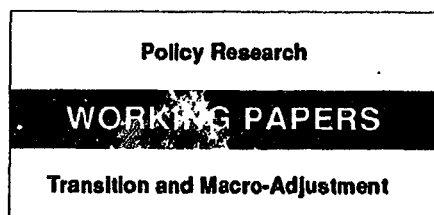


WPS 1026



Country Economics Department
The World Bank
November 1992
WPS 1026

Financial Liberalization and Adjustment in Chile and New Zealand

Paul D. McNelis
and
Klaus Schmidt-Hebbel

Liberalization of the capital account does not eliminate volatility. Rather, it shifts it from the domestic interest rate to the real exchange rate.

Policy Research

WORKING PAPERS

Transition and Macro-Adjustment

WPS 1026

This paper — a product of the Transition and Macro-Adjustment Division, Country Economics Department — received financial support from the Instituto Interamericano de Mercados de Capital. An earlier version of the paper was presented at the Seventh Latin American Regional Meeting of the Econometric Society, Costa Rica, August 1988. The paper will be published in the August 1993 *Journal of International Money and Finance*. Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Anna Marañon, room N11-042, extension 31450 (November 1992, 52 pages).

McNelis and Schmidt-Hebbel analyze macrodynamic adjustment during financial liberalization in Chile and New Zealand.

During the adjustment to more open capital accounts in the late 1970s or mid-1980s, both countries experienced appreciation of the real exchange rate and a collapse of net exports, while domestic interest rates slowly converged to international levels. McNelis and Schmidt-Hebbel develop and estimate a two-sector

dynamic model using both current and time-varying parameters. They find the domestic interest rate to be more responsive to shocks under imperfect capital mobility, the real exchange rate more responsive under perfect capital mobility.

In short, liberalization of the capital account does not eliminate volatility but rather shifts it from the domestic interest rate to the real exchange rate.

The Policy Research Working Paper Series disseminate the findings of work under way in the Bank. An objective of the series is to get these findings out quickly, even if presentations are less than fully polished. The findings, interpretations, and conclusions in these papers do not necessarily represent official Bank policy.

Financial Liberalization and Adjustment in Chile and New Zealand

**Paul D. McNelis
Department of Economics
Georgetown University
Washington, DC 20057
(202) 687-5573 office
(202) 687-6102 FAX**

**Klaus Schmidt-Hebbel
The World Bank
1818 H Street, NW, Room N11-049
Washington, DC 20433
(202) 473-7453 office
(202) 676-0083 FAX**

TABLE OF CONTENTS

INTRODUCTION	2
I. GENERAL EQUILIBRIUM UNDER IMPERFECT ASSET SUBSTITUTABILITY AND PERFECT CAPITAL MOBILITY	6
I.A. Asset Markets Equilibria and Wealth	7
I.B. Goods Markets Equilibria in a Dependent Economy	10
I.C. Foreign Sector Equilibrium	11
I.D. General Equilibrium	12
II. CAPITAL FLOWS AND DOMESTIC ADJUSTMENT UNDER IMPERFECT CAPITAL MOBILITY	14
III. MODEL IMPLEMENTATION AND EMPIRICAL RESULTS: CHILE AND NEW ZEALAND	21
III.A. Relations Implied by Model	22
III.B. Stationarity of the Data	23
III.C. Estimation Results, Constant Parameters	23
III.D. Estimation Results with Kalman Filtering	30
IV. CONCLUDING REMARKS	41
APPENDIX 1	
APPENDIX 2	
FOOTNOTES	
REFERENCES	

Financial support by the Instituto Interamericano de Mercados de Capital is acknowledged. Our thanks go to Hector Hernandez and Brendan O'Donovan for able research assistance, and to James Hanson, John Cuddington, Felipe Morande, and anonymous referees for valuable comments. We also benefitted from suggestions of the late Bela Balassa. An earlier version of this paper was presented at the VII Latin American Regional Meeting of the Econometric Society, Costa Rica, August 1988.

INTRODUCTION

Significant fluctuations of foreign credit flows, domestic interest rates and real exchange rates affected most financially semi-open economies in recent years. Especially affected were those Southern hemisphere countries which rapidly liberalized their capital accounts, overborrowed, and then experienced a foreign credit squeeze.

Chile and New Zealand, far apart geographically, are small primary producers which were long isolated from international financial markets. Both countries followed a similar pattern of adjustment following rapid financial liberalization. Initial overborrowing and real exchange rate overappreciation led to a loss of competitiveness and ultimately a balance of payments crisis, followed by protracted stagnation and real exchange rate depreciation.

Domestic interest rates did not converge rapidly to covered world interest rates following liberalization of capital markets. This slow convergence posed severe problems. With interest rates remaining high during the liberalization process, and imports becoming relatively cheap, domestic producers faced a credit squeeze at the worst possible time.

In Chile, the nominal exchange rate was fixed during the period of financial liberalization (1979-1982), followed by discrete devaluations, a brief float, and an active crawl in the wake of the 1982-83 financial crisis and recession.¹

Several studies have analyzed interest rate adjustment in Chile. Corbo and Matte (1984) estimated a simple portfolio adjustment model. The offset coefficient for Chile was less than minus one, implying less than perfect capital mobility, despite the liberalization policies. Edwards (1985), on the other hand, defined a "semi-open" economy as one in which the interest rate depends on both domestic credit conditions as well as on covered foreign interest rates. With standard econometric techniques, he found Chile (as well as Colombia) to be financially semi-open, and not open (in which case only covered foreign interest rates matter). Valdes-Prieto (1992) reviews Chilean capital-account liberalization, concluding that both its timing and intensity were beneficial to the country, in spite of the costs of overborrowing due to inadequate banking supervision before 1983.

The New Zealand experience of liberalization and reform came much later than the Chilean experience. As well as similarities, there are some important differences from the Chilean adjustment. The debt that was accumulated in New Zealand was mostly private debt, and never was assumed by the government, as in Chile, followed by the financial crises in 1982. There was no high inflation problem, comparable to Chile, although a reduction of inflation rates from double-digit levels was a goal of the reforms set in place in 1985. The nominal exchange rate was floated after liberalization, but in 1988, the Reserve Bank changed the emphasis of monetary policy to greater exchange rate.²

We develop a two-sector model for current and capital-account interaction during financial liberalization. It yields the dynamic relations between foreign debt accumulation, the real exchange rate and domestic interest rate adjustment (when all three variables are endogenous) under imperfect asset substitutability and imperfect capital mobility. With regard to trade in goods and non-financial services, different degrees of openness are consistent with this general framework. We wish to explain the sharp fluctuations in domestic interest rates, real exchange rates, and capital inflows following financial liberalization. In particular, we wish to show that during the process of financial liberalization, the responsiveness of the domestic interest rate to underlying domestic variables diminishes over time, as it slowly converges to the covered world interest rate, while the real exchange rate becomes increasingly more responsive to domestic variables.^{3,4}

Our starting point is Dornbusch and Fischer (1980). However, rather than following a national/foreign goods dichotomy, we define the real exchange rate as the relative price in a traded/non-traded goods model. In addition to the two assets in the Dornbusch-Fischer model, money and foreign bonds, we also introduce a third asset, domestic bonds, which enables us to model imperfect asset substitutability and imperfect capital mobility. We assume imperfect capital mobility in response to domestically imposed restrictions on flows or on holdings of foreign capital or debt. Imperfect capital mobility thus allows for short-run deviations of domestic interest rates from their long-run equilibrium levels.

Because of additional imperfect asset substitutability, stationary equilibrium interest rates also deviate from values under perfect arbitrage.

Kouri and Porter (1974) have used a portfolio model in which domestic and foreign assets are imperfect substitutes. There are two differences between our portfolio model and theirs. We model explicitly the variables which are behind imperfect substitutability between domestic and foreign bonds and we distinguish between instantaneous and long-run asset market equilibria.

In our dependent-economy specification the current account is determined by the excess of income over absorption. We assume that the nominal exchange rate is controlled by the government and is subject to discrete or continuous changes or even to fixed exchange-rate periods. While this assumption does not fit strictly the New Zealand experience for the first three years following liberalization (1985-1988), it does apply to the New Zealand case from 1975-85 and from 1988 to the present. Furthermore, greater real exchange rate volatility under flexible exchange rates with capital mobility is an implication of nominal exchange rate overshooting explored by Dornbusch (1976). While the model can be recast for the case of flexible exchange rates, the propositions we derive for real exchange rate and interest rate behavior are valid for both a fixed and flexible exchange rate regimes.

In the next section we present the model, for the benchmark case of perfect capital mobility. In section II we study the

dynamics of the real exchange rate, capital inflows and domestic interest rates under imperfect capital mobility. In section III we present the results of an empirical analysis--using time-varying parameter methods--of the real exchange rate, the interest rate, net exports, and foreign reserves for both countries. The Chilean period covers the 1975-1982 bust-boom-bust years of financial liberalization and high foreign debt accumulation, while the New Zealand analysis spans 1975 to 1991, with financial liberalization, real exchange rate appreciation, and output stagnation beginning in 1985.

I. GENERAL EQUILIBRIUM UNDER IMPERFECT ASSET SUBSTITUTABILITY AND PERFECT CAPITAL MOBILITY

Our model specifies asset and goods markets equilibrium conditions, and under capital mobility spells out the dynamics of foreign asset accumulation. From this, we derive dynamic equilibrium conditions for foreign asset accumulation and the real exchange rate. Although inflationary and exchange rate devaluation expectations appear in the model, they do so in order to define real interest rates and arbitrage levels of international interest rates. We make no assumptions about expectations mechanisms, since we do not analyze continued exogenous nominal exchange-rate changes nor changes in long-run inflation rates.

I.A. Asset Markets Equilibria and Wealth

Total private domestic wealth (w) is composed of financial wealth (w_f) and real wealth (w_r). Financial wealth is the sum of three outside assets in private hands: domestic money (M), domestic government bonds (B) and foreign assets (F), each of them deflated by the domestic price index (Q).

Continuous asset market clearing ensures that real asset demands L , BD and FD equate actual real asset holdings at equilibrium returns. The signs of the partial derivatives of each variable in the equations appear in brackets below the corresponding functions. The three demand functions have the following form:

$$(1) \quad M/Q = L(i, i^* + \mu LR + \hat{E}^e + \phi, y, w_f) \\ [-, \quad -, \quad +, \quad +]$$

$$(2) \quad B/Q = BD(i, i^* + \mu LR + \hat{E}^e + \phi, y, w_f) \\ [+ , \quad -, \quad ?, \quad +]$$

$$(3) \quad EF/Q = FD(i, i^* + \mu LR + \hat{E}^e + \phi, y, w_f) \\ [-, \quad +, \quad ?, \quad +]$$

where i and i^* are the nominal domestic and foreign interest rates, respectively, LR is a variable measuring legal restrictions imposed on capital flows, μ is the corresponding non-negative coefficient, E is the nominal exchange rate (units of domestic currency per unit of foreign currency), \hat{E}^e is the expected rate of devaluation, ϕ is a risk-premium parameter, and y is current real disposable income.

Legal restrictions can be established by domestic authorities on foreign asset or liability holdings, and/or on flows of foreign assets or liabilities. Restrictions on stock holdings of foreign

assets or liabilities affect the LR variable influencing asset demands in equations (1) - (3), even in the case of perfect capital mobility. But capital mobility is mainly impaired by restrictions on capital flows, which are introduced in the following section. For the purpose of our analysis the variable LR captures the extent of restrictions on both foreign capital holdings and flows. In our model, financial liberalization means a reduction in the foreign transactions costs on domestic bonds as well as a reduction in domestic transaction costs of foreign bonds.⁵

Domestic and foreign assets also are imperfect substitutes because of a second variable, the risk premium on domestic assets. In section II we define ϕ as a function of the foreign position. The domestic - foreign interest spread thus depends on foreign asset holdings.

Finally the domestic interest rate could differ in the short run from its long-run (imperfect) arbitrage value represented by the second argument in the preceding equations, because of imperfect or slow capital mobility. This is the case modelled in section II. Here we assume the benchmark case of perfect capital mobility with imperfect arbitrage.

Consistent with the above equations, total financial wealth must satisfy the following adding-up constraint:

$$(4) \quad wf = [M + B + E F] / Q$$

where Q is the price deflator defined as a weighted average of domestic traded (P_T) and non-traded (P_N) goods prices:

$$(5) \quad Q = P_T^{(1-\alpha)} P_N^\alpha$$

I.B. Goods Markets Equilibria in a Dependent Economy

In a two-sector dependent economy, the real exchange rate (and the absolute non-traded goods price) is determined by the following equilibrium condition for non-traded goods:

$$(9) \quad y_N(p) = c_N(p, w(f, i-\pi^e, p, y_p, tt), i-\pi^e) + j_N(p, i-\pi^e) + g$$

$\begin{matrix} [-] & [+ & +, +, & -, & +, +, & +, & ? &] & [+ & - &] \end{matrix}$

where sub-index i ($i = N$ for non-traded goods in equation (9), T for traded goods in equation (10) below) denotes the goods sector, y_i is sectoral output supply, c_i is sector consumption demand, j_i is sector investment demand, π_e is traded and non-traded sector expected inflation, and g is public consumption, falling entirely on non-traded goods.

Sector supply and demand equilibrium functions appearing in equation (9) are consistent with intertemporal optimization, although we do not explicitly derive them from an optimization program.⁷ Non-traded consumption depends positively on the real exchange rate and on private wealth, and ambiguously on the real rate of interest, while investment in non-traded goods depends positively on the real exchange rate and negatively on the real interest.^{8,9}

The trade surplus (or net exports) in quantity terms is determined by the excess supply of traded goods:

$$(10) \quad NX = y_T(p) - c_T(p, w(f, i-\pi^e, p, y_p, tt), i-\pi^e) - j_T(p, i-\pi^e)$$

$\begin{matrix} [+ &] & [-, & +, +, & -, & +, +, & +, & ? &] & [-, & - &] \end{matrix}$

Since the real exchange rate comes from the non-traded market clearing condition, we solve equation (9) for the following real

exchange rate equation:

$$(9') \quad p = p(f, i-\pi^e, y_p, g, tt) \\ [-, +, -, -, -]$$

Collecting terms in equation (10), we derive the following function for quantum net exports or the trade balance:¹⁰

$$(10') \quad NX = NX(p, w(f, i-\pi^e, p, y_p, tt), i-\pi^e) \\ [+ , - , + , - , + , + , + , +]$$

I.C. Foreign sector equilibrium

Foreign asset accumulation satisfies the following balance of payments identity defined in terms of foreign currency:

$$(11) \quad \dot{F} = P^* NX(p, w(f, i-\pi^e, p, y_p, tt), i-\pi^e) + i^* (F+R) - \dot{R} \\ [+ , - , + , - , + , + , + , +]$$

where R measures international reserves in units of foreign currency.

Multiplying equation (11) by E/Q, we obtain the balance of payments restriction in real domestic currency units. By an appropriate substitution, we transform equation (11) into an equation describing the accumulation of foreign assets defined in terms of real domestic currency units:

$$(11') \quad \dot{f} = p^e NX(p, w(f, i-\pi^e, p, y_p, tt), i-\pi^e) + (i^* + \hat{E}^e - \pi^e) (f+r) - \dot{r} \\ [+ , - , + , - , + , + , + , +]$$

where r measures the stock of international reserves in real domestic currency units and \hat{E}^e is the expected rate of devaluation.

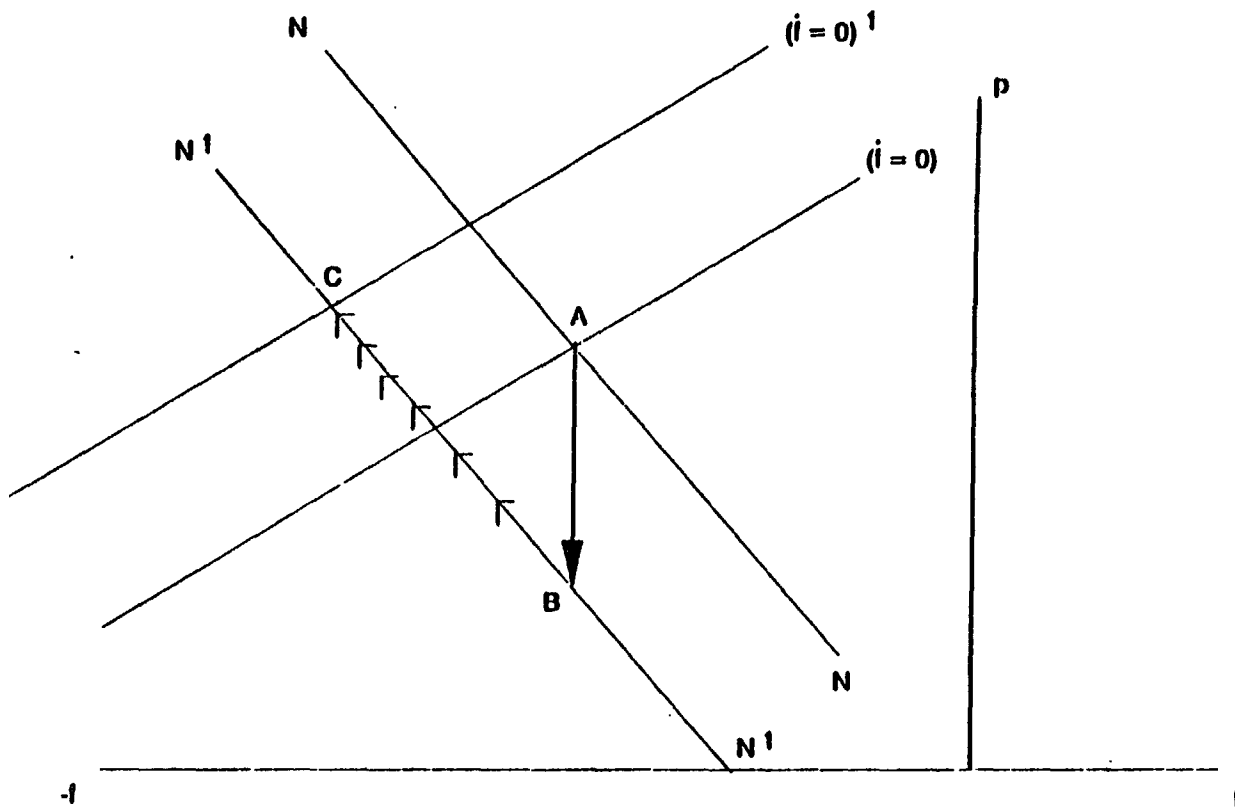
I.D. General Equilibrium

Domestic financial markets (for money and government bonds) clear instantaneously. We assume perfect capital mobility, implying an infinite velocity of international capital flows in response to foreign-domestic interest differentials. The interest arbitrage condition holds continuously for given levels of devaluation expectations, legal restrictions and country risk. We call this the imperfect arbitrage condition:

$$(12) \quad i = i^* + \hat{E}^e + \mu LR + \phi$$

The dynamic paths of foreign assets and the real exchange rate appear in Figure 1. The phase diagram is based on equations (9') and (11'). The NN schedule represents in (f-p) space continuous non-traded goods market clearing equation (9'). Appendix 1 shows that the NN curve is unambiguously downward sloping, because higher foreign assets have a positive wealth effect on consumption which lowers the equilibrium real exchange rate. Imposing the steady state equilibrium condition on equation (11'), we obtain the ($\dot{f}=0$) schedule in Figure 1. Its slope is ambiguous and depends on the current account consequences of the wealth effect on consumption relative to the debt-servicing effects when foreign assets increase. Assuming the wealth effect dominates, the ($\dot{f}=0$) schedule has a positive slope. We show this in Appendix 1.

Figure 1



Real Exchange Rate and Foreign Asset Dynamics
Under Perfect Capital Mobility

Dynamic adjustment takes place along the NN schedule. Steady-state equilibrium is reached when the increase in foreign debt stops, such as at the international dynamic equilibrium position at point A.

An increase in permanent income raises consumption of both traded and non-traded goods, and forces a leftward shift of both the NN and the $(\dot{f}=0)$ curves in Figure 1. The impact effect of higher spending is an appreciation of the real exchange rate. The effect depends only on the size of the increase in y_p and on the elasticity of the excess supply of non-traded goods with respect to real exchange rate. Dynamic adjustment along the N^1N^1 schedule shows simultaneous real exchange rate depreciation and foreign debt accumulation. The final effect on p is ambiguous, depending on the value of final wealth resulting from higher levels of permanent income and of foreign debt, as compared to initial stationary wealth. If initial and final wealth levels coincide, the real exchange rate returns to its initial value.¹¹

II. CAPITAL FLOWS AND DOMESTIC ADJUSTMENT UNDER IMPERFECT

CAPITAL MOBILITY

Under imperfect international capital mobility, domestic interest rates temporarily deviate from their international imperfect arbitrage levels. Domestic interest rates adjust to continuous short-run money and domestic bond market equilibrium conditions, although incentives for changing the portfolio composition remain as long as the imperfect arbitrage condition

given by equation (12) is not met. This occurs because domestic asset holders can not quickly change their portfolio compositions by buying or selling foreign assets because of domestic legal restrictions imposed on foreign capital flows.

To derive the behavior of interest rates and international reserves under imperfect capital mobility, we focus on the monetary flow equilibrium condition, which equates constant-price flow supply and demand:

$$(13) \quad (\dot{M}/Q) = \dot{L}$$

Money supply is increased by accumulating domestic credit and international reserves. Asset holders adjust their monetary balances over time in response to the difference between desired and actual holdings. They do this by exchanging international reserves for foreign assets at a speed β times the gap between desired and effective monetary holdings. Hence flow monetary equilibrium relates reserve accumulation and monetary flow demand as follows:

$$(13') \quad (\dot{ER}/Q) + (\dot{C}/Q) = \beta[L^D - (M/Q)] + (\dot{C}/Q)$$

where L^D is desired or long-run real money holdings under conditions of imperfect interest arbitrage, β is the speed of adjustment coefficient, and (C/Q) is the stock of real domestic credit of the central bank.

Excess demand of money causes domestic interest rates to increase instantly (and domestic bond prices to fall). Asset

holders accumulate cash balances by turning to international credit markets, where they sell foreign assets (or accumulate debt) and change the proceeds at the domestic central bank for domestic currency. Through this sluggish monetary adjustment process, domestic interest rates come down and cash balances increase until stationary monetary equilibrium is reestablished.

The difference between the short-run interest rate and its long-run arbitrage level depends only on the partial derivative of the money demand with respect to the domestic interest rate.

The speed with which asset holders accumulate money balances depends on the legal restrictions which regulate the flows or acquisitions of foreign assets or liabilities. Hence β is a negative function of the legal restrictions variable LR:

$$(15) \quad \beta = \beta(LR) \\ \quad \quad \quad [-]$$

The country-risk parameter ϕ depends negatively on the stock of foreign assets or liabilities, a frequently used indicator for a country's foreign position for a given GDP level:

$$(16) \quad \phi = \phi(f) \\ \quad \quad \quad [-]$$

This function could be either continuously differentiable or could have a kink at a critical value of the stock of foreign debt.

After substitution and use of desired and actual domestic money stocks L^D and L , we obtain the following equation for the change in international reserves at constant prices:

$$(17) \dot{r} = \beta(LR) \begin{bmatrix} L^D(i=i^*+\mu LR+\hat{E}^c+\phi(f), i^*+\mu LR+\hat{E}^c+\phi(f), y, wf) - \\ [-, \quad -, \quad -, \quad +, +] \\ L(i, i^*+\mu LR+\hat{E}^c+\phi(f), y, wf) \\ [-, \quad -, \quad +, +] \end{bmatrix}$$

We substitute the equilibrium real exchange rate [equation (9')] and the foreign-reserve accumulation [equation (17)] into equation (11), to obtain the following equation for foreign asset accumulation under imperfect capital mobility:

$$(18) \dot{f} = [p(f, i-\pi^c, yp, g, tt)]^c NX(f, i-\pi^c, yp, g, tt) + (i^*+\hat{E}^c - \pi^c)(f+r) - \\ [-, +, -, -, -] \quad [-, +, -, -, -] \\ \beta(LR) \begin{bmatrix} L^D(i=i^*+\mu LR+\hat{E}^c+\phi(f), i^*+\mu LR+\hat{E}^c+\phi(f), y, wf(f) - \\ [\quad -, \quad -, \quad +, +, +] \\ L(i, i^*+\mu LR+\hat{E}^c + \phi(f), y, wf(f)) \\ [-, \quad -, \quad +, +, +] \end{bmatrix}$$

In equation (18) β plays the role of the offset coefficient first presented by Kouri and Porter (1974), which measures the effect of an increase in domestic credit on foreign asset accumulation. But there are two important differences between our framework and the Kouri and Porter model. We specify the variables explaining imperfect substitution (LR and ϕ), and we distinguish between instantaneous and long-run equilibria in asset markets. Our offset coefficient depends explicitly on the variable determining imperfect capital mobility (LR), and not on the magnitude of the interest elasticities of asset demands, as in their model.

Substitution of ϕ from equation (16) into (18) reinforces the negative effect of f on foreign asset accumulation. We already assumed this when we postulated the dominance of the wealth effect over the interest effect when f increases.

On the other hand foreign asset accumulation in equation (18) depends ambiguously on the domestic interest rate. A rise in i increases net exports but also induces a higher foreign reserve accumulation as asset holders build up cash balances in response to their excess demand for money. If the latter effect dominates, \dot{f} falls with the interest rate.¹² This is the case reflected by the negatively sloped ($\dot{f}=0$) schedule in Figure 2, which shows steady-state foreign asset equilibrium under imperfect capital mobility in $(f-i)$ space.

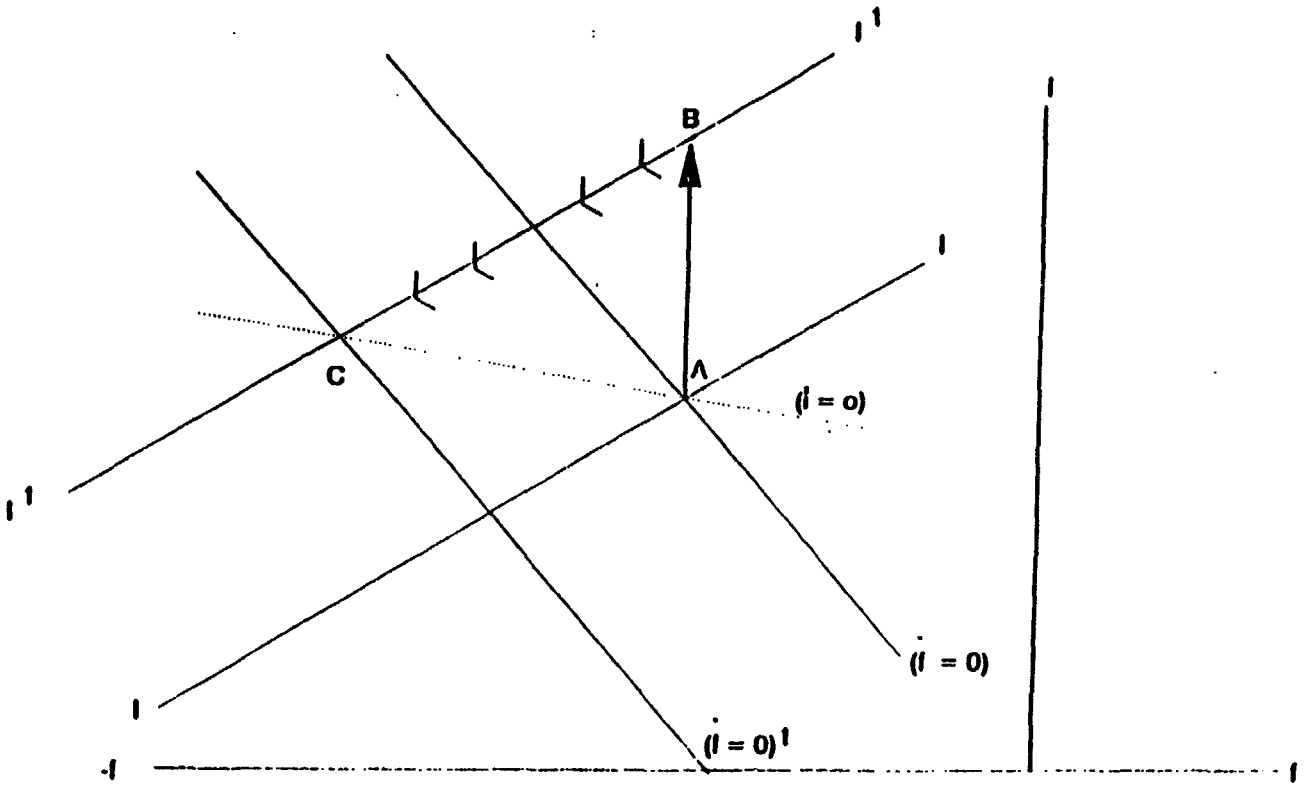
What about instantaneous or short-run equilibrium in the domestic money market? From equation (1), after substitution of Q from equation (6) and p from equation (9), we obtain the following expression for i in terms of the determinants of stock supply and current (not desired) stock demand:

$$(19) \quad i = i((M/EP^*), \pi^e, f, y^p, g, tt, i^* + \mu LR + \hat{E}^e + \phi(f), y)$$

$$\quad \quad \quad [\quad -, \quad +, +, +, +, +, \quad -, \quad +]$$

The II curve in Figure 2 represents the unambiguously positive relation between i and f in equation (19). Adjustment takes place on this curve after a disturbance to the dynamic system given by equations (18) and (19).

Figure 2



Domestic Interest Rate and Foreign Asset Dynamics
Under Imperfect Capital Mobility

Long-term or stationary equilibrium is reestablished when domestic interest rates reach imperfect arbitrage levels determined by stationary values consistent with equation (12). The adjustment equation for domestic interest rates is derived from the relation between money demand and the interest rate in equation (20), where ϵ is the partial derivative of money demand with respect to the interest rate:

$$(20) \dot{L} = \epsilon \dot{i} = \beta(LR) [L^D - L]$$

With further substitution, the adjustment of domestic interest rates is given by the following equation:

$$(21) \dot{i} = [\beta(LR)/\epsilon] [L^D(i=i^*+\mu LR+\hat{E}^e+\phi(f), i^*+\mu LR+\hat{E}^e+\phi(f), y, wf(f)) \\ [-] \quad [\quad -, \quad -, \quad +, \quad +, +] \\ - L(i, i^*+\mu LR+\hat{E}^e+\phi(f), y, wf(f))] \\ [-, \quad -, \quad +, +, +]$$

From equation (21) the steady-state condition ($\dot{i}=0$) is reached when domestic interest rates converge to their parity levels determined by equation (12). The ($\dot{i}=0$) curve in Figure 2, negatively sloped since ϕ is negatively related to f , thus coincides with the imperfect arbitrage condition. This curve also represents the foreign credit supply schedule which relates higher foreign debt levels to higher credit costs.

An increase in permanent income causes leftward shifts of both the ($\dot{i}=0$) and the II curves. The impact effect is a real exchange rate appreciation and an increase in the domestic interest rate, as shown in Figure 2. Then foreign debt is accumulated, the real

exchange rate depreciates and the domestic interest rate falls as adjustment continues on the II^1 curve toward the final steady state at point C in Figure 2.

This adjustment process is quite different from the corresponding one under perfect capital mobility. Under perfect capital mobility the domestic interest rate is continuously maintained at its imperfect arbitrage level, while the real exchange rate shows greater variability. Under imperfect capital mobility, the reverse is true. The increase in the domestic interest rate reflects a lower foreign debt accumulation and a lower domestic monetary accumulation than under perfect mobility, during the first phase of dynamic adjustment process. The instantaneous appreciation of the real exchange rate is smaller under imperfect capital mobility because of the partly offsetting effect of the higher interest rate on p .

Although the dynamic transition of f , i , and p is different in the polar cases of perfect and imperfect mobility, the final stationary levels are the same.

III. MODEL IMPLEMENTATION AND EMPIRICAL RESULTS: CHILE AND

NEW ZEALAND

In this section we discuss simplified relationships implied by the model developed above, which are suitable for dynamic econometric analysis. Then we present the results of estimation with constant parameters and with time-varying parameters separately for each country.

III.A. Relations Implied by Model

Equations (9) and (9') imply a relation between the real exchange rate, domestic financial wealth, the real interest rate, and government expenditures:

$$(22) \quad p_t = p(wr_t, wf_t, ir_t, g_t) \\ \quad \quad \quad [-, \quad -, \quad +, \quad -]$$

where ir_t is the real interest rate defined as $i - \pi^{e13}$. Since real wealth is not observable, it has been omitted from equation (22), which includes only on financial wealth as the domestic wealth argument. The latter variable is defined as the sum of foreign assets and international reserves. Hence, $wf = f + r$.

In order to derive a reduced-form equation for the short-term nominal interest rate, actual holdings of base money are assumed to be a weighted average of desired holdings and ex-ante monetary base (z). Hence the domestic nominal interest rate relates to the foreign interest rate, $(i^* + \hat{E}^e)$, foreign assets, foreign reserves, and monetary base, z :

$$(23) \quad i_t = i(i_t^* + \hat{E}_t^e, f_t, r_t, z_t) \\ \quad \quad \quad [\quad ?, \quad ?, \quad +, \quad -]$$

The first two right-hand variables present an ambiguous sign. For empirical reasons we expect the dominance of the positive effects in each case, as discussed in Appendix 2.

Instead of specifying a relation for foreign assets, we specify two separate relations, for net exports and foreign reserve

Table 1

Phillips - Perron Unit Root Tests of Macroeconomic Variables

CHILE, 1975-1982

Variable:	Two Unit Roots vs. One			One Unit Root vs. None		
	Z(I3)	Z(I2)	Z(I1)	Z(I3)	Z(I2)	Z(I1)
p	19.65	12.97	18.48	3.89	2.69	1.88
wf	14.50	9.59	10.67	2.18	1.54	0.50
ir	26.51	17.39	27.66	14.02*	9.28*	14.13*
g	16.00	10.67	16.69	4.28	2.86	2.90
i	31.07	20.44	28.51	7.25	5.04	5.22
i ⁻ + E [*]	18.31	12.15	16.54	8.15	5.63	8.26*
f	16.06	10.62	12.26	2.52	1.88	0.23
r	14.15	9.35	14.10	1.36	1.31	1.20
z	8.87	5.88	8.20	1.29	0.92	1.18
nx	13.27	8.77	12.82	2.02	1.41	1.20

NEW ZEALAND, 1975-1991

p	30.12	20.03	28.74	5.87	4.01	0.49
wf	42.38	28.14	42.51	7.41	5.02	2.48
ir	45.75	30.36	46.47	11.02*	7.41*	3.30
g	36.60	24.36	36.04	2.95	1.97	2.66
i	30.15	20.03	30.13	5.22	3.48	4.32
i ⁺ +E	58.38	38.74	59.42	32.84*	21.83*	32.22*
f	44.32	29.41	45.05	3.72	2.64	1.29
r	43.25	28.70	43.55	9.18*	6.22*	1.86
z	51.03	33.83	51.20	11.64*	7.78*	5.42
nx	50.27	33.33	51.19	17.93*	11.93*	17.63*

In test model: $y(t) = u + b t + a y(t-1) + e(t)$

z(I3) tests $a=1, b=0$

z(I2) tests $a=1, b=0, u = 0$

z(I1) tests $a=1, u=0, \text{ given } b=0.$

where y is the respective variable to be tested, t is time, e is the residual, and $u, b,$ and a are coefficients.

* Significant at the one percent level, in rejection of appropriate unit root hypothesis vs. no unit root.

four-period lag structure. Then "irrelevant" variables were progressively eliminated. Irrelevant variables are those which were not significant, and whose omission did not affect the significance of the remaining variables.¹⁵

The results for the Chilean data appear in Table 2, and for the New Zealand data appear in Table 3. In addition to the usual regression estimates, each table has a set of diagnostic tests for evaluating autocorrelation, normality of the disturbance terms, heteroskedasticity, and misspecification, with chi-square statistics.¹⁶

While financial liberalization makes this assumption of constant coefficients hard to defend, these results serve as a benchmark for assessing how much time-varying coefficient values depart from the constant parameter values which represent the average coefficient values for the entire period. The constant coefficients also allow a quick comparison between countries, for assessing the importance of specific variables during the adjustment period.

Table 2 shows that the Chilean real exchange rate is significantly determined by real interest rates and its own lag. Neither wealth nor government spending affect the relative traded/nontraded goods price. For New Zealand the opposite is true: Table 3 shows that both wealth and government spending are significant, with the expected signs.

Table 2
The Estimated Model
Chile, 1975.3 - 1982.4

The Real Exchange Rate:

$$\Delta p = -0.027 + .448 \Delta p_{t-1} + .673 ir_{t-1} - .772 ir_{t-2} + .673 ir_{t-3}$$

(1.63) (2.23) (2.94) (3.17) (2.58)

D.W. = 1.96 RSQC = .412

Diagnostics:	Stat	order	P-Value
Serial correlation	.395	4	.982
Normality	3.37	-	.184
ARCH	2.39	4	.663
Heteroskedasticity	3.10	-	.927
Specification	6.67	2	.035

The Nominal Interest Rate:

$$\Delta i = -0.0062 + 0.349 \Delta (i^* + \hat{E}^e)_{t-2} - .00071 \Delta f_{t-4} + .0032 \Delta r_{t-2} - .0004 \Delta z_{t-2}$$

(1.21) (2.46) (1.04) (1.75) (2.23)

D.W. = 1.83 RSQC = .45

Diagnostics:	Stat	order	P-Value
Serial correlation	1.26	4	.86
Normality	1.34	-	.50
ARCH	2.01	4	.73
Heteroskedasticity	4.22	-	.83
Specification	1.31	2	.51

Net Exports:

$$\Delta nx = -.561 + .683 \Delta nx_{t-4} - .169 \Delta wf_{t-3} + 22.62 ir_{t-4}$$

(.969) (4.16) (1.90) (5.79)

D.W. = 2.17 RSCQ = .645

Diagnostics:	Stat	order	P-Value
Serial correlation	6.23	4	.182
Normality	1.48	-	.476
ARCH	3.03	4	.551
Heteroskedasticity	8.95	-	.176
Specification	2.88	2	.236

Foreign Reserves:

$$\Delta r = .883 - .1318 \Delta f_{t-4} - 32.067 \Delta (i^* + \hat{E}^e)_{t-2}$$

(1.66) (1.78) (2.06)

D.W. = 1.11 RSCQ = .102

Diagnostics:	Stat	order	P-Value
Serial correlation	5.14	4	.272
Normality	.670	-	.715
ARCH	3.08	4	.543
Heteroskedasticity	1.27	-	.865
Specification	7.58	2	.022

Table 3
The Estimated Model
New Zealand, 1976.3 - 1991.1

The Real Exchange Rate:

$$\Delta p = -0.004 + .235 \Delta p_{t-1} - 6.014E-06 \Delta w_{t-2} - 3.74E-07 \Delta g_{t-3}$$

(1.12) (1.97) (1.63) (2.43)

D.W. = 2.00 RSQC = .207

Diagnostics:	Stat	order	P-Value
Serial correlation	3.15	4	.530
Normality	1.35	-	.508
ARCH	1.54	4	.818
Heteroskedasticity	4.55	-	.601
Specification	1.04	2	.594

The Nominal Interest Rate:

$$\Delta i = -0.419 - .0304(i^* + \hat{E}^e)_{t-3} - .031(i^* + \hat{E}^e)_{t-4} - .0003\Delta f_{t-1} + .0011\Delta r_{t-1} - .0031\Delta z_{t-4}$$

(1.170) (2.08) 2.27) (2.16) (4.03) (1.51)

D.W. = 1.84 RSQC = .36

Diagnostics:	Stat	order	P-Value
Serial correlation	4.59	4	.33
Normality	1.55	-	.45
ARCH	5.36	4	.25
Heteroskedasticity	17.8	-	.05
Specification	7.03	2	.02

Net Exports:

$$nx = -78.7 + .716 nx_{t-1} - .546 nx_{t-2} + .594 nx_{t-3} - 2110 \Delta p_{t-1} + 1735 \Delta p_{t-2} + 1640 \Delta p_{t-3}$$

(1.34) (7.24) (5.34) (6.31) (2.76) (1.97) (2.10)

$$- .051 \Delta w_{t-2} + .049 \Delta w_{t-4} - 35.98 \Delta ir_{t-2}$$

(2.15) (2.06) (2.99)

D.W. = 2.26 RSCQ = .61

Diagnostics:	Stat	order	P-Value
Serial correlation	5.47	4	.242
Normality	0.96	-	.617
ARCH	4.97	4	.290
Heteroskedasticity	14.3	-	.703
Specification	2.25	2	.324

Foreign Reserves:

$$\Delta r = 276.31 - 17.60 (i^* + \hat{E}^e)_{t-1} + .154 \Delta f_{t-2}$$

(2.64) (2.81) (2.49)

D.W. = 1.87 RSCQ = .128

Diagnostics:	Stat	order	P-Value
Serial correlation	5.70	4	.222
Normality	3.55	-	.168
ARCH	18.3	4	.001
Heteroskedasticity	10.0	-	.040
Specification	10.3	2	.005

Nominal interest rates are significantly sensitive to most variables expected a priori. For Chile, covered arbitrage interest levels ($i^* + \hat{E}^c$) have a dominant influence on domestic nominal rates, during a period characterized by massive changes in the access to foreign credit markets.

While foreign assets (the negative of the gross foreign debt) are not significant, the role of foreign reserves is significant. Ex-ante domestic money supply z presents the correct sign, negatively associated to domestic nominal interest rates. Table 3 shows that for New Zealand, foreign assets, reserves, and the money supply are also significant, with the same signs as the corresponding variables in the Chilean equation. For the foreign arbitrage interest rates, however, the story is different: higher levels at three and four lags lead to less change in domestic interest rates, implying a ceiling or bound on the domestic interest rates, characteristic of the pre-liberalization period.

With regard to the determination of the excess supply of traded goods or the net exports quantum (NX), for Chile, only two, the real interest rate and real wealth, are significant. Wealth has a negative effect, through its effect on consumption, while the effect of the real interest rate is positive, through its effect on domestic demand. For New Zealand, the story is somewhat different. Apart from its own lagged effects, the real exchange rate initially has a negative effect, but at two and three period lags it has a positive effect. The total effect is positive. Wealth also has opposite effects at two and four lags, but the total effect is negative. Finally, the real interest effect is negative and at a

two-period lag, reflecting a different channel than the Chilean case, which was positive at a four-period lag: higher real interest rates depress the current account as capital is drawn into the country.

Tables 2 and 3 show that foreign reserves are significantly determined by the same variables, although at different lag lengths. For Chile, reserves respond negatively to changes in foreign interest, and are negatively related to changes in foreign assets. For New Zealand, higher foreign interest levels lead to reserve losses, but foreign asset accumulation has a positive effect on reserve changes, implying that reserves were insulated from capital movements.

At the five percent level of significance, practically all of the tests are insignificant, and thus do not allow us to reject the hypothesis of white noise. The exception is the test for specification in the reserve equation for both countries, as well as for ARCH in the New Zealand reserve equation, and specification in the Chilean real exchange rate equation.

The absence of serial correlation in the equations permits the use of Kalman filtering for evaluating the variability of the coefficients over time. The possibility of specification error in the dynamic linear model with constant coefficients, indicated by the tests, indicates that the use of a time-varying coefficients may be a more appropriate specification for the model during the liberalization process.

III.D. Estimation Results with Kalman Filtering

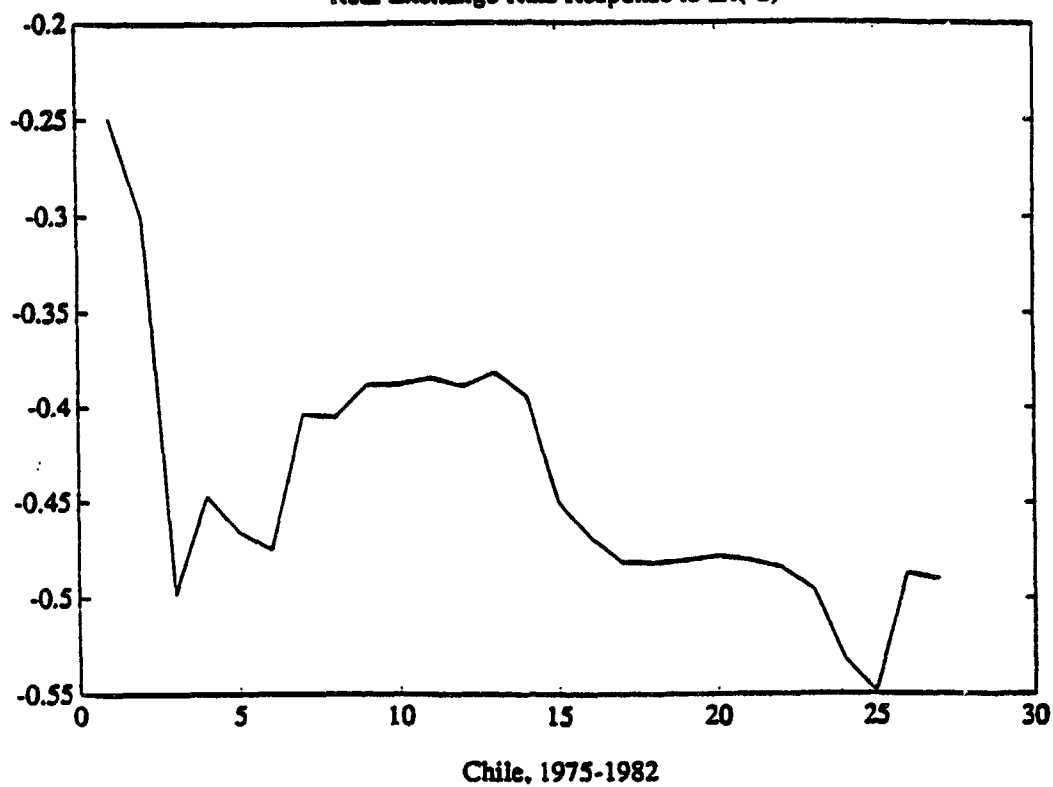
The Kalman filter follows a two-stage process for estimating the time-varying coefficients. At time t , an optimal predictor for the dependent variable is formed, using all information available up to and including time t . In the second-stage, the forecast error is used to modify the coefficients, and new information is used to generate new predictions at time $t+1$ for time $t+2$. Detailed descriptions of Kalman filtering appear in Anderson and Moore (1979), Pagan (1980), Hansen and Sargent (1991), Harvey (1981) and Chow (1984). Intuitively, the Kalman filter may be described as an "optimal discounting" of past data to find the best one-period forward predictor.¹⁷

Figures 3 through 6 picture the adjustment of key coefficients in the real exchange rate equation, the interest rate equation, net exports, and the reserves for Chile, during the period of financial liberalization.

We see in Figure 3 that the real exchange rate became progressively more responsive (negatively) to the real interest rate at the lag of two periods, whereas the positive effects of the real interest rates at lags one and three progressively diminished. As the economy became more open, the capital flow effects of real interest rates had progressively stronger negative effects on the Chilean real exchange rate.

Figure 3

Real Exchange Rate Response to IR(-2)



Real Exchange Rate Response to IR(-1) and IR(-3)

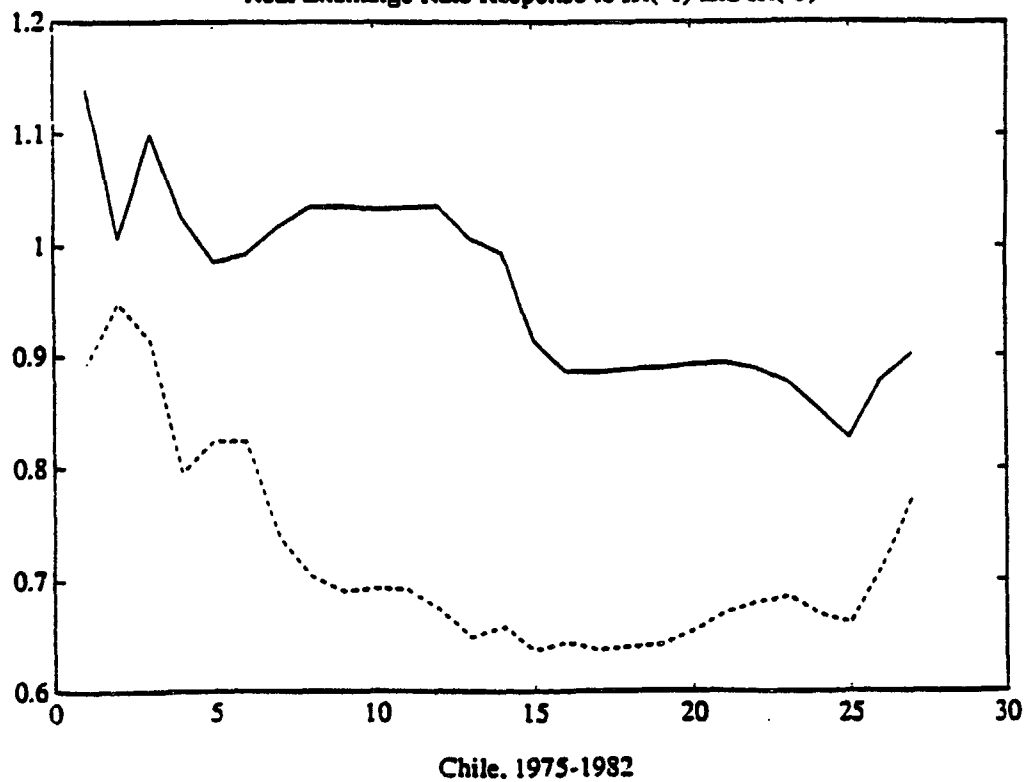


Figure 4

Nominal Interest Response to $(i^* + \hat{E})$

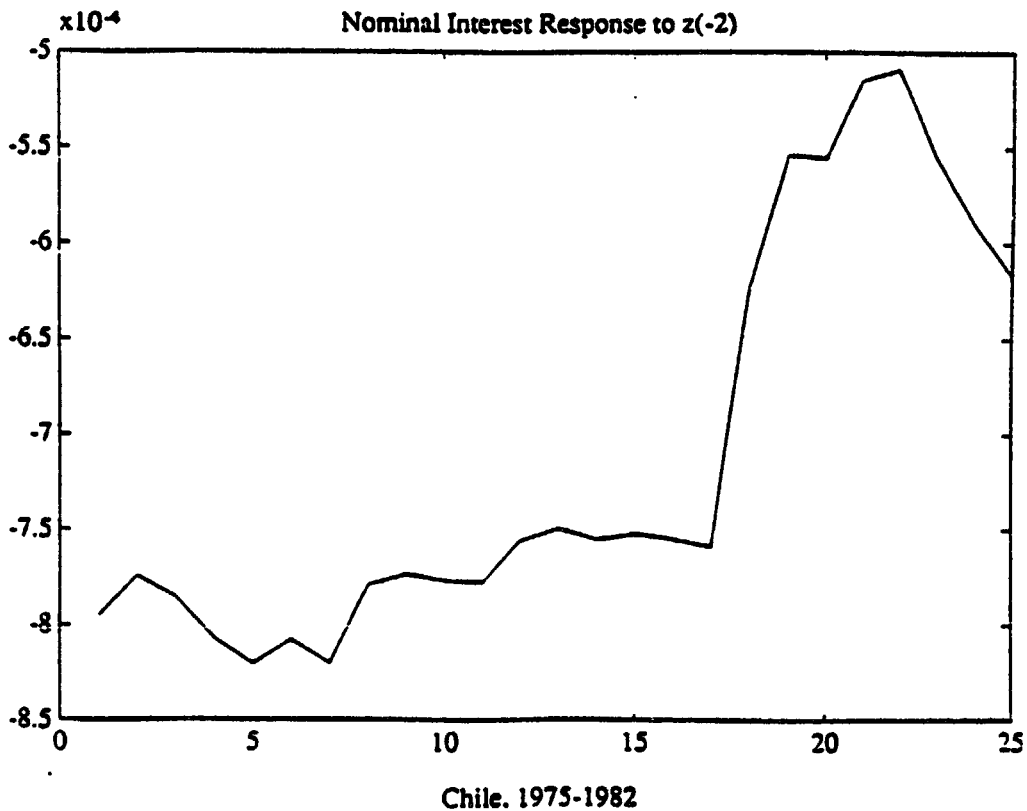
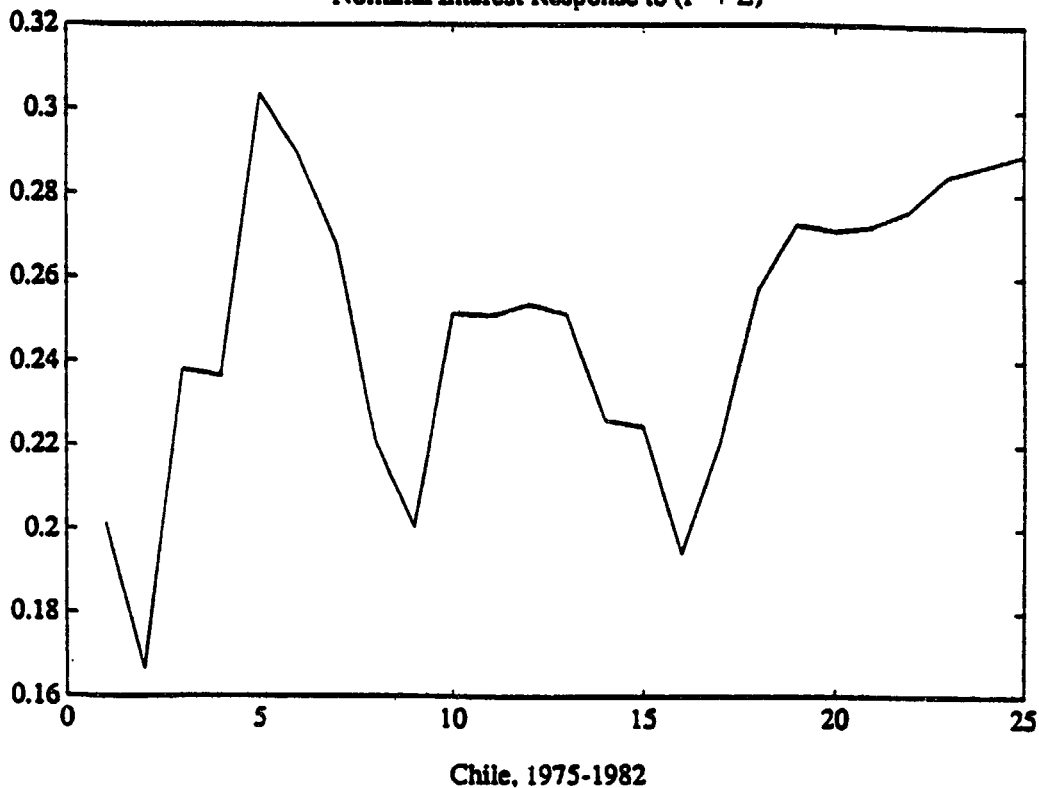
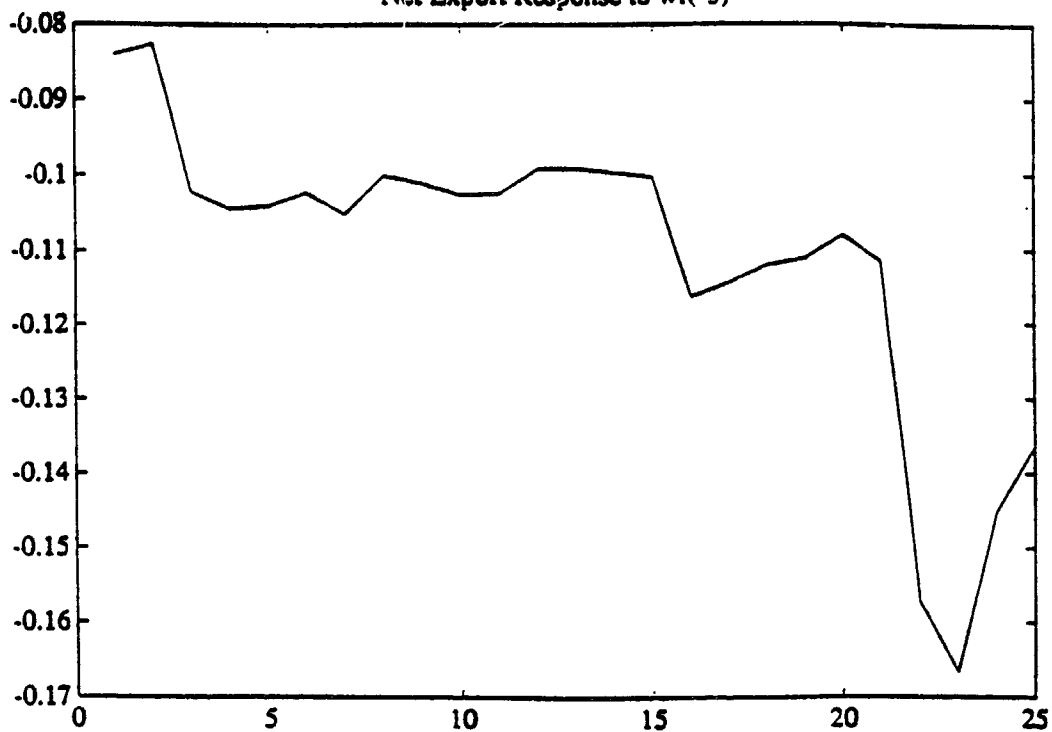
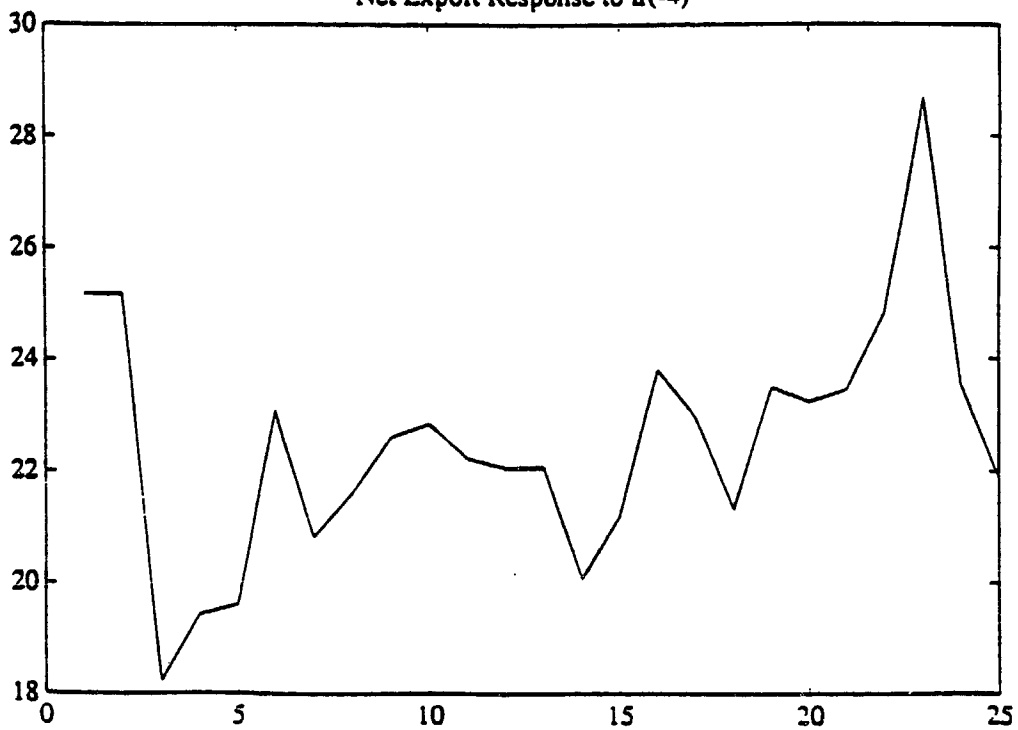


Figure 5
Net Export Response to wf(-3)



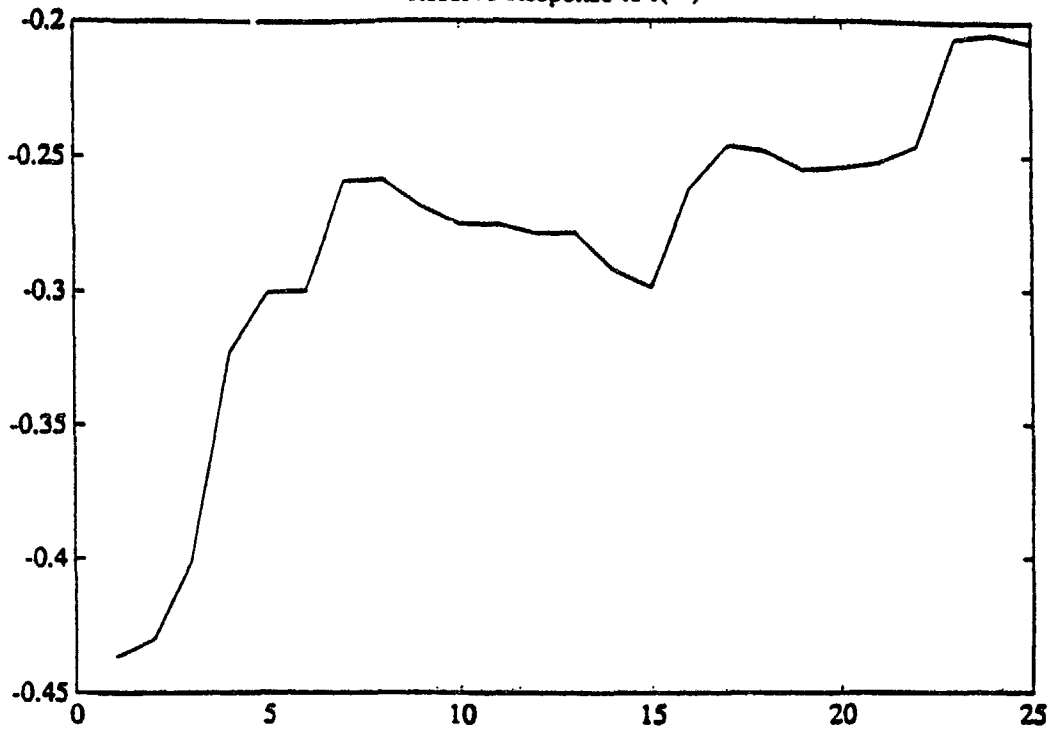
Chile, 1975-1982

Net Export Response to ir(-4)



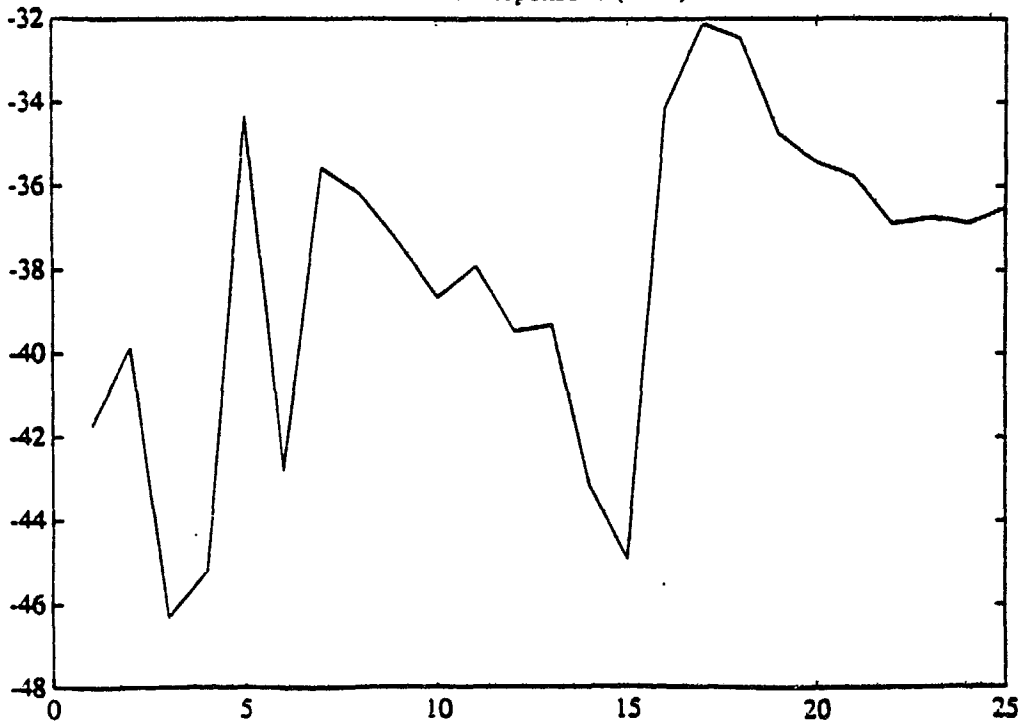
Chile, 1975-1982

Figure 6
Reserve Response to $f(-4)$



Chile 1975-1982

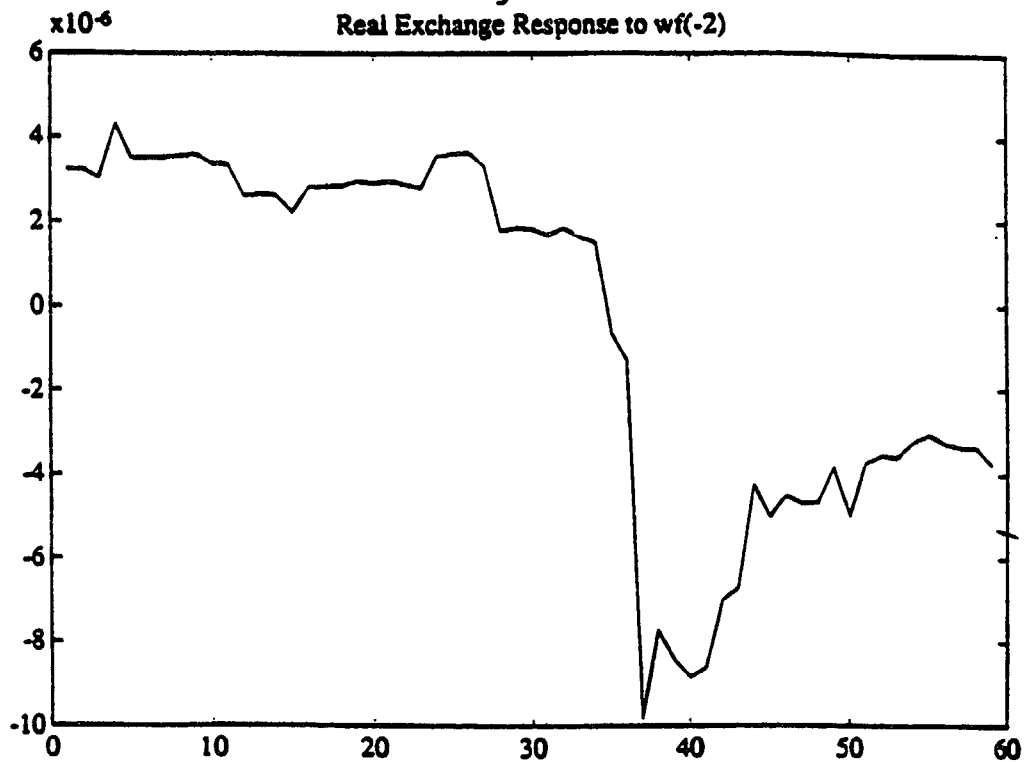
Reserve Response to $(i^* + \hat{E})$



Chile 1975-1982

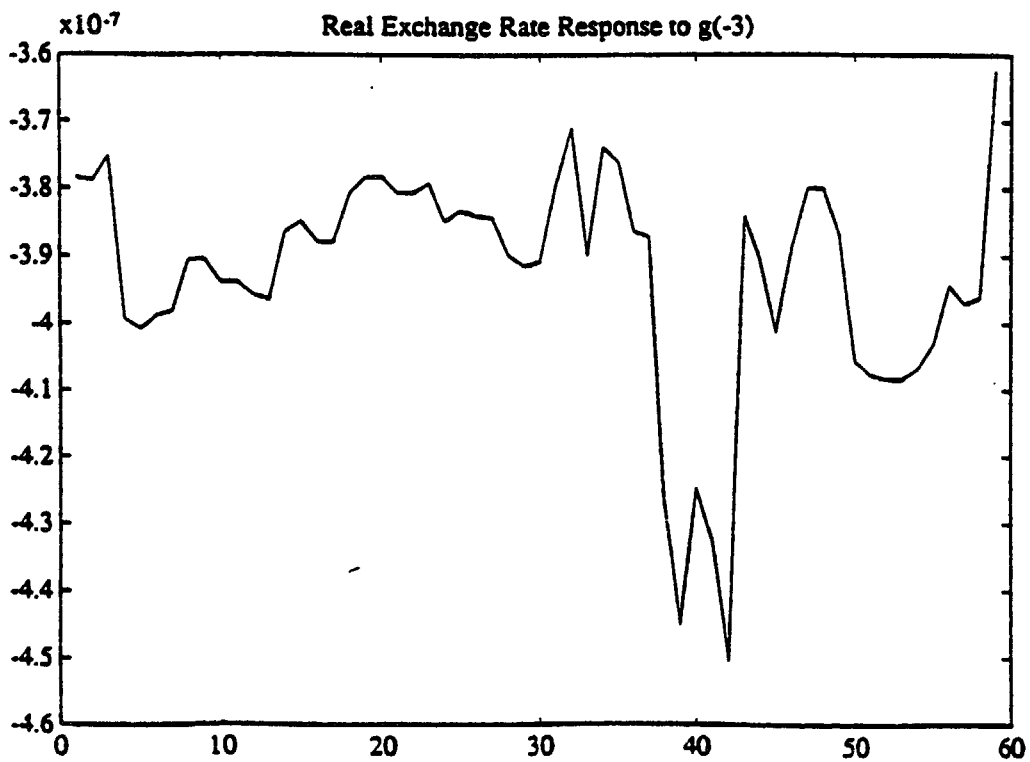
Figure 7

Real Exchange Response to $wf(-2)$



New Zealand, 1975-1991

Real Exchange Rate Response to $g(-3)$



New Zealand, 1975-1991

Figure 8

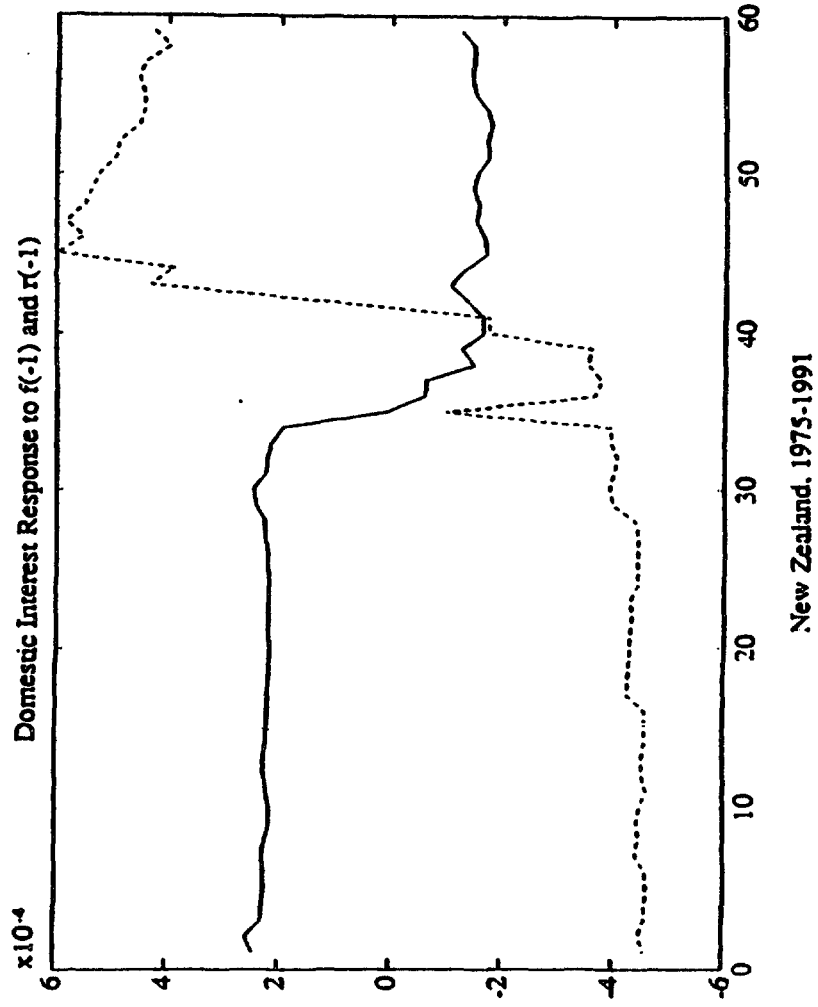
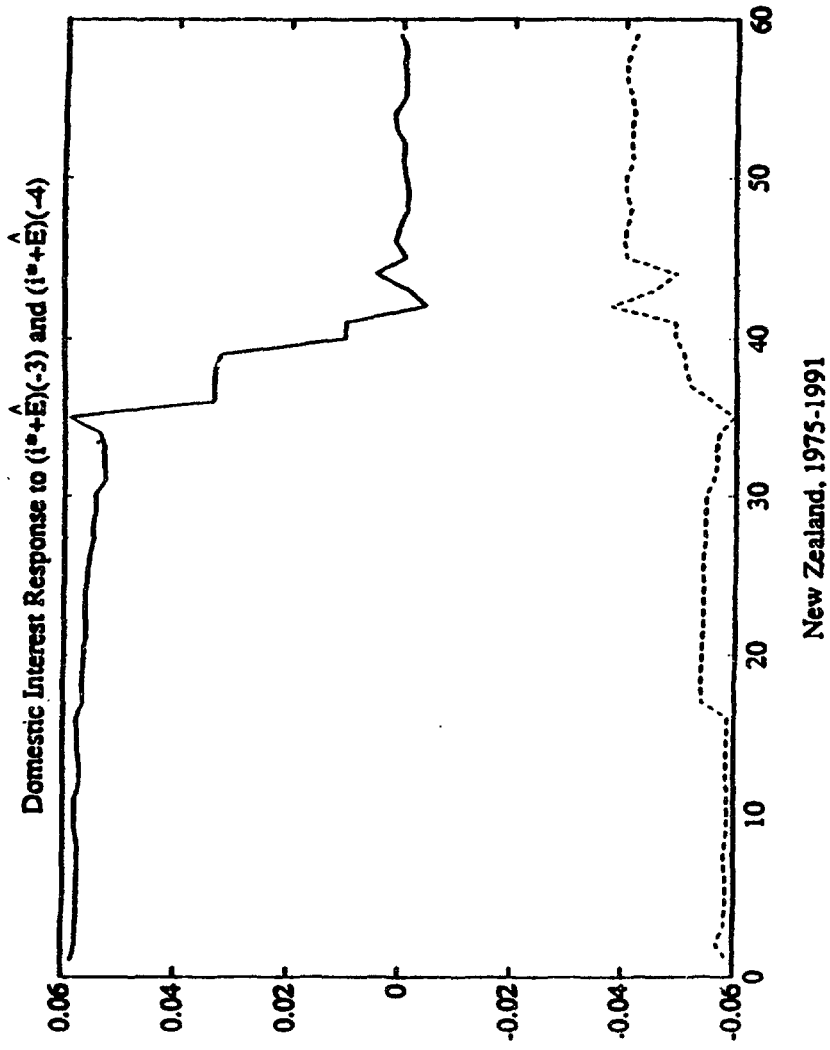


Figure 9

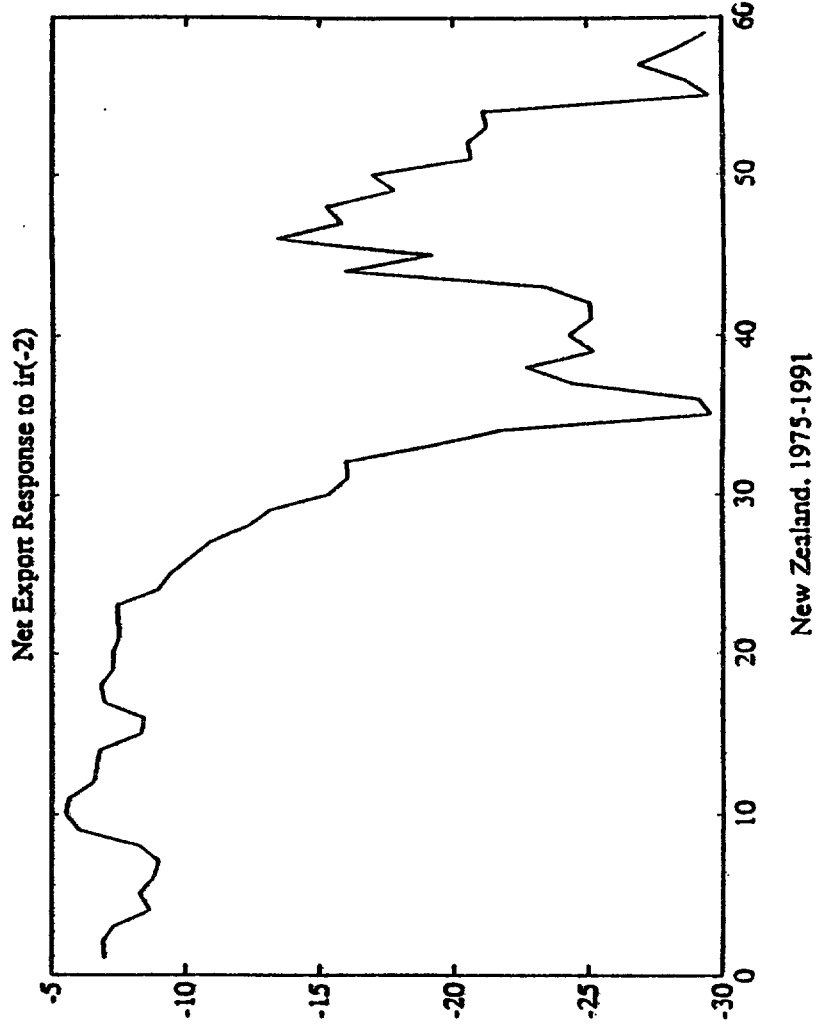
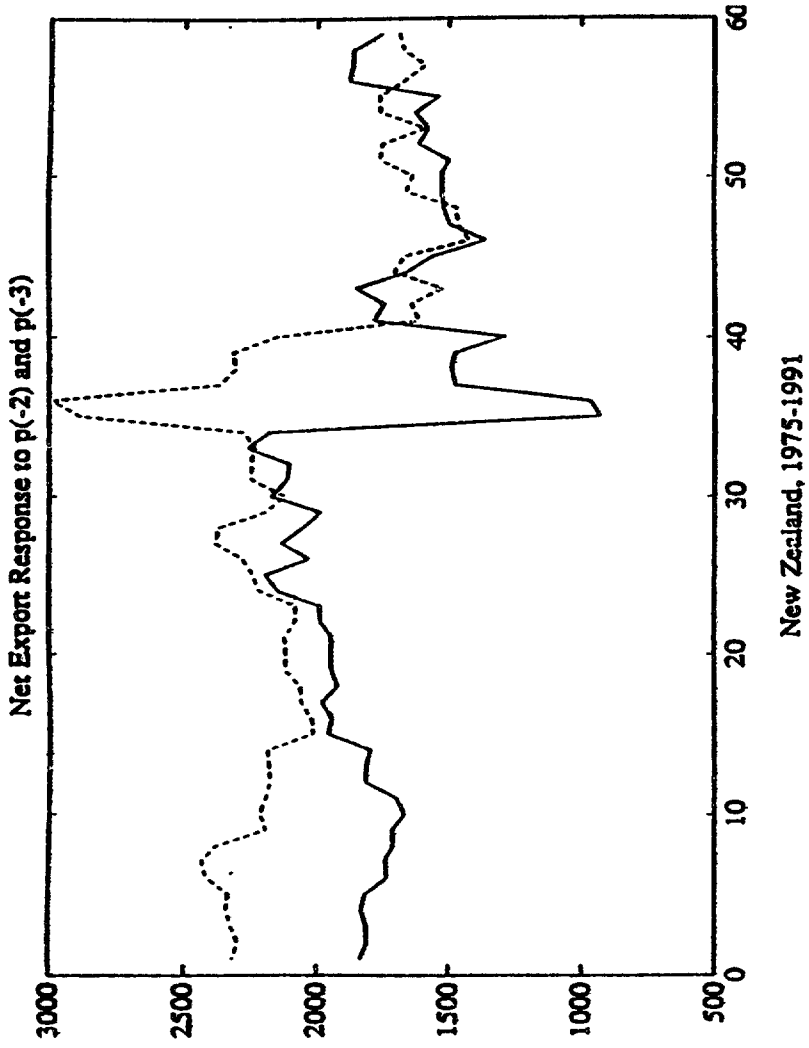
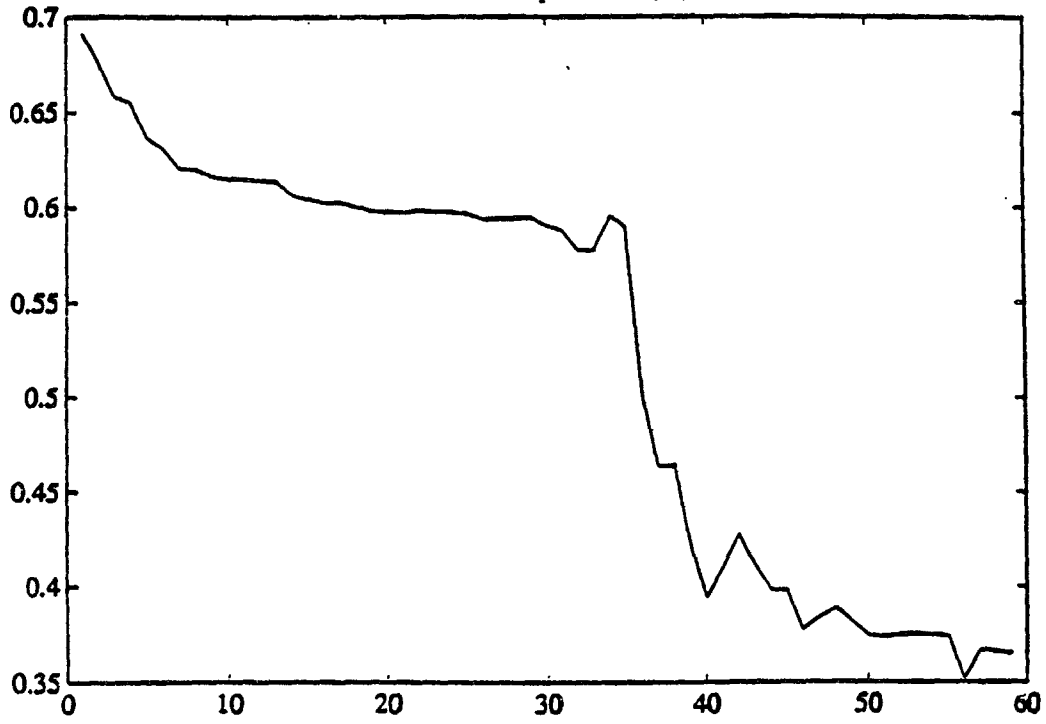


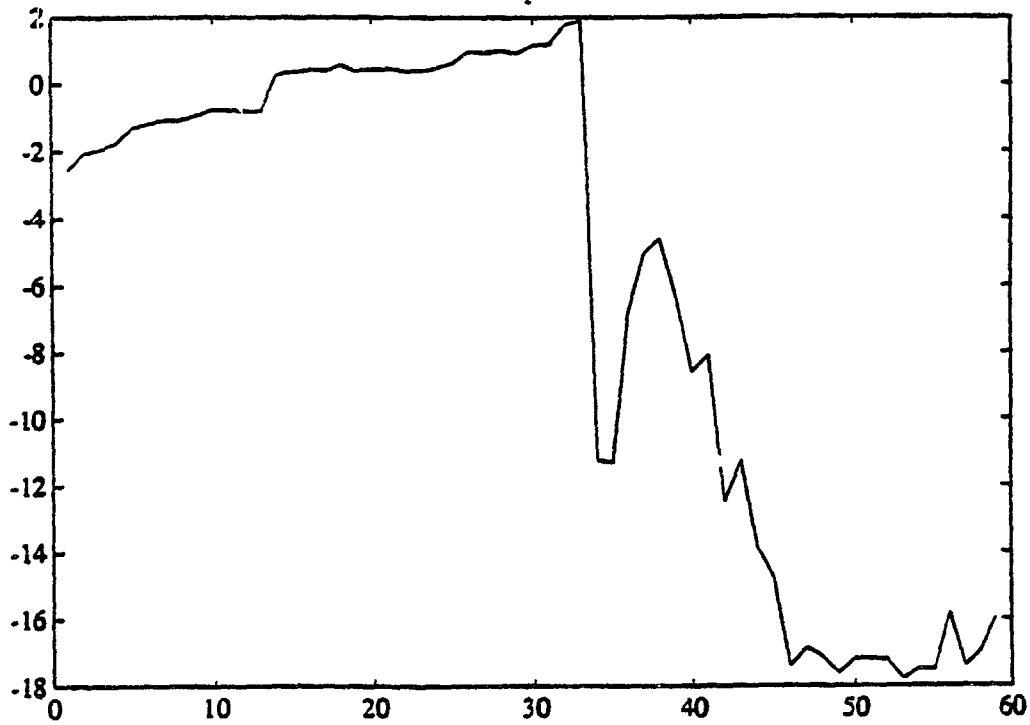
Figure 10

Reserve Response to $f(-2)$



New Zealand, 1975-1991

Reserve Response to $i^* + \hat{E}$



New Zealand, 1975-1991

Figure 4 shows that the domestic interest rate in Chile became less responsive to domestic credit expansion, while the effects of foreign interest rates at the end of the sample period were stronger than at the beginning, although the coefficient fluctuated in value during the process of liberalization.

In Figure 5 we see that net exports became more responsive (negatively) to financial wealth effects, and more positively responsive to real interest rate effects. The behavior of net exports thus became more closely linked to factors in financial markets during the period of liberalization.

In Figure 6, reserves were less responsive, negatively, at the end of the period to foreign assets (or the foreign debt) and to foreign interest rates, although the response pattern to foreign interest rates showed strong fluctuations, indicating some periods of highly responsive capital movements and reserve losses due to foreign interest rate movements.

The results for New Zealand appear in Figures 7 through 10. For the response pattern of the real exchange rate, we see that it became progressively more dependent (negatively), on financial wealth and more dependent (negatively) on government spending. Thus domestic monetary and fiscal factors became more significant determinants of the real exchange rate as the economy became more financially open.

Figure 8 pictures the effects of the lagged foreign interest levels and the lagged foreign asset and reserve stocks on the change in domestic interest rates. The upper graph shows that the two lagged level effects diminish in absolute value terms in their

effects on the change in domestic interest rates, indicating greater convergence at the end of the period. The lower graph shows sign-switching: at the end of the period foreign asset effects, indicated by the solid curve, became negative, while reserve accumulation effects, represented by the broken curve, became positive.

Figure 9 pictures the movement of coefficients in the net export equation. While the effects of real exchange rate changes had slightly lower positive effects on the net export balance at the end of the period, net export became negatively more responsive to real interest rate changes, by a factor of six. Thus, as the economy became more open financially, interest rates had stronger (negative) effects on the current account through the capital inflow effect, which dominated the positive effects through aggregate consumption and investment. Financial and capital market effects became more important for the current account as liberalization progressed.

Finally, Figure 10 pictures the response of reserves to foreign assets and to foreign interest rates. The results are different from the Chilean response pattern. We see that reserves became less responsive to foreign assets in New Zealand, while foreign interest rates had progressively stronger negative effects. Foreign interest rates became more important, rather than less, as determinants of reserves, as private asset holders responded progressively more to foreign interest rates. Foreign assets or debts, mostly private, had less influence on reserves as foreign interest rates became more important.

IV. CONCLUDING REMARKS

Tests show that financial liberalization experiences have both important similarities and differences. Financial liberalization can have very different effects, depending on the way it is implemented, on the array of transactions costs on domestic and international assets, and on the public or private status of its existing international debts. While Chile and New Zealand are clear cases of rapid liberalization, the way macroeconomic variables evolved in their responses to domestic and international variables show a very different adjustment, reflecting differences in the deep "transactions costs" parameters as well as different risk factors associated with its external debts.

Despite the differences, our results show that domestic interest rates became less volatile when the capital account is opened, while the sensitivity of the real exchange rate to changes in fundamentals increases with financial openness. The results also suggest that financial market factors as well as fiscal policy become more important determinants of the real exchange rate and net exports as financial liberalization progresses. Since both of these variables have important effects on employment and growth during the adjustment process, our analysis of Chile and New Zealand shows that misguided fiscal or financial policy can exact high costs when an economy becomes more financially open.

APPENDIX 1

To obtain the slopes of the non-traded market equilibrium condition and of the steady-state equilibrium condition implying a stationary level of foreign assets, as represented by schedules NN and $(\dot{f}=0)$ in figure 1, differentiate equations (9) and (11). The corresponding slopes are given in equations (A1) and (A2), where d denotes total differentials and ∂ partial derivatives, and the signs in brackets are those of the partial derivatives:

$$(A1) \quad dp/df = (\partial c_N/\partial w) / [\partial y_N/\partial p - \partial c_N/\partial p - \partial c_N/\partial w \quad \partial w/\partial p - \partial j_N/\partial p] < 0$$

$$\qquad \qquad \qquad [+]\qquad \qquad [-]\qquad [+]\qquad [+]\qquad [+]\qquad [+]$$

$$(A2) \quad dp/df = [p^\alpha \partial c_T/\partial w - (i + \hat{E}^e - \pi^e)] / [(\alpha p^{\alpha-1} NX) + p^\alpha \partial y_T/\partial p - \partial c_T/\partial p$$

$$\qquad \qquad \qquad [+]\qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad [+]\qquad [-]$$

$$\quad - \partial c_T/\partial w \quad \partial w/\partial p \quad - \partial j_T/\partial p] > 0$$

$$\qquad \qquad \qquad [+]\qquad [+]\qquad \qquad [-]$$

While equation (A1) has an unambiguous negative sign, both the numerator and the denominator of equation (A2) can have either sign. However in footnote 4 we assume that net exports depend unambiguously and positively on the real exchange rate p , implying a positive denominator of (A2).

In the absence of additional information on parameter values one could expect that the magnitude of the slopes of the excess demand curves for traded and non-traded goods with respect to p are similar, so that the magnitude of the denominator of (A1) is higher than that of (A2).

The sign of the numerator of (A2) depends on the magnitude of the wealth effect on consumption relative to the interest effect

stemming from higher foreign assets. In Figure 1 we assume that the wealth effect dominates, so that the numerator is positive.

APPENDIX 2

I. Sign-dependencies in Equation (23)

We might expect a dominance of the positive effects of $i^* + \hat{E}^e$, LR, and f on domestic interest rate i for the following reasons.

The ambiguous effect of $i^* + \hat{E}^e$ stems from the fact that an increase in the arbitrage interest level reduces desired (i.e. long-run) money demand L^D , therefore increasing i_t , but at the same time it reduces (shifts) the short-run or current money demand, reducing i_t . The higher β is, and the lower the magnitude of the cross derivative of the money demand $[\partial L / \partial (i^* + \hat{E}^e)]$, the higher is the probability that the first effect dominates, as we assume is the case.

The ambiguity of the effect of f on i also stems from two channels. Assuming again the dominance of β on $\partial L / \partial (i^* + \hat{E}^e)$, an increase in f reduces i . But on the other hand there is also a wealth effect of f via higher financial wealth, which increases i . Under dominance of the second channel, the net effect of f on i is positive.

FOOTNOTES

1. Dornbusch (1985) analyzes overborrowing in Latin America which led to the 1982 debt crisis. He emphasized the role of domestic policies. Calvo et al. (1992) study the recent resumption of capital flows to Latin America, emphasizing the role of external factors. For a detailed analysis of Chile's 1975-83 bust-boom-bust cycle, see Morande and Schmidt-Hebbel (1988). See Dornbusch and Reynoso (1989) for a more general survey of financial issues, including the role of inflationary finance, in the development process.
2. See Spencer and Carey (1988) and Hunn, Mayes, and Williams (1989) for details on the financial policy reforms put in place in New Zealand in 1985.
3. In our analysis, we compare dynamic adjustment of the nominal interest rate with the real exchange rate, rather than the real interest rate with the real exchange rate. We do so because the nominal interest rate is the variable which clears the money market, and the real exchange rate clears the non-traded goods market. Their dynamic behavior reflects the underlying disequilibria in these two markets. The nominal interest rate is consistent with the real interest rate driving intertemporal consumption and investment decisions.

4. A major limitation of this paper is that we do not cover the issue of sequencing of capital and current-account liberalization. For a recent survey, see Hanson (1992).

5. Niehans (1991, 1992) recently analyzed the effects of financial liberalization under a wider-array of transactions costs parameters. He found that the effects of financial liberalization in a variety of cases depends more on the relationships between individual transactions costs than on their general level.

6. Q is replaced by a function depending negatively on the real exchange rate. The positive influence of p on w stems from the fact that an increase in p reduces the general price deflator and therefore increases the value of real money and domestic bond holdings for given M and B .

7. We cite the recent work by Butlin (1985), Brock (1985) and Schmidt-Hebbel (1987), among others, which extend previous work on intertemporal optimization, and derive behavioral functions in the context of a dependent or small open economy.

8. Consumption demands in equations (9) and (10) depend ambiguously on own real interest rates because of the well-known opposite signs of the substitution and wealth effects. Investment demands depend unambiguously and negatively on their own real rates of interest in each sector. We simplify our dynamic analysis by dropping the effect of interest rates on consumption.

9. In addition to the variables we include in (9), factor prices could determine output supplies while investment could depend either on factor prices or output levels. This opens the possibility of explicitly introducing unemployment and business cycles, through exogenous or sluggish factor prices and accelerator mechanisms.

10. We postulate that net exports depend unambiguously and positively on the real exchange rate. This assumes very realistically that the indirect price effect of a higher real exchange rate on consumption via a wealth rise is more than compensated by the sum of the direct effects of higher p on traded goods production, consumption and investment.

11. When the debt-servicing effect of a rise in f dominates the wealth effect, i.e. when the $(\dot{f}=0)$ curve is negatively sloped, there is an unambiguous rise in the stationary values of both the foreign debt and the real exchange rate.

12. This dominance depends on value of the speed of adjustment β , and thus on the intensity of legal restrictions, as shown in equation (18).

13. Expected inflation π^e , (the expectation of inflation between periods t and $t+1$, as of period t) and expected nominal devaluation (defined similarly) are obtained from autoregressive time-series

specifications for actual rates of inflation and nominal devaluation.

14. The results of the Phillips-Perron tests appearing in Table 1 are for lag truncations at zero. The same results held up at lag truncations 1 through 4. A copy of a Matlab (1990) program for the Phillips - Perron tests is available from the first author.

15. Unfortunately, the length of observations made it impossible to test for cointegration among the variables, using the Johansen - Juselius (1991) test. Thus, we could not specify an error-correction mechanism in our dynamic analysis.

16. These tests are a part of the Micro TSP Version 7.1 program, and are discussed in Hall, Johnston, and Lilien (1990).

17. A copy of a Matlab program for Kalman filtering, using the program provided with Hansen-Sargent (1991), is available from the first author upon request.

References

ANDERSON, BRIAN AND JOHN MOORE, Optimal Filtering. Englewood Cliffs: Prentice-Hall, 1979.

BROCK, PHILLIP L., "Temporary and Permanent Economic Liberalization", Manuscript, Department of Economics, Chapel Hill, Duke University, 1985.

BUTLIN, M.W., "Imported Inputs in an Optimizing Model of a Small Open Economy", Journal of International Economics, February 1985, 18: 101-122.

CALVO, GUILLERMO A., LEONARDO LEIDERMAN AND CARMEN M. REINHART, "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors". Manuscript, International Monetary Fund, June 1992.

CHOW, GREGORY, "Random and Changing Coefficient Models" in Z. Griliches and M. Intrilligator, eds., Handbook of Econometrics 2: 1213-1245. Amsterdam: North Holland, 1979.

CORBO; VITTORIO, "Reforms and Macroeconomic Adjustment in Chile during 1974-1984", World Development, August 1985, 13: 893-913.

_____ AND RICARDO MATTE, "Capital Flows and the Role of Monetary Policy: the Case of Chile", Working Paper, Catholic University of Chile: Department of Economics, 1984.

DORNBUSCH, RUDIGER, "Expectations and Exchange Rate Dynamics",
Journal of Political Economy, December 1976, 84, 1161-1176.

_____ Open Economy Macroeconomics, New York: Basic Books,
1980.

_____, "Overborrowing: Three Case Studies", in Gordon W.
Smith and John T. Cuddington, eds., International Debt and the
Developing Countries. Washington, D.C.: The World Bank, 1985.

_____ AND STANLEY FISCHER, "Exchange rates and the Current
Account", American Economic Review, December 1980, 70: 960-71.

_____ AND ALEJANDRO REYNOSO, "Financial Factors in Economic
Development", NBER Working Paper 2889, 1980.

EDWARDS, SEBASTIAN, "Money, the Rate of Devaluation, and Interest
Rates in a Semi-Open Economy", Journal of Money, Credit and
Banking, February 1985, 17: 59-68.

_____, "Monetarism in Chile, 1973-83: Some Economic Puzzles",
Economic Development and Cultural Change, April 1986, 34: 535-560.

_____ AND ALEJANDRA COX EDWARDS, Monetarism and
Liberalization: The Chilean Experiment, Boston: Ballinger, 1987.

HALL, ROBERT E., JACK JOHNSTON, AND DAVID M. LILIEN, Micro-TSP User's Manual, Irvine, CA: Quantitative Micro Software, 1990.

HANSEN, LARS PETER AND THOMAS J. SARGENT, Linear Recursive Models of Dynamic Economies, Princeton, NJ: Princeton University Press, 1991.

HANSON, JAMES A., "An Open Capital Account: A Brief Survey of the Issues and the Results". Manuscript, World Bank. 1992.

HARVERY, ANDREW C., Time Series Models, London: Philip Allen Publishers, 1981.

HENDRY, DAVID A., "Econometric Modeling with Cointegrated Variables: An Overview", Oxford Bulletin of Economics and Statistics, May 1986, 48: 201-212.

HUNN, NICOLA, DAVID MAYES AND NEIL WILLIAMS, Financial Deregulation and Disinflation in a Small Open Economy, Wellington: New Zealand Institute of Economic Research, Research Monograph 44, 1989.

JOHANSEN, SOREN AND KATARINA JUSELIOUS, "Maximum Likelihood Estimation and Inference on Cointegration-with Application to the Demand for Money", Oxford Bulletin of Economics and Statistics, May 1990, 51: 169-210.

KOURI, PENTII AND MICHAEL PORTER, "International Capital Flows and Portfolio Equilibrium", Journal of Political Economy, May/June 1974, 86: 443-468.

MATLAB, Matlab 386, South Natick, MA: The MathWorks, Inc.

MORANDE, FELIPE AND KLAUS SCHMIDT-HEBBEL, Del auge a la crisis de 1982: ensayos sobre liberalización financiera y endeudamiento en Chile, Santiago: IIMC-ILADES Georgetown University, 1988.

NIEHANS, JURG, "Capital Mobility with Transactions Costs: A Concept and Applications", Working Paper No. PB91-03, Center for Pacific Basin Monetary and Economic Studies, Economic Research Department, Federal Reserve Bank of San Francisco, 1991.

_____, "The International Allocation of Savings with Quadratic Transactions (or Risk) Costs", Journal of International Money and Finance, June 1992, 11: 222-234.

PAGAN, ADRIAN, "Some Identification and Estimation Results for Regression Models with Stochastically Varying Coefficients", Journal of Econometrics, August 1980, 13: 341-363.

PHILLIPS, PETER C.B. AND PIERRE PERRON, "Testing for a Unit Root in Time Series Regressions", Biometrika, June 1988, 75: 335-46.

SCHMIDT-HEBBEL, KLAUS, "A Short-run Macro Model for a Small Open Economy with An Application to Chile, in Foreign Shocks and Macroeconomic Adjustment in Small Open Economies", Ph.D. dissertation, M.I.T., 1987.

_____, Consumo e inversión en Chile: una interpretación "real" del boom", in Morandé and Schmidt-Hebbel, op. cit., 1987.

PENCER, JOHN AND DAVID CAREY, "Financial Policy Reform-the New ealand Experience, 1984-1987", Wellington: Reserve Bank of New ealand, Discussion Paper G88/1, 1988.

VALDES-PRIETO, SALVADOR, "Financial Liberalization and the Capital ccount: Chile 1974-84". Manuscript, World Bank. 1992.

Policy Research Working Paper Series

Title	Author	Date	Contact for paper
WPS1006 Preparing Multiyear Railway Investment Plans: A Market-Oriented Approach	Jorge M. Rebelo	October 1992	A. Turner 30933
WPS1007 Global Estimates and Projections of Mortality by Cause, 1970-2015	Rodolfo A. Sulatao Patience W. Stephens	October 1992	O. Nadora 31091
WPS1008 Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries	Harold Alderman Christina H. Paxson	October 1992	C. Spooner 32116
WPS1009 Labor and Women's Nutrition: A Study of Energy Expenditure, Fertility, and Nutritional Status in Ghana	Paul A. Higgins Harold Alderman	October 1992	C. Spooner 32116
WPS1010 Competition and Efficiency in Hungarian Banking	Dimitri Vittas Craig Neal	October 1992	W. Pitayatonakarn 37664
WPS1011 How Tax Incentives Affect Decisions to Invest in Developing Countries	Robin Boadway Anwar Shah	November 1992	C. Jones 37754
WPS1012 The Brady Plan, the 1989 Mexican Debt Reduction Agreement, and Bank Stock Returns in the United States and Japan	Haluk Unal Asli Demirgüç-Kunt Kwok-Wai Leung	November 1992	W. Patrawimolpon 37664
WPS1013 The Impact of Mexico's Retraining Program on Employment and Wages	Ana Revenga Michelle Riboud Hong Tan	November 1992	D. Young 30932
WPS1014 Ethnicity, Education, and Earnings in Bolivia and Guatemala	George Psacharopoulos	November 1992	L. Longo 39244
WPS1015 Benefit Incidence Analysis in Developing Countries	Thomas M. Selden Michael J. Wasylenko	November 1992	C. Jones 37754
WPS1016 Europe and Central Asia Region, Middle East and North Africa Region Population Projections, 1992-93 Edition	My T. Vu Eduard Bos Ann Levin	November 1992	O. Nadora 31091
WPS1017 Rural Poverty, Migration, and the Environment in Developing Countries: Three Case Studies	Richard E. Bilborrow	November 1992	WDR 31091
WPS1018 Tariff and Tax Reform: Do World Bank Recommendations Integrate Revenue and Protection Objectives?	Anand Rajaram	November 1992	P. Pender 37851

Policy Research Working Paper Series

Title	Author	Date	Contact for paper
WPS1019 How Effective are Directed Credit Policies in the United States? A Literature Survey	Anita M. Schwarz	November 1992	M. Raggambi 37664
WPS1020 Another Look at Population and and Global Warming	Nancy Birdsall	November 1992	S. Rothschild 37460
WPS1021 Measuring Welfare Changes from Commodity Price Stabilization in Small Open Economies	Jonathan R. Coleman Chris Jones	November 1992	D. Gustafson 33714
WPS1022 A New Approach to Evaluating Trade Policy	James E. Anderson J. Peter Neary	November 1992	M. T. Sanchez 33731
WPS1023 Tariff Index Theory	James E. Anderson	November 1992	M. T. Sanchez 33731
WPS1024 An Exact Approach for Evaluating the Benefits from Technological Change	Will Martin Julian M. Alston	November 1992	D. Gustafson 33714
WPS1025 Openness and Economic Performance in Sub-Saharan Africa: Evidence from Time-Series Cross- Country Analysis	Kazi M. Matin	November 1992	D. Ballantyne 38004
WPS1026 Financial Liberalization and Adjustment in Chile and New Zealand	Paul D. McNelis Klaus Schmidt-Hebbel	November 1992	A. Marañon 31450
WPS1027 Lessons from Bank Privatization in Mexico	Guillermo Barnes	November 1992	W. Pitayatonakarn 37664