt})K_{jt} + w_t(1 + \gamma_{wt})L_{jt} \quad j=1, \dots, N; t=1, 2 \quad (2)$$

Let a_{ij}^t be the number of units of output from industry i necessary to produce one unit of time- t output from industry j and let A_t be the matrix with representative element a_{ij}^t . Let y_{ij}^t be the output from industry i used in industry j and let y_j^t be the output of industry j . By the definition of a_{ij}^t , $y_{ij}^t = a_{ij}^t y_j^t$. Let x_j^t be the final demand for good j . Then

$$y_j^t = \sum_{i=1}^n a_{ji}^t y_i^t + x_j^t \quad j=1, \dots, N, t=1, 2 \quad (3)$$

Solving (3) for $y_t \equiv (y_1^t \dots y_N^t)$ gives

$$y_t = (I - A_t)^{-1} X_t, \quad (4)$$

where $X_t = [X_1^t \dots X_N^t]$ and I is the $N \times N$ identity matrix. Zero profits requires

$$\sum_{i=1}^N a_{ji}^t p_i^t - C_{jt} = 0. \quad j = 1 \dots N; t=1, 2 \quad (5)$$

where $p_t \equiv (p_1^t \dots p_N^t)$ is the vector of goods prices. Solving (5) for p gives

$$p_t = C (I - A_t)^{-1}, \quad t=1,2 \quad (6)$$

where $C_t \equiv (C_{1t} \dots C_{Nt})$ and I is the $N \times N$ identity matrix.

Time- t capital and labor may also be combined to produce time $t+1$ capital via the technology

$$K_{t+1} = K_{Kt}^{\delta_{Kt}} L_{Kt}^{1-\delta_{Kt}}, \quad t=1,2 \quad (7)$$

where $\delta_{Kt} > 0$. Because profits are not realized until a period after production takes place, production is financed by selling bonds to the private sector. Given factor taxes and rents, let C_{Kt} be the minimum cost of producing K_{t+1} . Then zero profits requires that the gross nominal return on bonds issued in period t and paid off in period $t+1$, ρ_t , times the nominal value of bonds issued, C_{Kt} , equal the next-period price of capital. Thus,

$$C_{Kt} \rho_t = p_{K,t+1} K_{t+1}. \quad (8)$$

It is assumed that investment is entirely debt financed, and that investors must carry out their borrowing in the domestic market. ^{1/}

^{1/} The first restriction could be relaxed, in the case of sector-specific capital, to allow investment out of retained earnings. Because we do not permit foreign borrowing to finance private investment, the degree of crowding-out predicted by our model is stronger than would otherwise be the case.

Thus, the investor sells a nominal quantity of bonds

$$C_{Kt} = B_t^P. \quad (9)$$

The Government

The government produces a pure public good using capital and labor. This good is assumed not to increase private utility or production. Output of the public good, Q_t , is given by

$$Q_t = K_{Qt}^{\delta_{Qt}} L_{Qt}^{1-\delta_{Qt}} \quad \delta_{Qt} > 0, \quad t=1,2 \quad (10)$$

The government chooses cost-minimizing levels of capital and labor, K_{Qt} and L_{Qt} , to produce Q_t . Thus, government expenditure on the public good is

$$C_{Qt} = p_{Kt} K_{Qt} + w_t L_{Qt} \quad (11)$$

Define i_t and π_t as the time- t nominal interest rate and inflation rate, respectively.

$$1 + \pi_t \equiv \frac{\sum_{j=1}^N \zeta_j p_{tj}}{\sum_{j=1}^N \zeta_j p_{t-1,j}}, \quad (12)$$

where ζ_j is the weight on good j in the price index and $\sum_{j=1}^n \zeta_j = 1$.

The real rate r_t is approximated by

$$r_t \equiv i_t - \pi_t. \quad (13)$$

The government would like to target the output of public goods \bar{Q}_t ; however it is necessary to impose certain constraints on government expenditure to reflect the fact that arbitrary targets for the public good may be impossible to finance. Accordingly, it sets guidelines for inflation and real interest rates, $\bar{\pi}_t, \bar{r}_t$. If inflation and real interest rates rise above these guidelines, the government will scale back its output of public goods. These guidelines, which are described in detail in Feltenstein (1985), are required to ensure the boundedness of the issue of financial assets by the government. Thus we define actual output of the public good as ^{1/}

$$Q_t = \bar{Q}_t / (1 + a \cdot \max(r_t - \bar{r}_t, \pi_t - \bar{\pi}_t, 0)) \quad a > 0 \quad (14)$$

The government also has interest obligations on borrowing, both domestic and foreign, that it has undertaken in the past. Let B_{t-1} be the stock of outstanding home-currency government bonds at time t , F_{t-1} be the outstanding stock of the government's foreign debt, i_t^f be foreign nominal interest rate, and e_t be the price of foreign bonds in

^{1/} Any decreasing function of r_t and π_t could have been used.

terms of home bonds (or the exchange rate). Then total period-t government expenditure is

$$G_t = C_{Qt} + i_t B_{t-1} + e_t i_t^f + F_{t-1} \quad (15)$$

Taxes are collected from two sources. The first is the levy on wages (γ_{Lt}) and interest earnings (γ_{Kt}) in equation (2) and the second is sales taxes on the consumption of final goods. Let γ_{jt} be the time-t sales tax on good j. Recalling that K_{jt} and L_{jt} are the cost-minimizing amounts of labor needed to produce one unit of good j, the total taxes in period t are

$$T_t = \sum_{j=1}^N ((p_{Kt} \gamma_{Kt} K_{jt} + w_t \gamma_{Lt} L_{jt}) y_j^t + \gamma_{jt} p_{jt} X_j^t) \quad (16)$$

The time-t budget deficit is

$$D_t \equiv G_t - T_t. \quad (17)$$

The government finances its deficit by monetization, sales of domestic bonds, and foreign borrowing. We will assume that the government has a rule which determines the proportions of the deficit to be financed by each asset. Suppose

$$F_t(D_t) = (f_{t1}(D), f_{t2}(D), f_{t3}(D))$$

is a continuous function of D such that

$$\sum_{j=1}^3 f_{tj} = 1, f_{tj} > 0. \quad (18)$$

Here f_{ij} , $j=1,2,3$ represent the share of the deficit financed by money, domestic bonds, and foreign bonds, respectively. Accordingly, the government's issuance of financial assets is determined by:

$$D_t = p_{Mt} f_{t1}(D_t)D_t + p_{Bt} f_{t2}(D_t)D_t + p_{BFt} f_{t3}(D_t)D_t$$

The flows of assets from the government, M_t , B_t , and F_t , are then defined by:

$$M_t = f_{t1}(D_t)D_t, B_t = f_{t2}(D_t)D_t, F_t = f_{t3}(D_t)D_t \quad (20)$$

The Foreign Sector

The foreign sector (or rest of the world) is explicitly linked to the home country through both the current and capital accounts. There is no foreign exchange per se in the model, as domestic investors hold foreign bonds but not foreign currency. ^{1/} This may be rationalized by viewing foreign-exchange as foreign currency-demoninated bank accounts, which pay interest equivalent to that on foreign bonds. Foreign bonds, then, are the mechanism by which all foreign transactions, current or capital take place.

^{1/} It is common in models of exchange rate determination to suppress domestic residents' holdings of foreign exchange. See e.g., Allen and Kenen (1980) and Mussa (1982).

We assume that the foreign currency-denominated value of total export demand in period t , X_t^f , is a function of relative export prices and world income, Z_t , as follows:

$$X_t^f = a \left(\frac{PX}{PXW}\right)_t^{b_0} \left(\frac{PX}{PXW}\right)_{t-1}^{b_1} \dots \left(\frac{PX}{PXW}\right)_{t-m}^{b_m} Z_t^{c_0} \dots Z_{t-n}^{c_n} \dots \quad (21)$$

where m and n are lag lengths, the world export price index (PXW) is given exogenously, the home export price index (PX), in terms of foreign currency, is given by

$$PX_t = \sum_{j=1}^n \eta_j^t p_j^t / e_t \quad (22)$$

where η_j^t is the export share of the j th sector, $\sum_{j=1}^N \eta_j^t = 1$. Note that, for a given foreign currency value of exports, the home-currency value of export demand is unit elastic with respect to the exchange rate. It is only the total volume of exports which may vary, however, the proportion of exports in each sector remains constant in each period, independent of relative prices, and is given by

$$X_{jt}^f = \eta_j X_t^f \quad (23)$$

Import demand equals the sum of final consumption demand and demand for intermediate inputs to production. One or more columns of the input-output matrix represent imports, hence final demand for imports is determined through the consumer maximization problem.

Foreign borrowing for investment purposes, F_t^I , is assumed to take place entirely within the public sector. This is intended to capture the notion that all foreign borrowing is eventually guaranteed by the government. Thus, the government sells bonds denominated in foreign currency in addition to domestic currency bonds. These bonds may be purchased by both domestic and foreign residents. ^{1/} The foreign denominated bonds pay the exogenously given world rate of interest in period t , i_t^f .

We also allow foreign borrowing for consumption purposes. This is set exogenously in period t at level F_t^C , and has domestic currency value $c_t F_t^C$. The exogenous setting of foreign borrowing may be interpreted in one of two ways. Either there are government imposed capital controls, or there is a supply constraint to foreign lending. We wish to avoid the additional complexities of having optimizing behavior in foreign borrowing. Such behavior would, however, be compatible with the structure of our model. It should be noted that although gross borrowing is exogenous, consumers may freely divest themselves of foreign assets, so that net borrowing is endogenous.

Thus the outstanding foreign debt in period t , y_t^F , on which the government pays interest is given by:

$$F_t = F_{t-1}^C + F_{t-1}^I \quad (24)$$

^{1/} In practice, of course, the bulk of government's foreign borrowing would be from foreign residents.

The demand for foreign bonds by domestic residents is derived from portfolio balance considerations, and is discussed along with the consumer maximization problem. The exchange rate (the price of foreign bonds) is determined in equilibrium as one of the prices which equate supply and demand in all markets, including the market for foreign bonds. As the supply of, and demand for, foreign bonds are determined simultaneously with the current account and the capital account, the exchange rate determination mechanism employed here is more general than those which assume one of the other to dominate. ^{1/} Note, however, that by postulating a high degree of substitutability between domestic and foreign bonds any deviation from interest parity would cause large capital flows, and the capital account would therefore exert a much larger influence on the exchange rate than would the current account.

Consumption

There are H consumers who live for the two periods of the model, and in order to motivate savings in period two, for a third, or future period. They are assumed to have perfect foresight about period two in period one; that is they perfectly anticipate all period two prices and taxes.

Let x_{jt}^h be the h th individual's consumption of good j in period t , $h=1, \dots, I$; $J=0, \dots, N$; $t=1, 2$. Good 0 is leisure and the other N goods

^{1/} Models of exchange rate determination which focus exclusively on the current account include Johnson (1958) and Dornbusch (1973). Those which focus exclusively on the capital account include Dornbursh (1976) and Branson (1977).

are the intermediate and final goods. An individual's utility level is given by

$$U = \frac{2}{\pi} \prod_{t=1}^N \prod_{j=0}^N X_{jt}^{\alpha_{jt}} \quad (25)$$

where the superscript h has been omitted. Parameter values may vary across individuals and $\alpha_{jt} > 0$, with equality holding for strictly intermediate goods. Without loss of generality let

$$\sum_{j=0}^N \alpha_{j1} = 1.$$

and define

$$\beta \equiv \sum_{j=0}^N \alpha_{j2}.$$

The parameter β can be thought of as the rate of time preference and is assumed to be constant across consumers. This particular specification of preferences is not crucial to the working of the model and permits a simple analytic solution to the consumer's problem.

In period one consumer h is endowed with \bar{M}^h units of domestic money, domestic bonds with a nominal value of \bar{B}^h , foreign bonds with a nominal (in terms of the domestic currency) value of \bar{B}^{*h} , \bar{K}^h units of physical capital, and \bar{L}^h units of labor. The bonds pay interest at the start of each period. The endowment of home bonds consists entirely of government debt, as initial private debt holding would be inconsistent

with the intertemporal investment problem specified. The consumer's nominal initial wealth is

$$Y_1 \equiv P_{K1} \bar{K} + w_1 \bar{L} + R_1 \bar{B} + R_1^* \bar{B}^* + \bar{M} + T_1, \quad (26)$$

where $R_t \equiv 1 + i_t$ and $R_t^* \equiv (1+i_t^f)e_t/e_{t-1}$ are the period- t gross nominal returns to holding domestic and foreign bonds, respectively, and T_t is the period- t nominal transfer from the government. The superscript h has been dropped. Transfers may vary across consumers.

In period two the consumer is again endowed with \bar{L} units of labor. It is assumed that there is no secondary market for physical capital and that this capital depreciates at a rate μ . Thus at the start of period two the consumer's nominal wealth is

$$Y_2 \equiv p_{k2} (1 - \mu)\bar{K} + w_2 \bar{L} + R_2 b_1 + R_2^* b_1^* + m_1 + T_2. \quad (27)$$

where b_1 , b_1^* , and m_1 are the consumer's first-period net acquisitions of home and foreign bonds and home money.

Purchases of the N non-leisure goods are taxed at the ad valorem rates $\{\gamma_{jt}\}_{j=1}^N$. Labor income taxes are withheld by the firm so that w_t represents the after tax wage. The first- and second-period budget constraints are given by

$$Y_t > \sum_{j=1}^N q_{jt} X_{jt} + w_t X_{0t} + b_t + b_t^* + m_1, \quad (28)$$

where $q_{it} \equiv (1+\gamma_{jt})p_{jt}$, and X_{Ot} is the consumption of leisure in period t .

Consumers save in the form of nominal interest-bearing bonds. While uncertainty is not explicitly modeled here, we wish to capture the idea that, because of risk considerations, home and foreign bonds are not regarded as perfect substitutes. Investors wish to hedge against uncertainty by holding a diversified portfolio. In a perfect foresight framework, equilibrium requires that the real returns in home and foreign bonds are equalized and investors are indifferent as to the composition of their portfolio. We capture the idea that consumers wish to hedge by imposing

$$b_t^* = c(R_{t+1}^*/R_{t+1})^d b_t. \quad (29)$$

Note that as $d \rightarrow \infty$ the bonds become perfect substitutes. Let nominal savings of bonds be denoted by

$$\begin{aligned} S_t &\equiv b_t + b_t^* \\ &= (1+c(R_{t+1}^*/R_{t+1})^d)b_t \end{aligned} \quad (30)$$

and the gross nominal return on bonds be denoted by

$$i_{t+1} = R_{t+1} (1+c(R_{t+1}^*/R_{t+1})^d). \quad (31)$$

Equation (28) can be rewritten as

$$Y_1 > \sum_{j=1}^N q_{j1} X_{j1} + w_1 X_{01} + S_1 + m_1. \quad (32)$$

The second-period budget constraint is

$$E_2 + i_2 S_1 + m_1 > \sum_{j=1}^N q_{j2} X_{j2} + w_2 X_{02} + S_2 + m_2, \quad (33)$$

where $E_2 \equiv P_{k2}(1 - \delta)\bar{K} + w_2\bar{L}_2 + T$.

In order to have consumers hold bonds in period 2 we assume a savings rate, σ , equal to the long-run savings rate for the economy. ^{1/} Period 2 savings thus depends on consumption and is given by:

$$S_2 = \sigma \sum_{j=1}^N q_{j2} X_{j2}. \quad (34)$$

Money is held solely for transactions purposes. One could specify a transactions technology and find the utility-maximizing choice of $\{m_t\}$, but instead we simply posit that the solution is

$$m_t = ar_t^{-b} \sum_{j=1}^N q_{jt} X_{jt}, \quad (35)$$

^{1/} For a discussion of other possible closure rules in similar model, see Blanchard (1985).

where a and b are estimated parameters. ^{1/} Note that velocity will vary with the interest rate. Letting $Z_t \equiv ar_t^{-b}$ and substituting (35) and (36) into (33) and (34) gives the consumer's problem.

max (25) with respect to $\{x_{jt}\}_{j=0}^n, \{S_t\}_{t=1}^2$

subject to

$$\bar{L} > X_{ot} \quad t=1,2 \quad (36)$$

$$Y_1 > (1 + Z_1) \sum_{j=1}^N q_{j1} X_{j1} + w_1 X_{01} + S_1 \quad (37)$$

$$E_2 + i_2 S_1 + Z_1 \sum_{j=1}^N q_{j1} X_{j1} > (1 + \sigma + Z_2) \sum_{j=1}^N q_{j2} X_{j2} + w_2 X_{02} \quad (38)$$

If \bar{L} is large enough, then the solutions are:

$$X_{j1} = \frac{\alpha_{j1} (i_2 Y_1 + E_2)}{q_{j1}^{AH}} \quad j=1, \dots, N \quad (39)$$

$$x_{01} = \frac{\alpha_{01} (i_2 Y_1 + E_2)}{w_1 A} \quad (40)$$

^{1/} The specification which implies a constant interest elasticity of money, is chosen because facilitates the algorithmic solution of our model. One might also choose to specify equation (35) in terms of a partial interest elasticity of money, as is more commonly done. In our estimations, however, neither specification proved superior to the other.

$$X_{j2} = \frac{\alpha_{j2} (\iota_2 Y_1 + E_2)}{q_{j2} A (\alpha + Z_2)} \quad j=1, \dots, N \quad (41)$$

$$X_{02} = \frac{\alpha_{02} (\iota_2 Y_1 + E_2)}{w_2 A} \quad (42)$$

$$S_1 = \frac{H((\beta + \alpha_{02})\delta_2 Y_1 - (\alpha_{01} + 1)E_2) - Z_1(\delta_2 Y_1 + E_2)}{AH\delta_2} \quad (43)$$

$$S_2 = \frac{\alpha\beta(\iota_2 Y_2 + E_2)}{A(\sigma + Z_2)} \quad (44)$$

$$m_1 = \frac{Z_1(\iota_2 Y_1 + E_2)}{AH} \quad (45)$$

$$m_2 + \frac{Z_2\beta(\iota_2 Y_1 + E_2)}{A(\sigma + Z_2)} \quad (46)$$

where $A \equiv 1 + \alpha_{01} + \beta + \alpha_{02}$ and

$$H \equiv \iota_2(1 + Z_1) - Z_1$$

By (30) and (31),

$$b_t = \frac{S_t}{1 + c(R_b^*/R_{t+1})^d} \quad (47)$$

$$b_t^* = \frac{c(R_{t+1}^*/R_{t+1})^d S_t}{1 + c(R_{t+1}^*/R_{t+1})^d} \quad (48)$$

III. AN ESTIMATION OF THE MODEL FOR AUSTRALIA

Australia is particularly suited for an application of our model. The economy is sufficiently market-oriented that the use of a general equilibrium model does not seem too far-fetched. It is also reasonable to assume that the country is a price-taker in all of its imported goods markets. We will, in addition, make the Armington (1969) assumption that traded goods are distinguished both by physical characteristics as well as place of origin. Perhaps most important for the comparison of fixed and floating rate regimes is the fact that Australia moved from a system of fixed to floating rates at the end of 1983, while liberalizing capital markets. We will therefore use 1981-82 to represent the period of fixed exchange rates, and 1983-84 to represent the floating-rate period. Since we will only attempt to give a illustrative example, we will go no further in attempting to describe Australian reality.

Our first task will be to demonstrate that the model represents a reasonable approximation to the actual outcomes of the two time periods. We will assume that all utility functions and production technologies remain the same in the two periods, and that the only changes are in initial allocations, exogenous government policy parameters (such as tax rates), and the foreign exchange regime. It will then be possible to make comparisons, isolating the effects of the exchange

regime. ^{1/} Rather than solving for parameters that give the exact outcomes of the years in questions, we have chosen to estimate these parameters directly wherever possible. ^{2/}

We will describe the benchmarking of 1983-84 under the floating exchange regime first. The Australian production technology is represented by a 30x30 input-output matrix, in which activities 29 and 30 represent imports of complementary and competing goods. We have assumed no technical change, so that the 1983 and 1984 technologies are given by the same matrix. We have imposed a Cobb-Douglas structure on the sectoral value added functions, and have estimated the individual coefficients from the relative shares of capital and labor in each sector in the 1977 input-output matrix. The aggregate investment function is also assumed to be Cobb-Douglas, and its coefficients δ_{Kt} , and $1-\delta_{Kt}$ for capital and labor, respectively, are derived from aggregating sectoral shares. The resulting coefficients are:

$$\delta_{Kt} = 0.5758 \quad 1-\delta_{Kt} = 0.4242$$

^{1/} These types of comparisons will be subject to the Lucas criticism that behavioral parameters would not remain constant when the exchange regime changes. It would be interesting test whether, in fact, the parameters have remained stable, but due to the shortness of the floating rate period we have not done this.

^{2/} This method of "calibration" is described in Shoven and Whalley (1984).

so that capital has a larger share in investment than does labor. ^{1/}
Targets for government expenditure on goods and services as a percentage
of GDP, \bar{Q}_t , are taken to be their actual values for 1983 (t=1) and
1984 (t=2). Thus ^{2/}

$$\bar{Q}_1 = 0.3825 \quad \bar{Q}_2 = 0.3903$$

We have also assumed a Cobb-Douglas form for government production. The
resulting coefficients for capital, δ_{Qt} , are:

$$\delta_{Q1} = 0.4140 \quad \delta_{Q2} = 0.4483$$

Finally, the rate of depreciation, μ , is taken to be $\mu = 0.0629$. ^{3/}

We lack sufficient data to derive effective sales tax rates on
a sector-by-sector basis. Accordingly, we have imposed a uniform rate,
a simplification that seems justified since the Australian system
charges uniform sales taxes on all goods except certain household
durables and private motor vehicles. The sales tax rates, γ_t are

^{1/} The above figures are derived from Australian National Accounts
Input-Output Tables (1983), Tables (12) (Input-Output Coefficients),
(11) (Value-added Functions), (18) Investment Coefficients).

^{2/} See Australian Economic Statistics (1983), Table 2.1 and
International Financial Statistics, various issues.

^{3/} This figure is taken from the ORANI general equilibrium model of
Australia (see Dixon et al. (1982)).

then: 1/

$$\gamma_1 = 0.178 \quad \gamma_2 = 0.187$$

We use the average personal income tax rate to represent the tax on labor usage, γ_{Lt} , while the capital tax is taken to be the corporate income tax rate, γ_{Kt} . These are 2/

$$\gamma_{kt} = 0.46 \quad \gamma_{L1} = 0.23, \quad \gamma_{L2} = 0.218$$

Our model has three consumer categories: high income Australian, low income Australian, and rest of the world. Initial allocations of the five factors are given by the end-of-1983 holdings by consumers. The derivation of allocations of capital, labor, and money is described in Feltenstein (1985). Holdings of domestic bonds are given by the 1983 interest obligations on government debt, with the shares being given by the shares in capital income of the two domestic consumer categories. Similarly, initial holdings of foreign reserves by domestic consumers are given by end of 1983 foreign reserve holdings, while the rest of the world's holdings, is given by the value of 1983 Australian exports. The allocations are:

1/ See, 1984/85 Budget Paper No. 1, Commonwealth Government.

2/ Op. cit.

Table 1. Initial Allocations (1983)
(Rows 1-4 in millions of A\$, row 5 in millions of US\$)

	Australian 1 (Low Income)	Australian 2 (High Income)	Rest of World
1. Capital ^{a/}	11386	35373	0
2. Labor ^{a/}	30384	52338	0
3. Money ^{b/}	16972	44681	0
4. Domestic Bonds ^{c/}	818	2553	0
5. Foreign Bonds ^{d/}	1530	4025	17645

a/ See Australian Economic Statistics (1984), Tables 5.5. See Income of Individuals, Australia 1981-82 (1984) for the distribution of income.

b/ See IFS, various issues.

c/ See Australian Economic Statistics (1984), Table 2.22.

d/ Cp. cit. Table 1.19.

The budget shares in the individual domestic consumers' utility function are taken from the addilog estimates for Australia in Bewley (1982), and are reported in Feltenstein (1985). It is assumed that the shares remain the same in each period. We have also assumed there to be positive elasticity of demand for leisure, which we have not attempted to estimate, but have allowed to vary in order to achieve an approximation to the benchmark years. Similarly, the rate of time preference has also been allowed to vary.

The money demand equation, specified in equation (35) is estimated in log form as:

$$\log M/C = .0936 - 0.169 \log r \quad (49)$$

(1.723) (-5.931)

$$R^2 = 0.90 \quad D.W. = 2.16$$

where M is nominal broad money, C is nominal consumption, and r is the nominal interest rate. The numbers in parenthesis are t-statistics. Here we have assumed instantaneous adjustment of the actual to the desired money stock. The original form in equation (35) may then have its parameters identified as:

$$M = 1.098 r^{-.169} C \quad (50)$$

Due to difficulties in data availability, we have not attempted to estimate directly the portfolio equation (29), but have allowed both the intercept and elasticity to vary to fit the benchmark years.

All capital inflows are taken to have their actual values for 1983-84, corresponding to our treatment of these flows as being exogenous. ^{1/} Foreign financing of the government budget deficit is taken to have its actual values, while the shares of money and domestic bonds in financing the remainder of the budget are allowed to vary.

Equation (21), representing demand for Australia exports, is estimated with a log length of 2, and a lagged dependent variable is

^{1/} All data comes from Australia Bureau of Statistics, Balance of Payment, various issues.

included to help account for serial correlation. ^{1/} The estimated equation is:

$$\begin{aligned}
 \log(X^f) = & -2.526 + .770 \log\left(\frac{PX}{PXW}\right) - .606 \log\left(\frac{PX}{PXW}\right)_{-1} \\
 & \quad (-2.2) \quad (4.0) \quad \quad \quad (-2.5) \\
 & + .056 \log\left(\frac{PX}{PXW}\right)_{-2} + 1.485 \log(USGDP) - .218 \log(USGDP)_{-1} \\
 & \quad (0.3) \quad \quad \quad (2.6) \quad \quad \quad (0.3) \\
 & -1.20 \log(USGDP)_{-2} + .650 \log(X^f)_{-1} \quad \quad \quad (51) \\
 & \quad (-2.3) \quad \quad \quad (4.7) \\
 R^2 = & .9938
 \end{aligned}$$

where FX and PXW represent home and foreign export price indices, and world income is proxied by USGDP. Figures in parenthesis are t-statistics. ^{2/}

^{1/} When estimating models with lagged variables, it is common to impose a lag structure (e.g, polynomial distribution lags) in order to reduce the number of estimated coefficients and reduce the risk of collinearity. For our purpose, however, we care only for the predicted values of the equation and not for the particular parameter estimates, hence collinearity is not of great concern. As a check, we ran the equation for a lag length of 10 using a polynomial distributed lag (Almon lag) or order 3, and compared the predicted values from this equation to those generated by the equation in the text. The predicted values for one equation had absolutely no explanatory power for the residuals of the other equation (both R² values were less than 0.1).

^{2/} We may note that the lag weights reflect a 'J-curve' phenomenon, that is, the price elasticity of demand 'value' in the first period is positive, and is larger than the long-run 'value' elasticity (the sum of the lag price coefficients is .220). Further, this long-run elasticity is positive, indicating that even in the long run the value of exports increases with the relative price of exports -- hence the demand 'quantity' elasticity is less than unity.

We now have all parameters needed to solve our model, and may turn to a benchmark solution. Table 2 gives actual and simulated values.

Table 2: Simulated Vs. Actual
(Benchmark Case, Floating Rate)

	1983		1984	
	Simulated (In Percent of GDP)	Actual	Simulated (In Percent of GDP)	Actual
Tax revenue	27.6	27.2	28.0	26.2
Government expenditure	30.0	29.9	30.9	30.5
Budget surplus	-2.4	-2.7	-2.9	-4.3
Gross private investment	10.0	15.3	8.1	12.0
Exports of goods	13.1	12.8	14.1	12.8
Imports of goods	12.0	13.4	12.3	12.7
Trade balance	-1.1	-0.6	1.8	0.1
			(in percent)	
Inflation ^{a/}			4.7	4.0
Interest rate	19.7	14.3	12.0	13.8
Change in exchange Rate (U.S.\$/A\$)			-5.9	-8.2
Growth in real GDP			5.1	6.7

a/ No first-period value was generated.

We thus notice that our model generates a reasonably accurate approximation to actual outcomes.

A benchmark solution for the corresponding model operating under fixed exchange rates in the years 1981-82 is given in Feltenstein

(1985). We have resimulated that model, changing slightly the exogenous parameters. For all estimable behavioral and technological parameters (money demand, export demand, consumption and production parameters), we have used identical values to those generated for the floating exchange rate model. The initial allocations and government policy parameters are period-specific and based on 1981-82. The solution to that model is only slightly different from the result reported in Feltenstein (1985), so we shall not report its comparison with actual outcomes again here.

free to choose parameters
home pref.
labor home use
portfolio parameter c. d.
proportions of govt
deficits financial diff.
ways

IV. A COMPARISON OF EXCHANGE REGIMES

Having now carried out approximate replications of the fixed and floating exchange rate periods, we may turn to a question. What would the implications, in particular for consumer welfare, have been if exchange regimes had been reversed? Thus the floating regime would be applied in 1981-82, and the fixed in 1983-84. The comparison will be made in the following way. We will suppose that all initial allocations remain as they were in the benchmark simulation. Thus, for example, the initial allocations for the 1981-82 fixed rate case are maintained when the floating rate regime is imposed on those years. In addition, all exogenous policy parameters, such as tax rates, the level of real government expenditures, and budget deficit financing rules, as well as all calibration parameters, remain unchanged. As we mentioned earlier, it is assumed that all behavioral parameters are the same under both fixed and floating regimes. Thus when, for example, we impose the floating rate regime in 1981-82, the only difference from the fixed rate regime will be in the exchange regime itself. It may, of course, be claimed that an experiment that supposes that behavioral parameters remain constant during a change in regime is invalid. This is, however, beyond the scope of this study.

Let us now turn to our first counterfactual example, in which we impose a floating exchange rate in the fixed exchange rate years, 1981-82. Corresponding to Table 2, we have the following results.

Table 3. Fixed Vs. Floating Exchange Rates, 1981-82

	1981		1982	
	Floating	Fixed	Floating	Fixed
	(In percent of GDP)			
Tax revenue	25.9	25.8	26.8	27.2
Government expenditures	26.4	28.6	24.8	28.2
Budget surplus	-0.5	-2.8	2.0	-1.0
Gross private investment	13.5	13.3	9.9	11.8
Exports of goods	13.3	11.5	16.9	9.4
Imports of goods	10.8	12.5	13.2	12.7
Trade balance	2.5	-1.0	3.7	-3.3
	(In percent)			
Inflation	a/	a/	27.1	12.0
Interest rate	15.8	4.6	37.4	17.6
Exchange rate (US\$/A\$)	1.47	1.13	0.69	1.13
Change in exchange rate	a/	—	-53.1	—
Growth in real GDP	a/	a/	4.7	12.3
Real GDP (In constant A\$) ^{b/}	133.6	128.8	139.9	144.5

a/ No percentage changes are generated for the first period.

b/ We have normalized 1981 figures so that real GDP simulated by the fixed rate regime equals its historical value in that year.

The most striking result is that the equilibrium floating exchange rate depreciates by over 50 percent between period one and period two, suggesting that the fixed rate in Australia in 1982 was sharply overvalued. As a result, import prices would have been sharply higher under a float. Thus inflation in the simulated float was 27 percent compared with 12 percent in the simulated fixed regime. In order to induce investors to hold Australian currency-denominated assets in the face of the large depreciation in 1981, simulated floating-regime

real interest rates are much higher than simulated fixed rate regime. The trade balance under the floating case is positive and improving, while under the fixed case it was negative and worsening, suggesting that the fixed regime would not have been sustainable.

The fact that the government budget deficit as a percentage of GDP is larger under the fixed regime may be attributed to the fact that the initial outstanding stock of both foreign and domestic government debt is same in both simulations. As indicated in Table 3, the 1981 exchange rate is lower under the floating than under the fixed regime, so that government interest payments on foreign debt is correspondingly lower. The lower 1981 budget deficit under floating rates required less bond financing than the fixed rate deficit and, accordingly, 1982 interest payments under the floating regime are sufficiently low so as to cause these to be surplus in the government budget. Domestic interest rates rise sharply in the floating regime, as the devaluation in the exchange rate causes the equilibrium price of domestic bonds to fall.

We now turn to the problem of welfare ranking the two regimes. Utility levels for the two representative consumers are summarized below.

Table 4. Utility Levels: Fixed Vs. Floating Regimes, 1981-82

	Floating	Fixed
Consumer 1 (low income)	0.82	0.80
Consumer 2 (high income)	8.69	9.02

In the years 1981-82 the higher income consumer is worse off under the floating regime. This is because he suffers a large capital loss on his holdings of domestic bonds and because imports account for a large fraction of his consumption. The low income consumer, however, is initially made better off by floating the exchange rate.

Of course this welfare comparison is a short-run ranking as the model extends for only two periods and the end-of-model stocks of capital, reserves and debt differ under the two regimes. Total private investment was almost two percentage points of GDP higher under the fixed regime in 1982, but the budget deficit was about three percentage points higher and reserves were lower, suggesting that in the longer run the fixed rate regime would be inferior. Thus the model suggests that a low income consumer ought to have preferred floating rates in 1982. The high income consumer would have initially been worse off, but would eventually have been made better off.

One obvious difficulty in making welfare comparisons with the model is that, while consumption and savings of bonds are derived while consumption and savings of bonds are derived from utility maximization, money demand is not. Presumably, because money facilitates transactions, it indirectly raises utility, but this is not captured here. Thus, all other things being equal, an increase in money holdings results in an opportunity cost of lost interest earnings with no attendant increase in utility. Under the fixed rate case a slightly larger amount of money is held (due to the lower nominal interest rate),

which should bias down utility for that regime. ^{1/} For the high-income consumer this strengthens the argument that in the short run a fixed regime is better. However, for the low-income consumer its possible that this in the near term. We attempted to compensate for this as follows. We computed the additional amount of money held in the fixed regime over the floating regime. We then assumed that consumers in the fixed regime could optimally allocate the money on consumption goods at equilibrium prices. Even with prices not being allowed to rise to reflect the increased demand, the low income consumer in the fixed regime was not made as well off as the low income consumer in the floating regime. The results are summarized belows.

Table 5: Compensated Utility Levels: Fixed Vs. Floating Regimes, 1981-82

	Floating	Fixed
Consumer 1 (low income)	.82	.813
Consumer 2 (high income)	8.69	9.16

Although the fixed rate regime is welfare-superior to the floating regime for one consumer, it clearly is unsustainable, as indicated by the trade deficits in each year. Suppose that the government had devalued the exchange rate in 1981 and had then fixed the

^{1/} In the floating regime the low income consumer allocated 51.7 percent of his consumption budget to money while the high income consumer allocated 50.8. In the fixed regime the low income consumer allocated 52.1 while the high income consumer allocated 51.6.

rate, thereby attempting to stabilize the trade balance. As an example, we will suppose that the exchange rate is devalued by 20 percent in 1981. The following results occur.

Table 6: Welfare and Trade Balance Implications
of Alternative Exchange Rate Regimes, 1981-82

	<u>Fixed</u>	<u>Fixed</u> ^{a/}	<u>Float</u>
1981: Trade Balance (billion US\$)	-1.2	-0.7	4.1
1982: Trade Balance (billion US\$)	-4.4	-2.9	3.7
Utility, Consumer 1	0.80	0.77	0.82
Utility, Consumer 2	9.02	8.63	8.69

a/ With 20 percent devaluation.

We thus note that the 20 percent devaluation leads to a solution that in the short run is welfare inferior to both the float and the original fixed regime. At the same time, it still leads to an unsustainable trade deficit, although one that is less severe than that caused by the original, highly overvalued, fixed rate. We thus have an example of a situation in which an overvalued exchange rate leads to welfare improvement for only part of the economy, as compared to a fixed rate, and is unsustainable because of the loss of reserves it brings about.

As a final example, we may impose the fixed exchange rate regime on 1983-84, when a floating regime was actually in place. The

same methodology was imposed as in the previous example. In order to make the comparison, we fixed the exchange rate in both periods at the rate that prevailed in the floating rate simulation in 1983. We will summarize the results of the comparison.

Table 7: Welfare and Trade Balance Implications of Alternative Exchange Rate Regimes, 1983-84

	Fixed	Float
1983: Exchange Rate (US\$/A\$)	0.70	0.70
1984: Exchange Rate (US\$/A\$)	0.70	0.66
1983: Trade Balance (billion US\$)	-1.6	1.2
1984: Trade Balance (billion US\$)	-1.9	2.1
Utility, Consumer 1	1.03	1.14
Utility, Consumer 2	11.76	12.73

We thus notice that in this example, where the fixed regime outcome was calculated at the "realistic" exchange rate of the floating regime in 1983, the differences between trade balances under fixed at floating regimes is less extreme than in the previous simulation. The floating regime also leads to a short-run welfare improvement over the fixed regime, due primarily to the impact of increased exports. End-of-model reserves are 15.1 percent higher under the floating rate, probably outweighing the 13.3 percent lower real investment level. We may conclude accordingly, that at least in this Australian case, floating the exchange rate is probably welfare-superior to fixing the rate, even in the short run. Only if the fixed rate is set at a highly overvalued

level does it lead to a short-run welfare improvement, for some consumers. Since this rate leads to an unsustainable trade balance, it is not a realistic alternative to the float.

V. CONCLUSION

We have constructed a two-period model of an open economy and have used the model to analyze the welfare implications of fixed and floating exchange regimes. Consumers have perfect foresight and save by holding domestic and foreign bonds, which are chosen according to relative interest rates, deflated by the rate of devaluation of the domestic currency. The government finances its deficits by issuing money, domestic bonds, and by foreign borrowing. The government's bonds compete with private investment, which is entirely debt financed. Foreign exchange, i.e., foreign bonds, are made available via the current account, private borrowing, which is endogenous, and public borrowing which is exogenous. The government, in turn, acts as a passive auctioneer, trading foreign currency at market prices, and the exchange rate is defined as the domestic price of foreign bonds.

The parameters of the model have been estimated for Australia, and two counterfactual simulations have been carried out. In the first of these, a floating exchange regime has been imposed upon 1981-82, when the exchange rate was actually fixed. Assuming that all exogenous parameters remain constant, the welfare implications of the two regimes are compared. The floating regime is found to be welfare improving for the low-income consumer, although the high-income consumer suffers a short-run welfare loss. The fixed rate is highly overvalued, however, and leads to trade deficits which, in the long run, would be unsustainable. A 20 percent devaluation of the fixed rate leads to an

improvement in the trade account, but is inferior to both the floating regime and the original fixed regime in the short run. In the second simulation a fixed regime was imposed on the period 1983-4 when a floating rate actually prevailed. In this case floating was preferred by both consumers in the short run, and probably the long run as well. Our initial conclusion would thus be that, from the point of view of consumer welfare, floating exchange rates were superior to fixed rates in this Australian case. Only in the short run with an overvalued, and unsustainable rate does fixing represent a welfare improvement for some consumers over floating.

BIBLIOGRAPHY

- Allen, Polly R. and Peter B. Keren. 1980. Asset Markets, Exchange Rates, and Economic Integration. Cambridge University Press.
- Australian Economic Statistics, 1949-50 to 1982-83, I Tables (Sydney: Reserve Bank of Australia, 1984).
- Australia National Accounts, Input-Output Tables, 1977-78, (Canberra: Australian Bureau of Statistics, 1983).
- Bewley, R. A. (1982), "On the Functional Form of Engel Curves: The Australian Household Expenditure Survey, 1975-76," The Economic Record , Vol. 58, No. 16, pp. 82-81.
- Blanchard, Oliver, J. 1985. "Debt, Deficits, and Finite Horizons". Journal of Political Economy 93(2): 223-47.
- Branson, W. 1977. "Asset Markets and Relative Prices in Exchange Rate Determination". Sozialwissenschaftliche Annalen 1:69-89.
- Chan, Kenneth S. 1982. "Rational Expectations and the Optimal Foreign Exchange Regimes", Canadian Journal of Economics (15(1):164-74.
- Cushman, David O., "The Effects of Real Exchange Rate Risk on International Trade", Journal of International Economics (Amsterdam). Vol. 15 (August 1983). pp. 44-63.
- Customs and Excise Revenue Australia, Annual Summary Tables, 1982-83 (Canberra: Australian Bureau of Statistics, 1984).
- de Grauwe, Paul and Bernard de Bellefroid, Long-Run Exchange Rate Variability and International Trade," mimeo 1986.
- Dixon, P. B., B. R. Parmenter, J. Sutton, and D. P. Vincent. 1982. ORANI: A Multisectoral Model of the Australian Economy. Australian: North Holland Publishing Company.
- Dornbusch, Rudiger, 1976. "Expectations and Exchange Rate Dynamics". Journal of Political Economy 84:1161-76.
- Dornbusch, Rudiger, 1973. "Currency Depreciation, Hoarding, and Relative Prices". Journal of Political Economy 81(4):893-915.
- Enders, Walder and Harvey E. Lapan, "Stability, Random Disturbances and the Exchange Rate Regime," Southern Economic Journal 45, July 1979, pp. 44-70.

- Fel'denstein, Andrew, 1985. "An Intertemporal General Equilibrium Model of Financial Crowding Out: Theory with An Application to Australia", IMF Staff Papers (forthcoming).
- Fischer, Stanley, 1977. "Stability and Exchange Rate Systems in a Monetarist Model of the Balance of Payments". In Robert Z. Aliber (ed.), The Political Economy of Monetary Reform, pp. 59-73. New York: Macmillan.
- Flood, Robert P., "Capital Mobility and the Choice of the Exchange Systems", International Economic Review 20, No. 2 June 1979, pp. 405-16.
- Frenkel, Jacob A. and Joshua Aizenman, "Aspects of Optimal Management of Exchange Rates", Journal of International Economics 13, No. 3-4, November 1982, pp. 321-56.
- Hause, John C. 1966. "The Welfare Costs of Disequilibrium Exchange Rate". Journal of Political Economy 74:333-52.
- Helpman, Elhanan, and Assaf Razin. 1979. "Towards a Consistent Comparison of Alternative Exchange Rate Regimes". Canadian Journal of Economics 12(3):394-409.
- Helpman, Elhanan. 1981. "An Exploration in the Theory of Exchange Rate Regimes". Journal of Political Economy 89(5):865-90.
- Hooper, Peter and Steven W. Kohlhagen, "The Effect of Exchange Rate Uncertainty on the Prices and Volume of International Trade", Journal of International Economics 8 (Nov. 1978) 483-511.
- IMF, Exchange Volatility and World Trade, a Study by the Research Department of the IMF, Occasional Paper, No. 28. Washington: (IMF, July 1984).
- Income Distribution Australia, 1978-79, Individuals (Canberra: Australia Bureau of Statistics, 1981).
- Jager, H. 1982. "Optimal Exchange Rate Policy in an Open Economy". De Economist. 130(2):228-63.
- Kenen, Peter, B. and Dani Rodrik, "Measuring and Analyzing the Effects of Short-Term Volatility in Real Exchange Rates", Review of Economics and Statistics, forthcoming.
- Mundell, Robert, "Uncommon Arguments for Common Currencies", in the Economics of Common Currencies ed. by H. G. Johnson and A. K. Swoboda. London: Allen and Unwin 1973. pp. 114-32.

- Mussa, Michael, "A Model of Exchange Rate Dynamics", Journal of Political Economy, 90 (1982):74-104.
- Shoven, John B., and John Whalley, 1984. "Applied General Equilibrium Models of Taxation and International Trade", Journal of Economic Literature, Vol. XXII:3, pp. 1007-1052.
- Thursby, Marie. 1980. "The Resource Reallocation Costs of Fixed and Flexible Exchange Rates: A Multi-Country Extension", Journal of International Economics 11(Nov. 1981): 487-493.
- Thursby, Marie C., and Jerry G. Thursby. "The Uncertainty Effects of Floating Exchange Rates: Empirical Evidence on International Trade Flows". It is scheduled to be published by Ballinger in Exchange Rates, Trade, and the U.S. Economy, ed. by Sven W. Arndt, Richard J. Sweeney, and Thomas D. Willet.

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