Exchange Control Liberalisation in Jamaica

A Study for the Private Sector Organisation of Jamaica

London Economics

March 1991

Contents

Acknowledgements

The London Economics' team is especially grateful for the assistance of the Statistical Institute of Jamaica, the Planning Institute of Jamaica, the Ministry of Finance, and the Private Sector Organisation of Jamaica, all of whom made data available to us in disc form.

Thanks are also due to those in the Jamaican Government, the Bank of Jamaica and in the private sector, who made time available to explain the Jamaican economy and its management to us. The views and conclusions in the report are entirely our own responsibility.

I would like finally to acknowledge the contribution of Alberto Pototschnig, who carried the burden of assembling the data and the analysis, and to thank Dr Charles Bean, of the London School of Economics, for his invaluable advice.

Dr Nicholas Owen
Study Director

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Dimitri Vittas (Team
Study Leader)

Executive Summary

Over the period 1973-1988, when developing countries as a whole raised their real GDP by over 80%, Jamaica's real GDP fell by 10%, even though it has recovered well since 1985. Against this background, all restrictions on the economy, including Jamaica's exchange controls, deserve close scrutiny.

The argument for exchange controls in Jamaica is that the economy is a small, open, and import-dependent; it would be destabilised by the likely accompaniments of liberalisation - capital flight and currency depreciation.

The case against them is that they distort purchasing and investment decisions, and inhibit initiative. To the extent that they sustain an overvalued exchange rate, they tax any industry which faces foreign competition, provide investors with a one-way bet against their currency, and discourage inward investment.

The key question for the study is not whether controls are damaging - they are - but whether the transition to a deregulated state can be achieved at this juncture without damaging the economy by more than the benefits.

This study has modelled the way the economy has behaved since 1973, to see how it might be expected to cope with liberalisation. It indicates that:

- the economy has not demonstrated sufficient dynamism to cope very well with liberalisation and GDP would probably fall initially;
- the basic problem is that exchange rate liberalisation would succeed by sending price signals to the economy but the economy is just not yet sufficiently responsive to prices;
- exports are not responsive to depreciation, and even though fixed capital investment would respond positively to liberalisation, it would not feed through to exports strongly enough.

The policy recommendations of the study are that:

- exchange rate liberalisation should be approached by accelerating the programme of deregulation in the domestic economy, to allow it to become more responsive;
- more competition in the domestic economy, less public ownership, fiscal neutrality, and the removal of price and wage controls, would all contribute to this objective;
- once the economy has acquired the market reflexes to cope with exchange control liberalisation, trade and capital liberalisation should proceed together, preferably on the basis of managed floating; and
- the fact that the exchange controls in Jamaica are "leaky" is an argument for abolishing them at the earliest prudent opportunity; incomplete controls may combine the problems of liberalisation with the discouraging effects of controls on inward investment.

Executive Summary

Over the period 1973-1986, when developing countries as a whole raised their real GDP by over 60%, Jamaica's real GDP fell by 10%, even though it has recovered well since 1985. Against this strong trend, all restrictions on the economy, including Jamaica's exchange control, have been progressively eased.

The argument for exchange control is based on the idea that the economy is small, open, and import-dependent. It would be destabilised by the likely accompaniments of liberalisation - capital flight and currency depreciation.

The case against them is that they cause misallocation of resources and investment decisions, and hidden rationing. In the specific case of Jamaica, they have not encouraged manufacturing, which has actually contracted, and have contributed to a conflict between the economy and the government.

The key question is whether or not the benefits from maintaining - they are - but whether the restrictions have delayed the adjustment of the economy without damaging the economy by comparison with Jamaica.

This study has modelled the way the economy has behaved since 1974, to see how it might be expected to react to some alternative policies, and it concludes that:

- the economy has not demonstrated sufficient flexibility to cope very well with increased flows of capital, and has lost ground.

- the balance of payments problem, including the liberalisation was to account by sending some capital to the rest of the world, the economy is that has not [illegible] the problem.

- export [illegible] in the [illegible] even though most capital [illegible] would be like [illegible], it would not lead [illegible] enough.

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- [illegible] the economy the capacity to cope with exchange [illegible] and liberalisation should proceed [illegible] and [illegible].

- [illegible] the "leader" is an appropriate [illegible] supporting controls [illegible] the problems of liberalisation with the strengthening efforts of [illegible] in [illegible].

1. Introduction

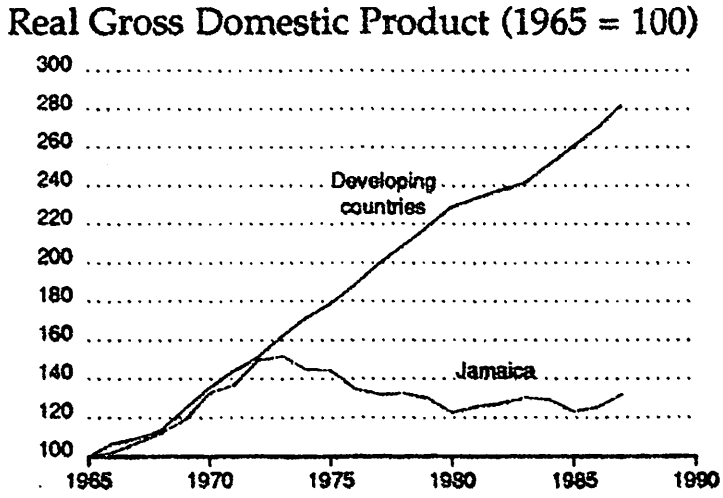
Exchange controls have operated in Jamaica since the Second World War. Clearly, the objective which prompted their introduction - the need to direct resources for a war effort - has little in common with the objectives of the successive Jamaican governments retaining these controls. However, the effect is the same - government control over the use of Jamaican resources.

Jamaica is not alone in operating foreign exchange controls. Most countries in the developing world do so. There is widespread support amongst the economics profession in favour of liberalising these controls as they apply to trade, because the freeing up of both domestic economies and their external trade is seen as a recipe for faster economic growth. It is noticeable, however, that this call for liberalisation stops short of capital liberalisation. Whereas trade liberalisation is seen as an adjunct to domestic liberalisation, capital liberalisation is regarded as a step which should either be completed later, or perhaps not at all.

1.1 The case for and against exchange controls

We would start by noting that over the period 1973-1988, developing countries as a whole raised their real GDP by over 80%, but Jamaica's real GDP fell by 10% (see Figure 1.1).

Figure 1.1



Source: IMF International Financial Statistics

This single, and startling, fact is a challenge to any study of any aspect of Jamaica's economic management, including the present one. A country's exchange rate, and its management, is central to the way its economy performs.

1. Introduction

Exchange controls have existed in Jamaica since the Second World War. Initially the objective, which prompted their introduction, the need to conserve foreign exchange, has been a vital one. Little in common with quantitative or other aspects, however, governing these controls. However, the effect is the same: government control over the use of Jamaican resources.

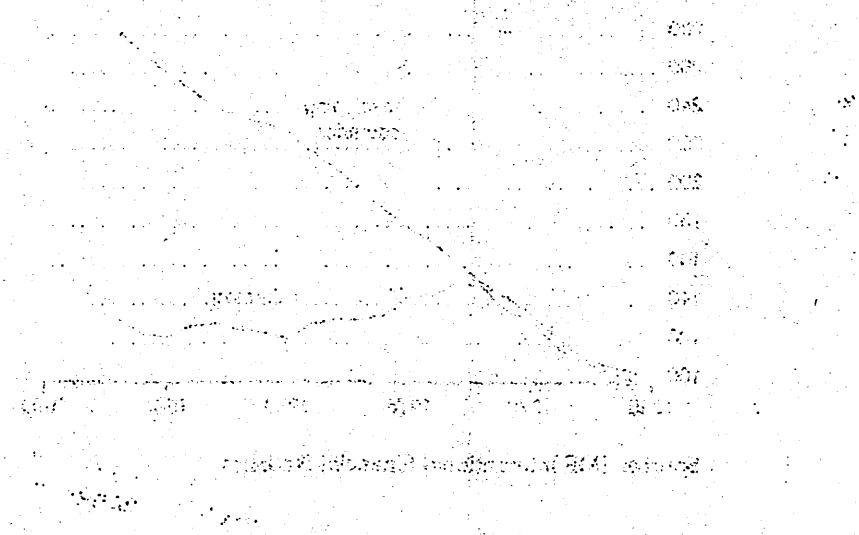
Jamaica is not alone in exercising foreign exchange controls. Most countries in the developing world do so. There is widespread support amongst the general public for protection in favour of liberalisation. It is easier as they only to trade because the funding up of both domestic consumption and industrial inputs in years as a recipe for faster economic growth. It is noticeable however that the call for liberalisation appears of capital liberalisation. Whereas most liberalisation measures as adjunct to domestic liberalisation, such liberalisation is a separate issue, which should either controlled level or perhaps not at all.

1.1 The case for and against exchange controls

We should start by noting that most developed OECD countries, developing countries and former based their not OECD by or EMS, but based on [illegible] 1.1).

Figure 1.1

Pace Curve (Industrial Nations, 1973 – 1987)



Source: IMF International Financial Statistics

The abuse and dodging of exchange controls is [illegible] by agents of Jamaica's economic management, including [illegible] management is central to the work of [illegible]

The arguments for and against exchange controls in Jamaica can be simply stated. The case for them is that:

1. Jamaica is a small open economy which relies on imports for almost all its capital equipment, all its energy and much of its food: these deserve priority over the acquisition of real estate and equities overseas;

2. capital flight would destabilise the currency, and by fuelling inflation, add to the Government's foreign debt burden, and hence to its expenditure;

3. the depreciation likely to accompany the abolition of controls would not lead to an improvement on the visible account because exports or imports are not responsive to the exchange rate; the effects of depreciation on domestic costs would be quickly nullified by higher wages, and such a depreciation would also have contractionary effects on the economy.

The case against exchange controls is that they:

1. sustain an overvalued exchange rate, which acts as a tax on those industries which export or which compete with imports, and provides investors with a one-way bet against their currency;

2. exchange controls discourage much needed foreign investment, partly because investors fear that they could not repatriate their capital, and partly because rates of return in the tradeable goods sectors are depressed by an overvalued exchange rate;

3. exchange controls distort the economy, favouring industries which are not exposed to foreign competition - financial services, housebuilding, trading - at the expense of those that are - exporting industries and tourism.

The case for and against controls is also linked to a debate about the relative merits of stable and variable exchange rates. If the view is taken that there are advantages for the economy in linking the currency to the US$, exchange controls are an obvious instrument with which to attempt to peg the exchange rate. There is currently an intellectual fashion, certainly in Europe, which favours fixed exchange rates, in the belief that they raise business confidence and provide the discipline necessary to control inflation. Against that background, it would be surprising if policy-makers in Jamaica did not also take the view that exchange rate stability is desirable, and that to achieve this without controls would require higher reserves than Jamaica possesses.

Other countries' experience

It has been argued that liberalisation is unlikely to work in a small economy which imports many necessities and most of its capital equipment. There are counter-examples. Hong Kong, Taiwan, South Korea and Singapore share these structural features but nevertheless thrive on the basis of exchange rate regimes which are, to varying degrees, liberalised. These dynamic economies, whose cultures are very different to Jamaica's, may not perhaps be considered relevant examples. How have less dynamic countries fared with liberalisation?

African experience may be more relevant. According to a study of the experience of nine sub-Saharan, low-income, trade-dependent countries which have experimented with exchange control liberalisation[1], four of the nine African countries which experimented with auctions and floats subsequently abandoned them. The study concluded that the evidence on whether exchange rate liberalisation has promoted faster growth, was "meagre and conflicting".

Devaluation tended to depress real incomes, and hence the output of industries serving the domestic market, but it has encouraged export industries (an inflow of investment into fisheries in the Gambia was noted). Liberalisation has been popular with the business sector, which suggests that it encourages better investment decisions. Where there has been a retreat from liberalisation, as in Zambia, the restoration of controls has discouraged investment. Foreign investors did not appear to be widely attracted by the prospect of greater convertibility, although there were signs of greater investor interest in some of the liberalising countries.Liberalisation has not generally produced exchange rate stability. This may explain why confidence in economic policy has been judged slow to respond in those African countries which have liberalised. This was not so much a result of surges in imports of luxuries following import liberalisation: these were dampened by the depressing effect of the accompanying devaluations. The instability appeared to arise because liberalisation was not accompanied by sufficiently firm monetary control. This policy inconsistency fuelled expectations that the currency would depreciate, and expectations of this sort tend to be self-fulfilling.

1.2 The purpose of the study

The purpose of this study is not to rehearse arguments for and against liberalisation. There is a large and inconclusive literature about the allegedly contractionary effects of devaluations; and arguments for liberalisation in Jamaica have been ably articulated already[2]. The study's purpose is to try, with the aid of empirical research into the workings of the Jamaican economy, to verify which of the assertions above are true, and to try to predict what would happen if exchange controls were abolished.

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1 "Policies for Liberalising Exchange Rates in Sub-Saharan Africa", John Roberts, Government Economic Service Working Paper No 104, London, June 1988.

2 See, for example, "Exchange Rate Policy for Economic Growth and Development", PSOJ, October 1987, for an exposition of the case for progressively dismantling exchange controls.

We can divide the discussion into two aspects of liberalisation:

- the efficiency benefits;
- the macroeconomic management implications.

There seems little doubt that liberalisation would improve economic efficiency. It would allow:

- Jamaicans to seek the best returns on their capital;
- foreign investors to exploit opportunities in Jamaica more fully;
- the exchange rate to find an equilibrium level, thereby removing a source of distortion to the economy.

These efficiency effects are inherently difficult to measure, especially by looking at one economy in isolation. It is interesting that in his study on exchange rates, Edwards[3] found that in a sample of developing countries, a country's rate of growth was negatively and significantly related to the degree of distortion in its foreign exchange market (as reflected by the divergence between the official and the black market rates). This suggests that to the extent that controls distort, they also hinder growth.

We have attempted to establish whether this relationship holds for Jamaica, but were hindered by the lack of historical data on black market exchange rates. We did find evidence that profitability in the economy was negatively related to overvaluation of the Jamaican $.

In short, there are strong reasons - derived both from economic theory and international research - for supposing that controls damage efficiency, and hence economic growth, in Jamaica.

Turning then to the macroeconomic effects, we need to understand whether and how the *transition* from the regulated state to the liberalised state can be managed. For example:

- How will exports and imports respond to changes in the exchange rate?
- Would there be a net capital flight?
- Would Jamaica's GDP rise, or fall?

The study focuses on this aspect, because the efficiency effects are not in serious doubt, and because even if they could be proved in advance (which we doubt), they would not in themselves solve the problem of how to achieve them.

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3 Sebastian Edwards, "Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries", The MIT Press, 1989, p.330.

We approached the task by constructing a model of the Jamaican economy. Only in this way, we believe, is it possible to understand the key relationships in the economy - relationships which determine the answers to questions of the kind posed above.

A number of assertions have been made about how the Jamaican economy works, and why exchange controls are necessary for the economy, or damaging to it, or difficult to remove. Hence we want a model of the economy to tell us how, in broad terms, the economy works.

We are not aware of any attempt to construct and estimate a model of the Jamaican economy. There have been efforts to estimate particular aspects of the economy, such as the demand for money. The issues we are concerned with - inflation, exchange rates, interest rates, growth, and investors' choice of assets - require nothing less than a general equilibrium model of the economy. This we have set out to provide.

One view accepts the advantages of liberalisation, but questions whether it is feasible to liberalise until Jamaica has accumulated greater reserves of foreign currency. The issue then turns on the size of the reserves that are necessary to cushion the exchange rate against the shocks imparted by capital flight, and indeed, to head off capital flight by giving investors confidence in the regime.

This is a natural way to think about the problem, but it is not particularly helpful. If the fundamentals of the economy are unfavourable to liberalisation, no amount of reserves would suffice. If they are, it is not clear why reserves are needed at all.

It is more helpful to anticipate worst-case scenarios, in which capital flight is substantial, and in which the authorities are unable, or choose not, to defend the Jamaican dollar. One can then consider whether the economy is robust enough to respond to such a scenario. Rather than trying to estimate the size of the necessary reserves we ask: if Jamaica had no net reserves, what is the worst that could happen in a liberalised regime? For example, would capital flight cause the J$ to sink like a stone, driving up inflation and unemployment?

The answer depends in part on the way the economy as a whole would respond to an exchange rate depreciation, and how quickly. If the "real" economy - national output, imports - responds strongly to the exchange rate, in ways which economic theory would predict, then they would tend to compensate for the effects of capital flight on the balance of payments and the exchange rate (and thereby discourage it).

Conversely, if exports and imports are insensitive to the exchange rate, perhaps because the effect of a depreciation on domestic costs is quickly offset by higher wage costs (as is contended by some in Jamaica), the J$ would indeed be highly unstable if exchange controls were abolished.

This report:

1. explains the shape of the model and the thinking behind it;

2. estimates the parameters of the model i.e. the extent to which each element responds to others, on the basis of Jamaica's experience over the 16 year period 1973-1988, using econometric techniques;

3. solves the model, focusing on the economic objective which is of overriding importance - the economy's growth rate -to show how it is determined;

4. simulates the effect of lifting exchange controls on the economic growth rate, and other key features, such as the exchange rate.

In parallel, we seek to understand past capital movements (much of which have been conducted unofficially) and then, using any insights from the modelling of the economy, predict how they might be expected to respond to the removal of exchange controls.

1.3 The outline of the study

The study is organised in the following way:

Section 2 provides an overview of Jamaica's recent economic history and offers some preliminary observations on the likely role of the exchange rate in the economy.

Section 3 reports on the modelling of the Jamaican economy.

Section 4 presents some simulations of the economy under possible liberalisation scenarios.

Section 5 presents our conclusions on whether Jamaica would benefit from liberalisation of exchange controls, and on the study's lessons for economic policy.

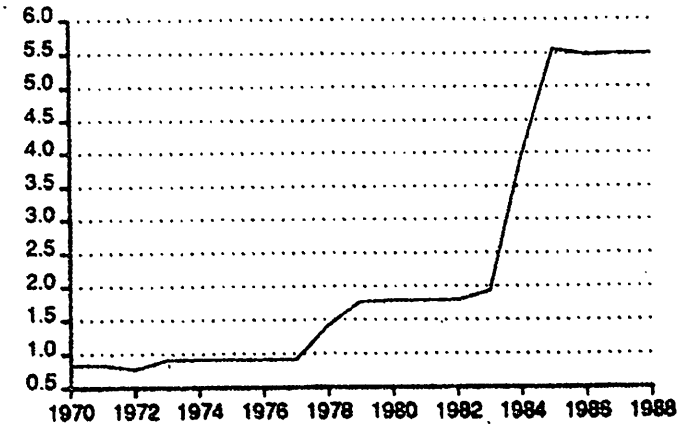
2. A Preliminary Overview

2.1 Some history

The history of the J$/US$ exchange rate over the last 19 years is summarised in Figure 2.1. Jamaica's exchange rate management over that period has experimented with a variety of institutional arrangements. Prior to 1973, exchange rates between major currencies were held fixed within the Bretton Woods system. The Jamaican currency - the Jamaican pound (until September 1969) and the Jamaican dollar thereafter - was also pegged to Sterling. In 1973 the Bretton Woods system collapsed and major currencies began to fluctuate vis-a-vis each other. The Jamaican dollar devalued by 18.5% and was then pegged to the US$ at what seems an extraordinary rate today - 1US$ = 0.909J$, for five years.

Figure 2.1

Jamaican dollar exchange rate (J$ to US$) 1970-1988



In 1977 a dual rate system was introduced with the basic rate at the 0.909 level and a special rate at a 37.5% premium. The dual system lasted just over a year, in which period the rates were devalued four times, by 70 % overall. This experience convinced the Jamaican government to adopt a policy of monthly mini-devaluations (1-1.5% per month, starting from a single rate at J$1 = US$ 1.55 in June 1978).

In May 1979 a fixed rate regime was reintroduced and maintained for three and a half years at the J$1.78. In January 1983 a multiple rate system was again introduced. This new system was based on an official rate fixed at the previous level, a parallel rate (determined in a parallel foreign exchange market operated by commercial banks - at a 50-66% premium over the official rate) and, since May, a CARICOM rate (at 1US$ = 2.25J$) for trade within the CARICOM area. This system survived less than a year. It was replaced by a system based on a J$0.30 variation band. The band was then re-adjusted repeatedly, moving from J$3.00-3.30 to J$4.60-4.90 in November 1984, when the system was finally abandoned.

A freely floating exchange rate system based on twice-weekly auctions followed, and remained in place until November 1989, when the auction system was suspended. It is remarkable that over the five year period 1984-89 the exchange rate, despite being described as "freely floating", actually showed very little variability. For example, between December 1985 and July 1989 (a three and a half year period including hurricane Gilbert in September 1988), the exchange rate remained within the 5.48-5.56 band (a percentage range of 1.45%). The administrative framework which has operated in recent years has been ably described by Dorothy Black[4] on whose work Annex A draws in summarising these arrangements.

The essence of the arrangements during the period of this study - 1973-1988 - is that access to foreign exchange has been restricted to Jamaicans. The length of the queue for foreign exchange which has, predictably, developed in the official market has been moderated by access to parallel markets. One of these (the "forward market") had official recognition and was administered on behalf of the Bank of Jamaica (BoJ) by the commercial banks.

In September 1990, the Jamaican Government announced a partial liberalisation of exchange control arrangements. Under these new arrangements, the official and forward markets were in effect merged into one market, which is managed on behalf of the BoJ by the commercial banks. The most significant change which flows from this reform is that all exporters can now sell their foreign exchange to the commercial banks at whatever rates they can negotiate. This can expect to benefit the traditional exporting industries - bauxite, agriculture and tourism - which have hitherto been obliged to surrender their earnings at the official exchange rate. The market-determined rate, at the time of writing, stands at a premium (at J$8 to US$1) to the previous official rate (J$7 to the US$1).

The liberalisation is only partial because only those who have proof that they will use foreign exchange for approved purposes are permitted to bid for it. The purchase of certain imports is an approved purpose; the purchase of foreign equities, for example, is not.

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4 "Eliminating Restrictions on Access to Foreign Exchange in Jamaica", Dorothy Black, USAID/Jamaica: Office of Economics and Private Enterprise, May 1990.

2.2 Overvaluation of the Jamaican dollar and its likely effects

This mixed history, in which large devaluations are succeeded by periods in which the exchange rate has remained constant, has, we believe, been the cause of many of the problems of the Jamaican economy.

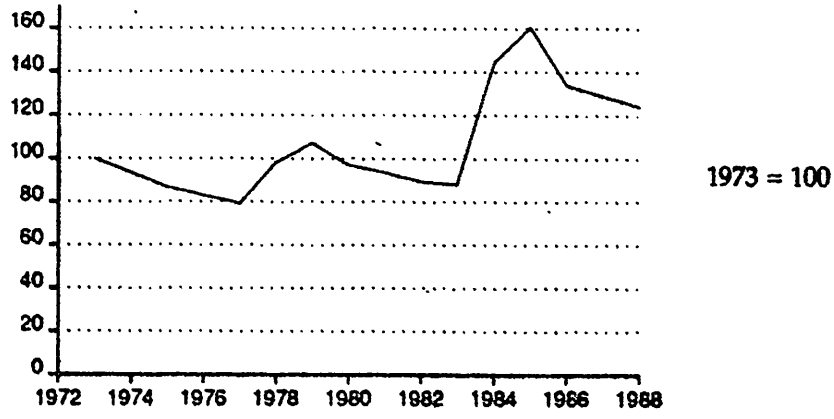
A concept of "equilibrium" exchange rate is helpful here, as a benchmark against which to compare the history of the exchange rate. The obvious candidate is the exchange rate which reflects Jamaican price levels, relative to those elsewhere - the so-called purchasing power parity (PPP) exchange rate. The idea behind PPP is that the exchange rate gradually moves to equate prices in different countries so that, for example, US$100 buys as much in the US as its equivalent in J$ buys in Jamaica[5].

Jamaica has departed from the path suggested by PPP, significantly, and for long periods, over the last 15 years. Figure 2.2 shows the trend in Jamaica's international competitiveness in PPP terms, relative to the position in 1973. A fall in the index indicates that the exchange rate was higher than was warranted by Jamaica's rate of inflation relative to that of its trading partners.

Figure 2.2 shows that the Jamaican exchange rate policy of the last fifteen years has been markedly uneven. When the exchange rate was maintained at a fixed level over prolonged periods of time, the competitiveness of the Jamaican economy declined quite

Figure 2.2

Jamaica's international competitiveness with respect to purchasing power parity (1973-1988)



5 The presumption here is that prices for homogeneous products should equalise internationally in the long run, because cross-border arbitrage would eliminate price differences. This is clearly a long run condition; short run discrepancies are bound to occur. Furthermore, the speculative forces which eliminate price differences may be frustrated by trade restrictions; and in any case, they are not able to equalise the prices of non-tradeable goods and services, but we think that this is a minor issue here.

markedly (by approximately 30% in each cycle) because Jamaica inflated faster than her trading partners (as in 1973-1977, 1979-1983 and 1985-1988). These disastrous situations were then recovered, in an abrupt manner, by means of devaluations.

What effects did these policies have on the Jamaican economy? The most obvious effect is evident in the balance of payments.

The deficit in the balance of payments has posed major problems, but has improved in recent years. From 1978 Jamaica has been a permanent client of the IMF. The conditions which the IMF has associated with its support has amounted in practice to the management of the economy by the IMF.

Jamaica's external trade in goods and services is summarised in Figure 2.3. It can be seen that in 1973, the deficit was significant but that by 1987 it had been eliminated. The 20% improvement in Jamaica's competitiveness over this period, evident in Figure 2.2, will have contributed to this. Figure 2.3 suggests that improvements in the external trade balance have been associated with devaluations. The deficit was substantial in the

Figure 2.3

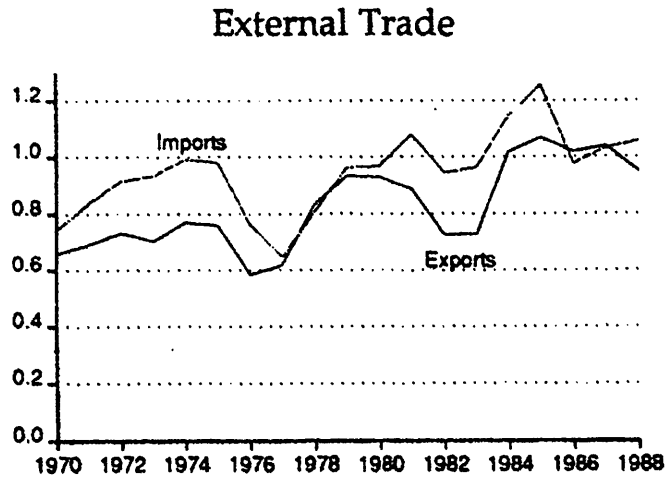
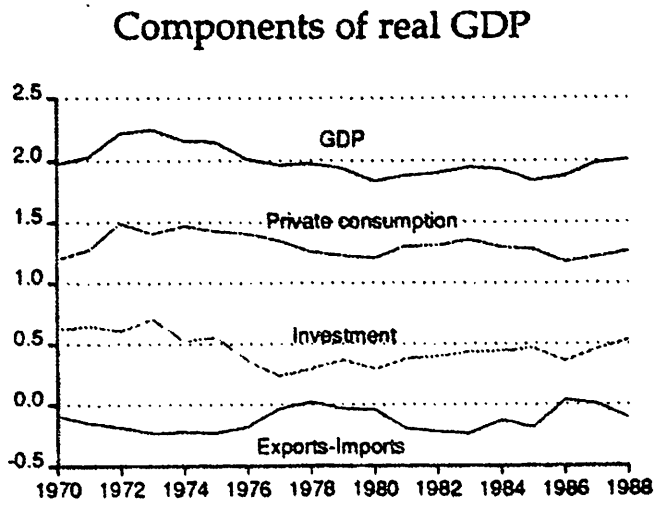


Figure 2.4



early 1970s and early 1980s, when Jamaica's competitiveness was declining (i.e. the exchange was appreciating in real terms). The trade balance recovered after the devaluations of 1977 and 1985.

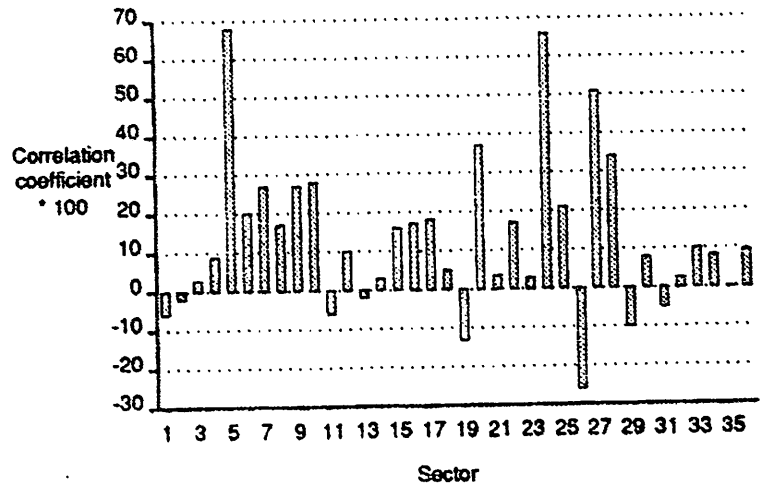
It is also instructive to see how the exchange rate has affected profitability, in view of its link with fixed capital investment.

Investment is a necessary condition for economic growth, to replace capital which is no longer economically useful, either because of obsolescence or because of technological changes. It requires a conducive environment. Persistent overvaluation of the exchange rate does not provide this encouragement. Rather, it diverts funds into speculative trade or financial assets.

We have therefore examined the relationship between the degree of overvaluation of the Jamaican currency and the gross profitability in each sector[6]. The results are reported in Table 2.1, and illustrated in Figure 2.5[7], where it is evident that, with the possible exception of the "traditional" export sectors, which were subject to a number of institutional controls, there seems to be a strong positive (and in many cases, a statistically significant) relationship between profitability and currency undervaluation. This suggests that the recurring periods of overvaluation have depressed profitability and reduced incentives to invest. This is borne out in Figure 2.4; investment declined in real terms until 1977, and recovered thereafter.

Figure 2.5

Undervaluation and profitability



6 Gross profits included indirect taxes and interest costs.

7 The time trend was first taken out of the exchange rate, and deviations around the trend were then calculated. The trend component was regarded as a proxy for the equilibrium value of the exchange rate, with the deviations representing over- or undervaluation of the currency. Regressions were then run to find the correlation between undervaluation and profitability of the various sectors of the economy.

Table 2.1

The effect of undervaluation on profitability by sector

t stastistics in brackets

u: degree of undervaluation t: time

osr: Operating Surplus Rate

	Sector								R^2	DW
1	Sugar cane	osr =	-0.21	-	0.006u	+	0.0032t		0.2	2.0
			(-0.7)		(-0.3)		(1.7)			
2	Other export crops	osr =	0.16	-	0.002u	-	0.0042t		0.45	2.1
			(13.1)		(-0.3)		(-3.1)			
3	Domestic crops & forestry	osr =	0.58	+	0.0029u	-	0.024t		0.94	0.79
			(36.8)		(0.19)		(-14.8)			
4	Livestock & fishing	osr =	0.34	+	0.0089u	-	0.017t		0.89	0.73
			(22)		(0.88)		(-9.9)			
5	Bauxite & alumina	osr =	0.38	+	0.068u	+	0.0021t		0.18	0.72
			(5.75)		(1.58)		(0.29)			
6	Other mining & quarrying	osr =	0.13	+	0.02u	-	0.43t		0.52	0.71
			(8.8)		(2.47)		(-2.62)			
7	Meat & dairy products	osr =	0.11	+	0.027u	+	0.17t		0.4	1.5
			(6.9)		(2.65)		(0.96)			
8	Grain milling & cured products	osr =	0.12	+	0.017u	+	0.41t		0.29	2.0
			(5.8)		(1.27)		(1.8)			
9	Bakery products	osr =	0.62	+	0.027u	-	0.001t		0.56	1.7
			(5.6)		(3.81)		(-0.85)			
10	Canning, preserving & misc foods	osr =	0.054	+	0.028u	+	0.009t		0.85	1.2
			(5.0)		(4.0)		(7.2)			
11	Sugar, rum & molasses	osr =	0.05	-	0.006u	-	0.01t		0.74	1.4
			(3.2)		(-0.58)		(-5.8)			
12	Beverage & tobacco	osr =	0.49	+	0.01u	-	0.006t		0.77	1.5
			(55.0)		(1.72)		(-6.1)			
13	Textile & textile products	osr =	0.15	-	0.0019u	+	0.0006t		0.01	1.4
			(8.4)		(-0.17)		(0.3)			
14	Leather & leather products	osr =	0.12	+	0.003u	+	0.002t		0.45	2.6
			(17.5)		(0.67)		(3.1)			
15	Wood & wood products	osr =	0.13	+	0.0158u	+	0.002t		0.5	2.6
			(14.9)		(2.78)		(2.1)			
16	Paper & paper products	osr =	0.08	+	0.017u	+	0.013t		0.73	1.9
			(3.8)		(1.18)		(5.6)			

17	Printing, publishing & allied industries	osr =	0.05	+	0.018u	+	0.01t	0.78	1.6
			(3.2)		(1.91)		(6.2)		
18	Petroleum refining	osr =	0.19	+	0.005u	+	0.005t	0.07	1.1
			(4.12)		(0.17)		(0.9)		
19	Chemicals; chemical, petroleum, rubber & plastic products	osr =	0.13	-	0.013u	+	0.007t	0.7	1.4
			(10.3)		(-1.59)		(5.1)		
20	Non-metallic mineral products	osr =	-0.14	+	0.037u	+	0.02t	0.79	0.93
			(-0.46)		(1.88)		(6.4)		
21	Basic metal industries & fabricated metal products	osr =	0.11	+	0.0035u	-	0.0005t	0.06	2.1
			(14.2)		(0.68)		(-0.56)		
22	Manufacture parts & repair of machinery, equipment etc	osr =	0.01	+	0.017u	+	0.01t	0.73	0.75
			(0.67)		(1.75)		(a)		
23	Miscellaneous manufacture & repair	osr =	0.22	+	0.0028u	+	0.002t	0.19	0.91
			(17.9)		(0.34)		(1.64)		
24	Electricity & water	osr =	0.21	+	0.066u	+	0.009t	0.45	1.74
			(5.1)		(2.46)		(1.9)		
25	Construction & installation	osr =	0.02	+	0.021u	+	0.009t	0.92	1.7
			(2.8)		(4.37)		(11.2)		
26	Distributive trades	osr =	0.42	-	0.026u	+	0.01t	0.78	0.7
			(19.6)		(-1.87)		(6.32)		
27	Transportation & storage	osr =	0.08	+	0.051u	+	0.0063t	0.57	0.89
			(3.43)		(3.22)		(2.34)		
28	Communications	osr =	0.21	+	0.034u	+	0.01t	0.49	1.0
			(6.0)		(1.48)		(3.0)		
29	Financing & insurance services	osr =	0.12	-	0.01u	+	0.01t	0.75	1.9
			(5.2)		(-0.9)		(5.9)		
30	Dwelling services	osr =	0.76	+	0.0079u	-	0.003t	0.66	1.22
			(11.9)		(1.92)		(-4.5)		
31	Real estate & other business services	osr =	0.52	-	0.005u	-	0.007t	0.97	1.96
			(16.2)		(-2.43)		(a)		
32	Hotels, restaurants & bars	osr =	0.04	+	0.0025u	+	0.001t	0.34	1.9
			(7)		(0.73)		(2.4)		
33	Miscellaneous service	osr =	0.22	+	0.01u	-	0.007t	0.85	1.2
			(29.5)		(2.17)		(-7.8)		
34	Personal & household services	osr =	0.22	+	0.0083u	-	0.001t	0.23	1.4
			(2.4)		(1.4)		(-1.3)		
35	Producers of government services	osr =	0.0002	-	0.00004u	-	0.00001t	0.73	1.6
			(7.8)		(-2.96)		(-4.9)		
36	All sectors	osr =	0.21	+	0.0094u	+	0.004t	0.76	1.7
			(35)		(2.4077)		(5.6)		

It is also clear that the sectors most affected are those which offer the greatest potential to raise the value added content of Jamaican exports. Traditional crops tend to suffer from weak prices and raw minerals are subject to the cyclical demands of downstream processing industries. Manufactured goods and tradeable services, on the other hand, have the potential for adding value, by quality and design, are less homogeneous and therefore less vulnerable to substitution. These factors suggest that a growth in export-oriented manufacturing and service sectors would have gone some way toward solving the balance of payment problems of the country.

2.3 Capital flight

The restrictive provision on repatriation of profits from investment in Jamaica by foreign residents probably discourages portfolio investment in Jamaica. We cannot know how much: official statistics do not report portfolio investment across the Jamaican border, since these transactions are not sanctioned. Despite capital controls, capital has flowed into and out of the country, on an unofficial basis, in response to economic and political conditions in Jamaica. The prolonged periods of Jamaican dollar overvaluation have provided speculators with one-way bets against the currency.

We have attempted to estimate the extent of capital flight from the official balance of payments statistics, using a method proposed by Bennett[8]. It involves calculating the difference between "Changes in Official Reserves" and the sum of items "above-the-line", where official capital movements are determined by the change in external public and publicly guaranteed debt. In the absence of capital flight these two quantities should be identical; discrepancies reflect unofficial capital flight.

Table 2.2 indicates that for the period 1977-1989, the total net outflow was US$ 720 million. If these funds had been invested in the US at, say, the Treasury Bill interest rate, the total amount of unofficial net foreign assets would have accumulated to US$ 1600 million by 1989[9]. It is interesting to consider the magnitude of these assets in relation to the figure of US$ 500 million suggested as the required official reserves level needed to support a liberalised currency.

If the current account deficit and capital outflow during the transition period (until a sustainable situation is achieved) is expected to be of the order of US$ 500 million, then the Jamaican portfolio investment which is held abroad would be a more than adequate reserve assuming economic conditions could be created which could mobilise it.

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8 "External Debt, Capital Flight and Stabilisation Policy; the Experience of Barbados, Guyana, Jamaica, Trinidad and Tobago", Karl M Bennett, Social and Economic Studies, Volume 37 No 4, 1988.

9 If we allow for the fact that these funds have also been used partly for purchasing goods or services which would otherwise have been unavailable or in short supply on the "official" domestic market. The actual stock of unofficial foreign assets held by Jamaicans will probably be lower than the capitalised figure, but is probably higher than the non-capitalised value.

Table 2.2

Jamaica: Unofficial Capital Flights

	Public external debt[1]			Change in ext public debt	Net official reserves[2]	Change in net official reserves	Current account balance[1]	Private capital trans.[1]	Curr acc + pr cap tr	Estimated capital outflows(+) or inflows (-)[3]	J$/US$ exchange rate end of per
	Direct net	Guaranteed	Total								
				A		B			C		
	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(US$mn.)	(J$/US$)
1977-1980	NA	NA	NA	NA	NA	NA	NA	NA	NA	443[4]	1.78
1981-1983	NA	NA	NA	NA	NA	NA	NA	NA	NA	383[4]	3.28
1984	1737	295	2031	NA	-583	226	-291	120	-171	-402[4]	4.93
1985	1977	283	2260	228	-656	-73	-296	55	-241	60	5.48
1986	2218	287	2505	245	-717	-61	-34	33	-1	305	5.48
1987	2581	458	3039	534	-479	237	-150	143	-7	290	5.50
1988	2703	452	3155	116	-313	166	94	-87	7	-43	5.48
1989	2745	430	3175	21	-337	-23	-233	-128	-361	-317	6.50
1977-1989										718	

1. from BOJ annual reports (1986-89)

2. from PSOJ, 1979-89

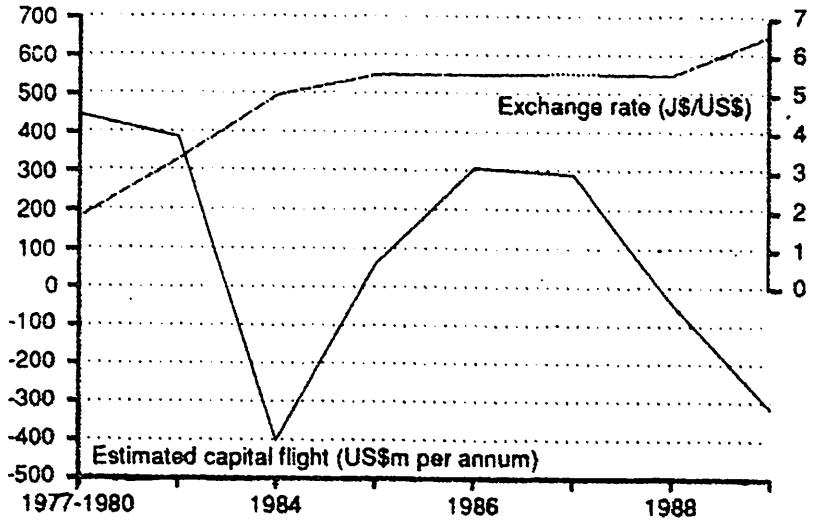
3. equal to A - B + C

4. Bennett, op cit

Capital flight was substantial in the late 1970s and the mid-1980s; it reversed briefly in 1984 and again in 1988. Unofficial capital flight responds to exchange rate policy in the way we would expect. Figure 2.6 suggests that whenever the exchange rate of the Jamaican currency has been held steady in nominal terms and has therefore moved widely out of line with its PPP equilibrium level - in the early 1970s and 1980s - sizeable amounts of capital have moved out of the country, in anticipation of a devaluation. The reverse has occurred immediately following major devaluations[10]. Capital flight was negative in 1984, 1988 and 1989.

Figure 2.6

Capital flight and the exchange rate



It appears then that unofficial capital movements have been primarily speculative in origin. To retain footloose capital within the country (even with exchange controls) in the presence of a substantially overvalued currency entails a high cost for the economy high interest rates (and even these may prove unsuccessful). When deciding whether to hold their funds at home or abroad, investors compare the domestic interest rate with the foreign interest rate plus any expected gain or loss on exchange rate movements.

Using the actual changes in the Jamaican dollar as indicators of expected rates of change (i.e. attributing perfect foresight to Jamaicans investors) we have in Figure 2.7 plotted the ratio between the ex-post rate of return for domestic investment and the ex-post rate of return for investment in the USA, both expressed in Jamaican dollars. When the ratio is greater than one (in mid-1970's and in the most recent period) the realised rate of return on domestic investment was higher than the return on foreign investment.

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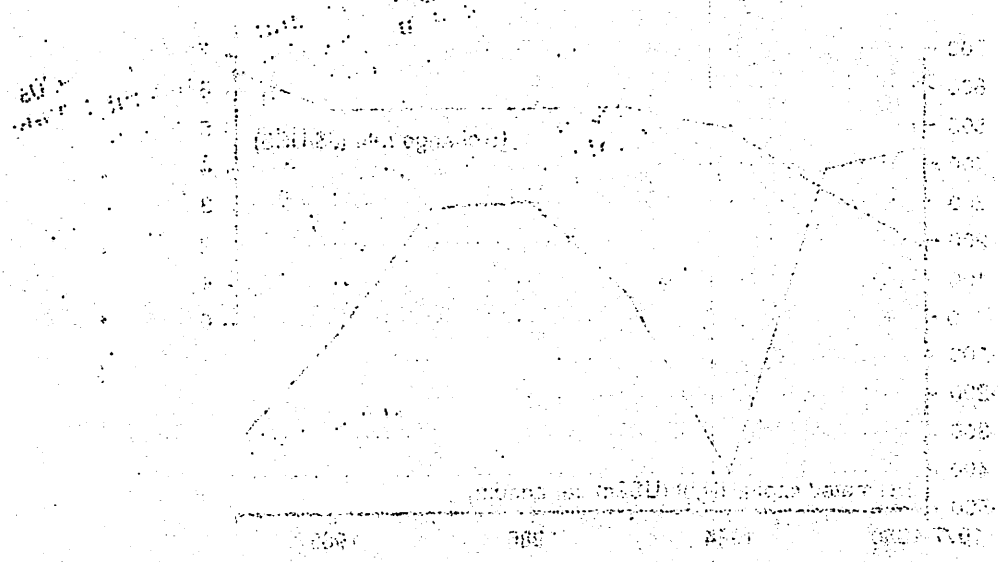
10 Unfortunately, the limited number of observations does not allow a statistical confirmation of this.

Capital flight was substantial in the late 1970s and the mid 1980s it surged briefly in 1984 and again in 1988. Individual central flight responds to monetary rate policy in the same way as would capital. Figure 1 suggests that whenever the exchange rate of the Jamaican currency has been held steady in nominal terms and has increased relatively out of line with the US equivalent level, in the early 1970s and late 1980s, massive amounts of capital have moved out of the country. In contrast, a significant slowdown in capital flight was observed immediately following major devaluations. Capital flight was negative in 1985, 1986 and 1987.

Figure 1

Capital flight and the exchange rate



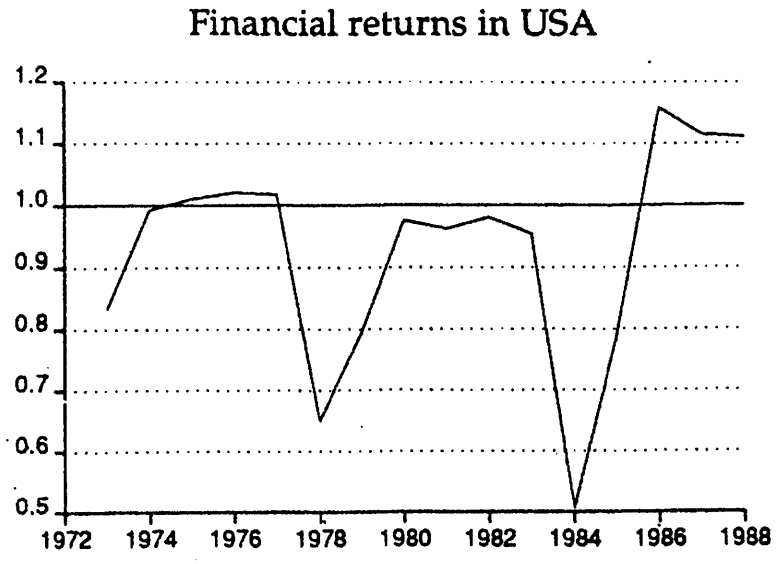
It is worth noting that unofficial capital movements have been particularly responsive to changes in interest rates. Capital flight has continued within the country even with exchange controls in place. Instances of a surge in capital flight have been observed during periods of a sharp upward change in the domestic interest rate. Such a surge in capital flight was observed in the late 1970s and early 1980s. When the domestic interest rate was high relative to the US rate, capital flight was observed. However, when the domestic interest rate was low relative to the US rate, capital flight was observed to be negative.

Using the actual change in the Jamaican dollar as the measure of expected rates of change of the exchange rate, the relationship between the interest rate differential and the exchange rate is not clear. Figure 2 shows the relationship between the domestic interest rate and the exchange rate of return for Jamaican dollars in the US. Both appeared to increase during the 1970s. However, from the late 1980s, and in the early 1990s, the relationship was not consistent. In some periods, the higher the interest rate, the lower the exchange rate of return.

[illegible] Unfortunately, the limited number of observations does not allow a formal econometric analysis.

Figure 2.7

Financial returns in Jamaica (allowing for exchange rate changes)



Two points of interest emerge. First, the rate of return in Jamaica has been generally lower than in the USA; it is no surprise that capital flight has been a persistent feature over this period. Second, during the only time in the period when Jamaican rates of return were significantly greater than in the USA (1986-1988), capital ceased to flow out and began to flow back in[11].

2.4 Summary

To summarise this overview of the 1973-1988 period, it appears to be the case that:

- the Jamaican economy has performed poorly over this period as a whole, by any standard, but has improved in recent years;
- despite exchange controls, there have been significant unauthorised capital movements;
- successive attempts to stabilise the Jamaican$ in nominal terms have ended in failure, have damaged the balance of payments and profitability;
- capital flight can be reversed, by realistic exchange rates and high interest rates.

11 In this context, the inflow in 1984 is an unexplained anomaly.

3. Modelling the Jamaican Economy

Having looked at some aspects of the exchange control policy in a general and non-rigorous way, we now take a more analytical approach. This requires a model which explains the macroeconomic structure of the economy. We have developed a simple model for this purpose. Readers who are interested only in what such a model can say about the consequences of exchange controls are advised to move straight to Section 4.

Rather than "reinventing the wheel", we began by considering whether a model of the IMF/World Bank type could adequately describe the economy of Jamaica. As we explain in Annex B in more detail, we found that it could not track the Jamaican economy. We therefore constructed our own model.

3.1 The London Economics model

Our own model goes beyond the IMF/World Bank type, in that it includes, as separate elements, the banking sector, the price level and interest rates. These all add greatly to the model's accounting complexity, but also to its relevance to the exchange control issue. The model does not include exchange controls explicitly - no model could, because exchange controls are not an economic component in the economy in the same sense as income, interest rates or exports. Rather they condition the way in which the economy works, as we explain in due course.

We have also built the modelling around four sectors:

- the private sector
- the Government/Monetary Authorities
- the foreign sector
- the banking system.

The two main differences in our approach compared with that of the IMF/World Bank model are that the Government and Monetary Authority sectors are treated as one, and that the banking system is introduced as a separate sector.

Interest rates are likely to be important in this context. If interest rates influence the public's demand for money - the key relationship in the IMF's approach - they will have a bearing on the balance of payments. They could also be important in determining the level of fixed capital investment, and hence the growth rate of the economy.

The model consists of two types of relationship: identities and behaviourial equations. Identities are true by definition, either because they reflect the way national income concepts are defined or because they follow from balance sheet conventions.

The behaviourial relationships attempt to explain how the economy behaves: for example, how imports respond to national income and the exchange rate. These relationships have to be estimated, and may be good or poor representations of the world, depending on their statistical fit and the plausibility of their parameters.

The data which have been supplied to us by institutions in Jamaica cover slightly different periods. For some series we have data since the beginning of the seventies. In other cases we have to rely on the shorter periods. Longer series would have helped, but only if the workings of the economy have not fundamentally changed over this longer period. Jamaica enjoyed a period of relative economic freedom in the first years after independence. 1960's data would therefore have permitted us to assess whether the economy's behaviour has been affected by the wide range of controls imposed on the economy since 1970.

3.2 The behavioural equations

The behaviourial equations describe the economy's responses to changes in economic conditions. We have constructed these equations on the basis of a mixture economic theory, data analysis, and our understanding of the Jamaican economy. A number of variants were tried for each equation. The choice was made on three criteria:

- plausibility in economic terms; did the equation conform to economic theory and with key features of the Jamaican economy?
- simplicity; the number of parameters need to be kept to a minimum because we have only a limited number of observations (16 years) on which to estimate the model;
- statistical properties (the chosen relationship should fit the available data reasonably well, determine coefficients well and be free of problems such as autoregressiveness).

The behaviourial equations are presented in Table 3.2 and are described below. The figures in parentheses under each variable's regression coefficient are t statistics; figures around 2 or more indicate that the result is statistically highly significant, in the sense that there is little likelihood that the result could have arisen by chance.

Private Consumption

Economic theory suggests that individuals react mainly to changes in what they perceive as their "permanent" income. It is difficult to construct a "permanent income" variable without using up some scarce observations, since it requires some sort of moving average or adaptive process.

Our preferred consumption equation is more straightforward; it assumes that first differences in real consumption (private consumption deflated by the consumer price index) are proportional to first differences in real income (also deflated using the consumer price index). The relationship is a convincing one and it enables us to distinguish between the short-run and the long-run marginal propensity to consume.

The relationship between variation in real consumption and variation in real income captures the short-run marginal propensity to consume. The error correction term captures the long term relationship between real consumption and income.

The specification provides a test for a unitary long-run marginal propensity. However, rearranging the function we can derive:

Table 3.2

Statistics for the equations estimated independently

(t statistics in parenthesis)

Dependent Variable																
1 Private Consumption				R-squared = 0.61		DW = 2.07										
Δ(c/p)	=			0.629 Δ(y/p)	-	0.512 ((c-y)/p)(-1)	-	0.178 (y/p)(-1)								
				(3.42)		(2.29)		(2.29)								
2 Profits				R-squared = 0.56		DW = 2.21										
Δ(log(os/y))	=	1.549	-	0.561 log(os/y)(-1)	-	0.523 log(y/py)(-1)	+	0.350 Δ(log(px/py))	+	0.186 log(px/py)(-1)						
		(1.49)		(2.79)		(2.18)		(4.33)		(1.60)						
3 Investment				R-squared = 0.86		DW = 1.76										
log((i/pz)/(y/p))	=	-1.0711	+	3.6096 Δ(log(y/p))	-	1.8424 ΔΔ(log(y/p))	+	1.1895 log(os/y)(-1)	-	0.80255 Δ(log(pz/py))	-	0.05606 rs(-1)				
(2.37)		(7.33)		(3.17)				(3.59)		(3.45)		(7.57)				
4 Increase in stocks				R-squared = 0.16		DW = 2.14										
is/y	=	0.028	-	0.001 rs(-1)												
		(5.08)		(2.15)												
5 Notes and Coins				R-squared = 0.75		DW = 2.82										
log(circ/py)	=	-8.027	+	0.023 time	-	1.640 Δ(log(y/py))	-	0.850 Δ(log(y/py))(-1)	-	1.036 Δ(log(py))	-	0.635 Δ(log(py))(-1)	+	2.055 log(y/py)		
		(4.97)		(6.30)		(3.09)		(2.23)		(4.08)		(2.34)		(6.15)		
6 Bank Deposits				R-squared = 0.95		DW = 2.97										
log(bd/py)	=	0.813	+	0.557 Δ(log(y/py))	+	0.471 Δ(log(y/py))(-1)	-	0.020 Δ(log(py))	+	0.003 (rΔ-100*Δ(log(py)))	+	0.580 log(y/py)	+	0.344D81		
		(0.69)		(1.48)		(1.98)		(0.07)		(1.39)		(2.37)				

7 Price Level				R-squared = 0.78		DW = 1.60								
ΔΔ(log(py))	=	0.064	-	0.707 Δ(log(py))(-1)	+	0.128 Δ(log(pz))	+	0.085 Δ(log(px))	+	0.038 Δ(log(poil))	-	0.195 d(log(y/py))		
		(2.43)		(4.53)		(1.31)		(1.17)		(1.06)		(0.65)		
9 Imports				R-squared = 0.59		DW = 1.78								
Δ(log(z/pz))	=	1.286	+	0.563 Δ(log(ic))	-	0.379 log(ic)(-1)	-	0.417 (log(z/pz)-log(ic))(-1)	-	0.256 Δ(log(pz/py))	-	0.213 Δ(log(pz/py))(-1)		
		(1.90)		(3.12)		(1.99)		(2.06)		(1.62)		(1.50)		
10 Exports				R-squared = 0.79		DW = 2.18								
log (x/px)	=	2.493	-	0.887 (log (px/pz)										
		(109.40)		(8.82)										

Definitions

ic	=	((i/pz)*(c/pc))^(1/2)
px	=	px(US$)*e
px(US$)	=	(pal*pcom)^(1/2)
pz	=	pz(US$)*e

Variables of the Model (J$m. unless otherwise indicated)

c	=	private consumption
os	=	operating surplus
i	=	gross investment in fixed assets (gross fixed capital formation)
is	=	increase in stocks
circ	=	currency (notes and coins) in circulation outside the deposit banking system
bd	=	bank deposits (demand, time, saving)

p	=	consumer price index
py	=	gross domestic product deflator
pal	=	aluminium price index (US$)
pcom	=	commodity price index (US$)
pz (US$)	=	manufactured goods price index (US$)
e	=	exchange rate (period average) (J$/US$)
z	=	imports of goods and services
x	=	exports of goods and services
y	=	gross domestic product
rs	=	treasury bill rate (%)
rl	=	banking lending rate (%)
D81	=	a dummy variable taking values zero before 1980, 0.5 in 1981 and unity thereafter

$$d(c/p)=0.629\ d(y/p) - 0.512\ [(c/p) - 0.652\ (y/p)]$$

which leads us to conclude that short and long-term behaviour is similar; the marginal propensity to consume is around two-thirds. These estimates refer to gross income. Average disposable income (on which data is not available to us) is, we understand, approximately 85% of gross income, on which basis, the marginal propensity to consume out of disposable income is approximately three-quarters.

Other variables have been also tried. For example, we expected that, as in other economies, interest rates or other variables representing monetary conditions would significantly affect consumption. This effect seems to be of negligible importance in the Jamaican case.

Operating Surplus

The strong relationship between the exchange rate and the profitability of productive sectors in Jamaica has already been discussed in this report. The equation we have specified contains real gross domestic product and the ratio of export prices to the GDP deflator as explanatory variables. The former variable is intended to represent the effect of the economic cycle on operating surplus. The price effect should pick up increased profitability due to exchange rate depreciation. The export price index is derived by multiplying foreign price indices by the exchange rate, on the ground that Jamaica is a price-taking country in its export markets.

The estimates obtained confirm our previous results. The short term elasticity of the surplus rate with respect to the exchange rate is around one-third and is statistically highly significant. We can safely conclude that depreciations have had a substantially beneficial effect on the profitability of productive activity in Jamaica.

A similar effect is also evident in the long-run equilibrium. From the estimated equation it is possible to obtain a steady equilibrium relationship between the surplus rate, real income and relative prices. When all first differences are set to zero,

$$\log(os/y) = 2.77 - 0.93 \log (y/py) + 0.34 \log(px/py)$$

The surprising result is the negative elasticity associated with the activity term. An increase in 1% in real income lead to an almost proportional decrease in the share of profits. Alternatively, we could note that for a constant level of relative prices (say py=px), real operating surplus are increasing less than proportionately to real income. The long-run income elasticity of profits, is just 0.07.

Investment in fixed assets

The dependent variable in the gross fixed investment equation is the ratio of real investment to real income. Since Jamaica produces only a limited share of its investment goods requirements, the price index for imported goods was used to deflate investment expenditure. Explanatory variables include real income, both in first difference and in accelerator form, relative prices, the rate of return, and the cost of money. The sign of all coefficients are as expected and they are also statistically significant.

The activity variable is real gross domestic product. A simple manipulation of the two terms involving this quantity shows that an increase in real GDP by 1% will cause the proportion of production devoted to investment to increase at a constant rate by 3.6% over two periods.

The operating surplus rate is intended to capture the incentive to invest stemming from the rate of return from productive enterprises that is available in the economy. The effect is positive, as would be predicted, with a nearly unitary elasticity. The ratio between import prices and the gross domestic product deflator has been included to capture another aspect of investment profitability. An increase in costs, measured by the import price index, relative to output prices, measured by the GDP deflator, would be expected to discourage investment. This is confirmed by our result.

Finally, the cost of borrowing, measured by the Treasury Bill rate, is included to represent an indicator of the cost of capital. This has a negative effect on investment, as we would predict, but a small one[12].

Increase in stocks

This is the weakest equation in the model, probably because stock-building is the result of the mis-match of demand and production, and is for that reason almost entirely involuntary. The equation we have chosen is a simple linear relationship, where the proportion of production which is accumulated as stocks is a function of the (Treasury bill) interest rate prevailing in the previous period. Unfortunately, this behaviourial regularity explains only a small proportion of the overall variation in the rate of stock-building. On the other hand, increase in stocks has, on average over the study period, accounted for only 1.7% of gross domestic product, so that the model should not suffer from the poor fit of this equation.

Notes and coins

The behaviour of real monetary aggregates is shown in Figure 3.1.

It is often remarked, that informal activities play a substantial role in the Jamaican economy. To analyse this role, economists have looked to a number of indirect indicators. One of the most favoured is the velocity of circulation of notes and coins (M0), because informal activities require cash rather than other forms of payment, such as cheques. Unfortunately, this observation does not help us in specifying the equation for notes and coins, since we have no reliable proxy for the importance of informal activities in the Jamaican economy.

An alternative solution, even though not fully satisfactory, is to assume that over the study period, the growth (or the decline) of the informal economy has followed a steady path. If we further assume that there are no substantial economies of scale in the use of

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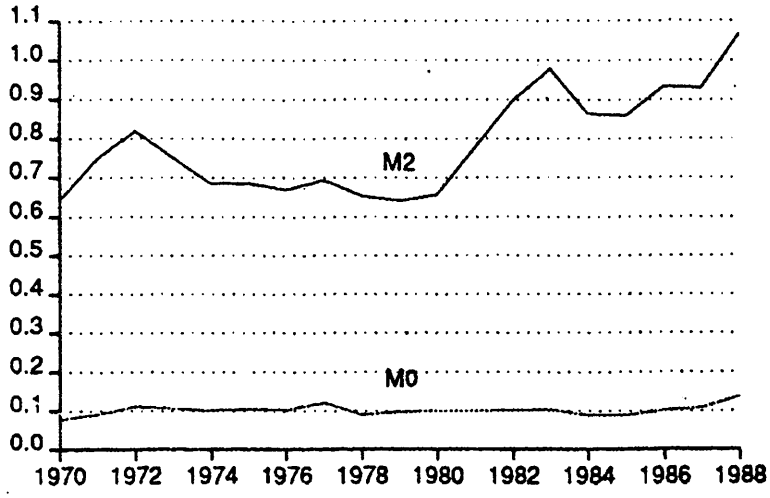
12 An increase in the Treasury bill rate of 1%, say from 20% to 21%, will only reduce investment, as a proportion of GDP, by one twentieth of one percent. Gross fixed capital formation has averaged 20% of GDP over the study period. An increase in interest rates by 10% - a substantial one - would cause this ratio to fall to 19.9%.

Figure 3.1

Monetary aggregates in real terms



cash for informal transactions, then the effect of the developments in the informal economy over the amounts of notes and coins in circulation may be proxied by a trend term. This is the approach we have followed and the interpretation of our results depends on the correctness of the above assumptions.

Our results indicate that the real amount of notes and coins in circulation outside the deposit banking system is a function of the importance of real income, the rate of inflation and the importance of the informal economy. The effect of real income is spread over time so that full adjustment of cash balances to the new level of activity takes place over three periods. On the other hand, adjustment to changes in the level of inflation are more rapid, lasting only two periods. It is easy to show that the income and inflation elasticities of real cash holdings are as follows:

Elasticities or real cash holdings with respect to

	Real income	Rate of inflation[13]
Contemporaneous effect	0.41	-1.04
Effect after 1 period	1.20	-1.67
Effect after 2 periods	2.05	-1.67

13 The elasticity referred to in the text is the proportional increase in real cash balanced with respect to a proportional increase in one plus the rate of inflation (expressed in decimal terms). However, for small inflation rates (denoted here by x) we may say that

$\log(1+x) = x$ approximately,

and the same coefficients can be interpreted as the proportional variation in real cash balances induced by a 1% increase in the rate of inflation (say from 10% to 11%).

A one percent increase in real income will therefore lead, in the second time period, to approximately a two percent increase in real cash balances held by the public. A one percent increase in inflation, the opportunity cost of holding cash, on the other hand will decrease the amount of notes and coins in circulation by slightly more than one percent in the same period and by one and three quarter percent by the end of the next period.

On top of these macroeconomic effects, the development of informal activities in the economy (and other trend effects) has caused the amount of cash held by the public to rise slightly over the years.

Bank deposits

The definition of bank deposits used here is the sum of demand, time and saving deposits (M2 - M0). These are interest-bearing financial instruments and in some years over the period they have yielded positive real rates of return. It seems therefore sensible to look at them as an alternative to real assets in the portfolio of investors. We have therefore used the appropriate opportunity cost - the real rate of return on bank deposits. The coefficient of the real rate of return has the right sign, even though it is very small in magnitude and really not statistically different from zero. Return considerations play only a minor role, if at all, in the decisions by the public about holding bank deposits.

Real income and inflation have expected effects. The dynamics of the adjustment process seems however simpler and weaker here than in the case of notes and coins. The strongest effect from income takes place in the same period, with an elasticity of real bank deposits with respect to real income of 1.14 (an increase in 1% in real income will lead, at the end of the same period to an increase in the real level of bank deposits by 1.14%). After this first period, the adjustment seems to reverse in direction (the coefficient of the first difference is only marginally significant). Taken at face value, our results would suggest an overshooting effect of income on bank deposits, with a long run elasticity of just over one half.

It is clear that inflation does not affect the amount of bank deposits, apart than through a reduction in the real rate of interest discussed above.

The striking feature in the bank deposit equation is the significance of the dummy variable D81. This variable is defined as being zero before 1980, one half in 1981 and unity from 1982 onwards. The magnitude of the coefficient associated to this variable suggests that between 1980 and 1982, even controlling for the effect of real income, inflation and real returns, bank deposits grew by more than one third. An inspection of the data shows that the increase is almost entirely due to a rise in the level of real time deposits (see Figure 3.1).

In 1980, Mr Seaga's government assumed power and it seems likely that this was perceived, at the time, as an improvement in economic prospects for the country. Increased confidence may be the phenomenon underlying the sharp increase in bank deposits.

This result signifies an indication of the scale of capital movements which can occur for confidence reasons. We have used this for guidance in the simulations of exchange rate liberalisation.

The price level

The model is primarily concerned with the dynamic behaviour of the demand side of the economy. We have attempted to analyse the production (supply) side explicitly, but our efforts were not entirely successful. We have therefore decided to incorporate supply side behaviour indirectly through the price level equation.

The rate of inflation is modelled as an adjustment process, towards what we could call its structural level, which during the study period has been around 8.5%. This adjustment process is continuously affected by inflationary impulses coming from foreign markets. We have therefore given consideration to imported inflation, with explicit inclusion of oil import prices as a separate variable.

The estimated coefficients should capture both the direct effect of higher costs for imported goods and the indirect costs arising from wage increases. The latter may be influenced by export industries, in which higher export prices induce increases in wage levels. The short run and steady state equilibrium elasticities from the different sources are as follows:

	Short	Equilibrium
Import costs (excl. oil bill)	0.13	0.18
Oil import costs	0.04	0.06
Exporting industry prices	0.08	0.11

The modest size of these price responses reflects the extent of Government control over the prices in the economy.

A last point concerns the effect on prices of the level of real activity. The inclusion of such a variable turned out to have little effect, and was statistically insignificant.

Taking our results at face value, and noting that none of the coefficients in the equation, except the one associated with lagged inflation, is statistically significant, one should be wary about the ability of prices to provide an efficient clearing mechanism in a liberalisation scenario.

Imports

The imports equation is similar, in its structure, to the private consumption equation, including an error correction term for the reversal of short term movements towards the long-term equilibrium. In addition we have added a dynamic adjustment in imports to reflect changes in relative prices between domestically produced and imported goods.

All coefficients have the expected signs. The activity variable that we have considered as determinant of the level of real imports is a geometric average of real private consumption and real fixed investments - which we can define as domestic absorption. We preferred this solution to the use of real gross domestic product as an explanatory variable to avoid the identification problem due to the fact that internal production and imports are substitutes in supply.

The short run elasticity of real imports with respect to domestic absorption is 0.56. This is much higher than the long run elasticity of just 0.10. The result would lead us to conclude that a one percent increase in internal demand, for consumption and investment purposes, is met, in the short run by a proportionately large (over a half of one percent) increase in imports. With the passing of time, domestic production reacts to the increase in demand, so that in the steady state equilibrium, the demand elasticity is just 0.10.

Real imports are also affected by changes in relative prices. The full extent of the price effect is reached only in the subsequent period, with approximately equal reactions in the two periods. A one percent increase in the relative price of imports (relative to prices of domestically produced goods) has resulted in a one fifth of one percent reduction in real imports in the same year, and a slightly larger reduction (one fourth of one percent) in the subsequent period.

Exports

A great deal of analysis was devoted to the specification of the export equation. It was not possible to discover any supply-side explanation for the volume of exports, such as investment. The relative attractiveness of export markets, measured by the ratio of export prices to the price of domestic production, was tried, but the model was less successful as a result.

Our results indicate that the best specification, from the statistical standpoint, is one where the real level of exports depends on the terms of trade, expressed as the ratio of export prices and import prices i.e. a weighted average of the world aluminium price index and the world commodity price index, divided by the world industrial products price index. Since Jamaica is a price-taking country in all these markets, the real value of exports does not therefore depend on domestic variables and in particular, devaluation of the Jamaican currency has no effect in improving the export performance of the country in real terms.

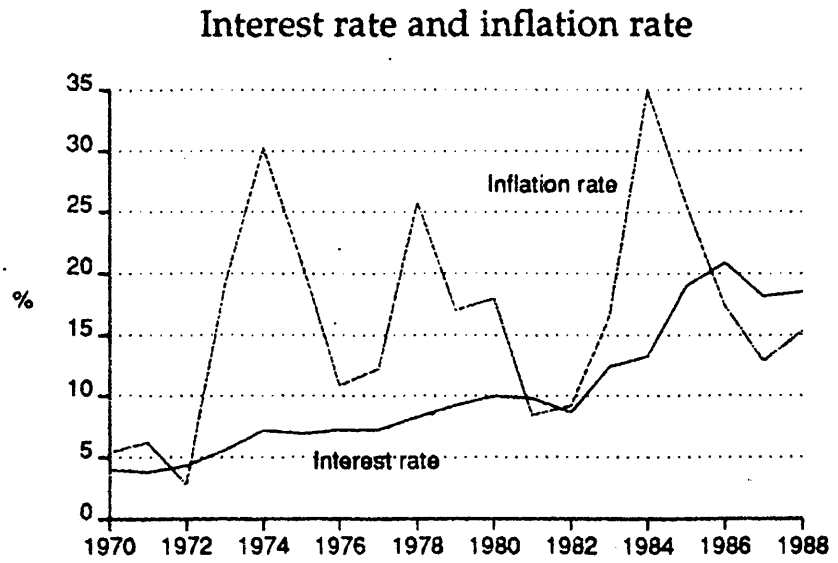
Interest rates

The determination of the level of interest rates is a particularly difficult issue in every macro-econometric model, to the point that sometimes treating it as an exogenous variable appears to be the only solution. This is what we have opted to do.

Figure 3.2 indicates that, except in 1986-88, real interest rates have on the whole been negative over the study period. We consider that the primary reason for the high interest rates in the recent period is a concern on the part of the Government to finance the public deficit without excessive increases in the money supply.

We would therefore expect that the difference between the public deficit and the variation in the money supply should exert a positive effect on the level of interest rates. The empirical results do indeed provide a weak confirmation of this expectation, but it seemed more plausible simply to regard the interest rate as a policy variable.

Figure 3.2



3.3 The identities

The model is closed by three identities:

The National Accounting Identity

This is the classical identity equating demand and supply of goods and services in the economy. GDP and imports, on the supply side, are set to be equal to private consumption, investment (both gross fixed capital formation and increase in stocks), public spending and exports, on the demand side. Since public spending is a policy variable while private consumption, gross fixed capital formation, increase in stocks, imports and exports are determined by their respective behaviourial equations, this identity ensures that the level of domestic production (GDP) is consistent with an equilibrium between demand and supply.

The Consumer Price Level Identity

The Consumer Price Index reflects movements in the cost of a basket which includes both domestically produced and imported goods and services. We have here assumed that the representative basket remained unchanged over the period of the analysis. The rate of increase in the consumer price index has therefore been expressed as a geometrically weighted average of the rate of increase in the GDP deflator (with weight 0.93) and the rate of increase of the import price index (with weight 0.07).

The Balance of Payments Identity

This relationship is intended to capture Jamaica's external transactions. Our identity explicitly includes imports and exports of goods and services, for which there is data in the national accounts; capital movements enter as a residual item. Transfer payments and income from investments are not taken into account in our behaviourial equations. In this identity they are grouped together in a residual item.

The model as a whole

The model has been estimated using instrumental variables to deal with the fact that some endogenous variables feature also as explanatory variables in other equations.

The behaviourial equations provide a convincing account of the economy's behaviour. The equations all have high degrees of fit (remembering that they are expressed in terms of real, rather than nominal variables) and satisfactory Durbin-Watson statistics. Due to the lack of data, some aspects of the economy - in particular, government debt and parts of the foreign sector - remain sketchy.

Solving the model

These equations and identities, together with some other definitional identities (relating levels to changes), constitute the structure of the model. In all we have nine equations and three identities.

Leaving aside the definitional identities, our model consists therefore of twelve relationships. It can therefore be solved for the twelve endogenous variables:

Private consumption
Investment in fixed assets
Increase in stocks
Imports
Exports
Gross Domestic Product
Operating Surplus Rate
The GDP Deflator
The consumer price level
Notes and coin
Bank Deposits
Balance of payments/exchange rate

The foreign sector identity can be considered in two different ways, depending the kind of exchange rate regime. In a fixed, or administratively managed exchange rate regime, the exchange rate is exogenously given and the balance of payment reflects the response of the current account and capital movements to this exchange rate.

Alternatively, in a floating exchange rate regime, the balance of payments is zero, by definition: its various components are brought into equilibrium by an adjustment in the exchange rate. In this case, the foreign sector determines the value of the exchange rate.

Once the model has been estimated, the estimated value of the coefficients can be substituted into the equations. The model then becomes a system of twelve equations, which is then solved to yield predicted values for each variable..

3.4 Simulating the economy's past behaviour

The simulated values for GDP, investment, exports, imports and inflation are compared in Figures 3.3 - 3.14 with their actual values, first in nominal terms (i.e the money of the day) and then in real terms.

Figure 3.3

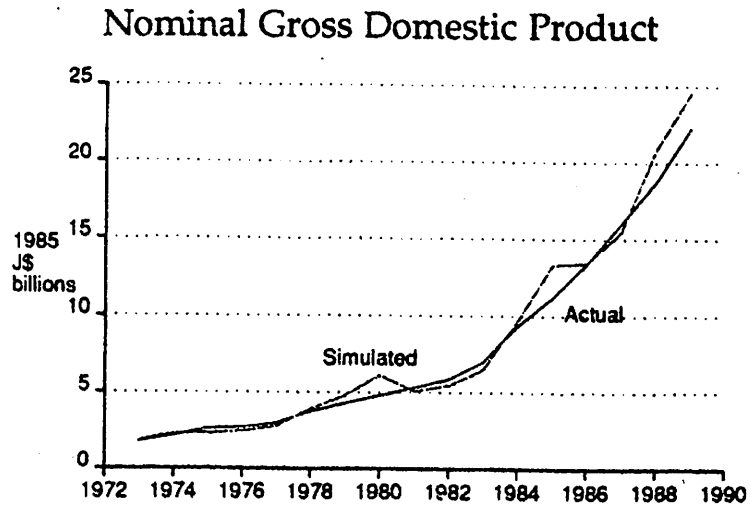


Figure 3.4

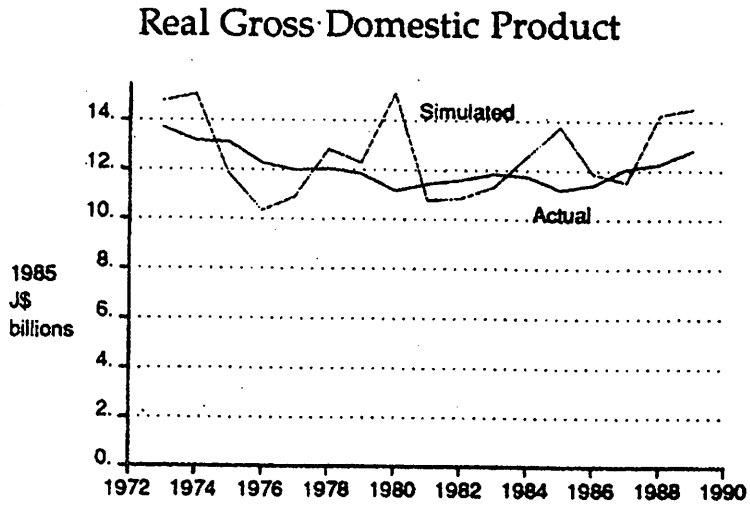


Figure 3.5

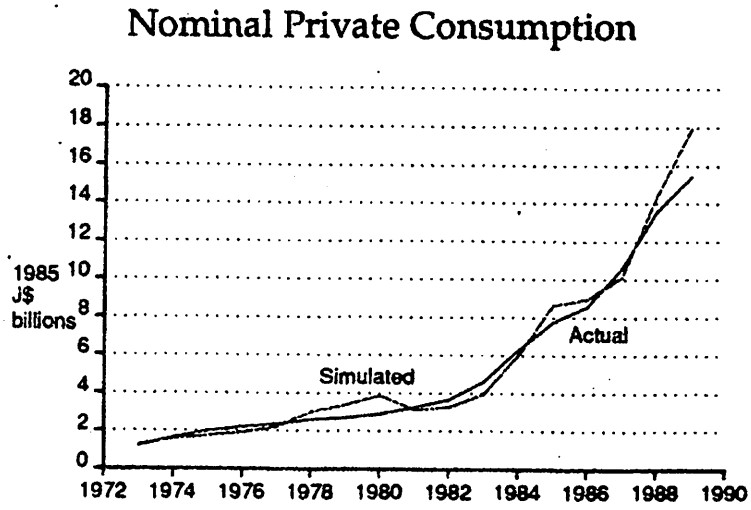


Figure 3.6

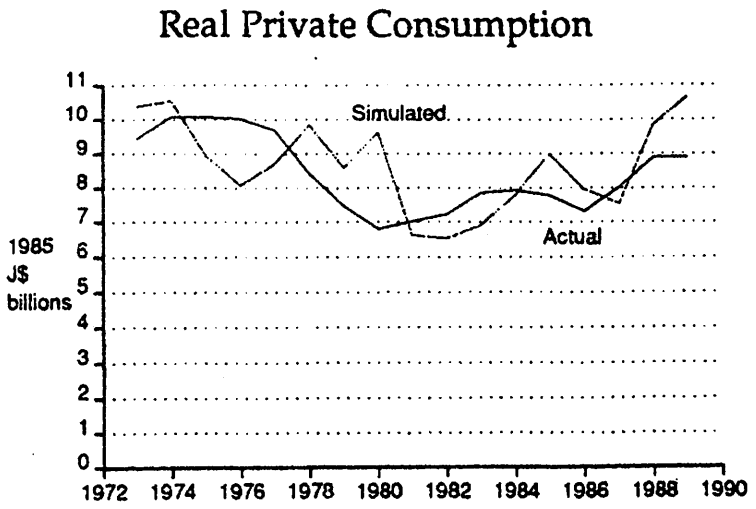


Figure 3.7

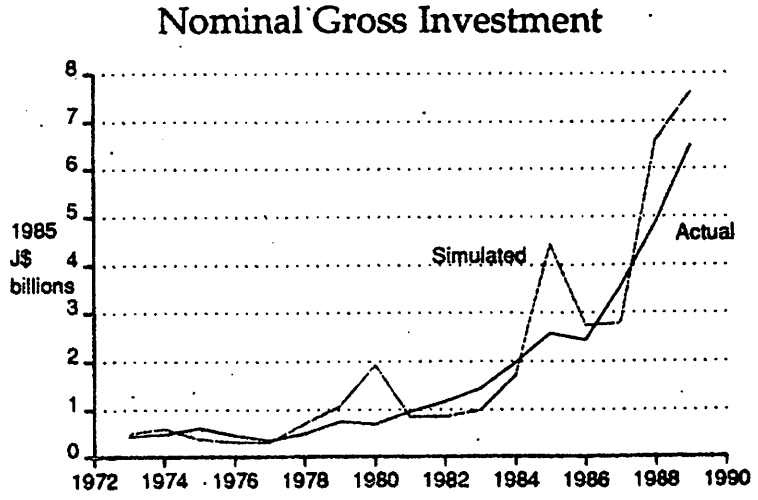


Figure 3.8

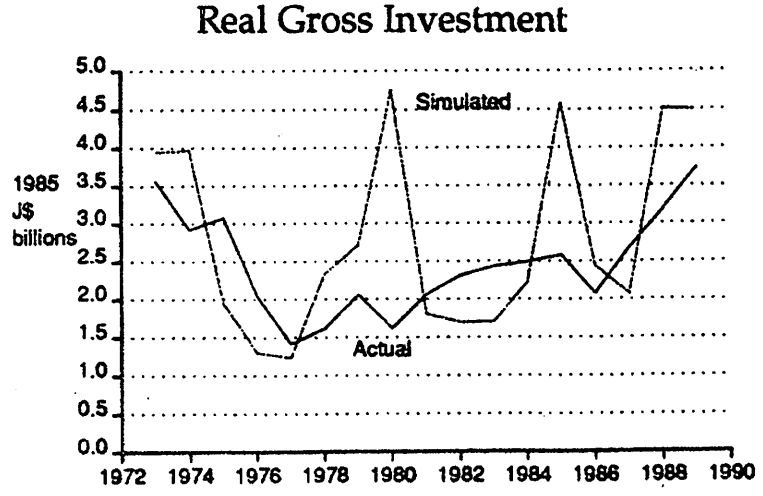


Figure 3.9

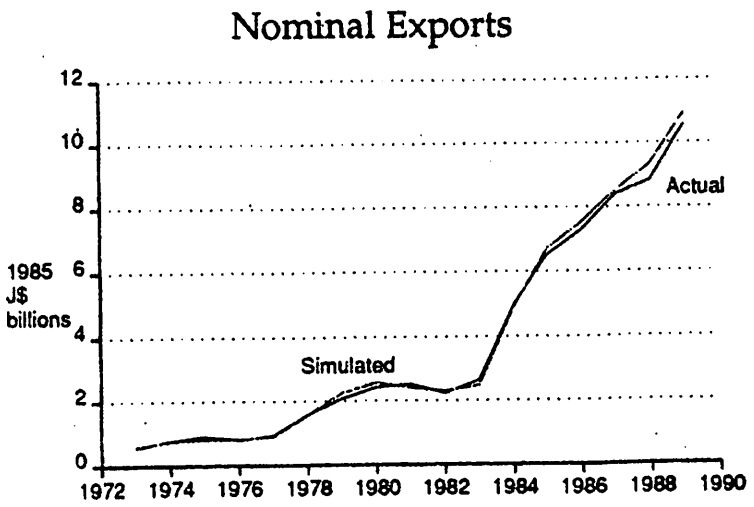


Figure 3.10

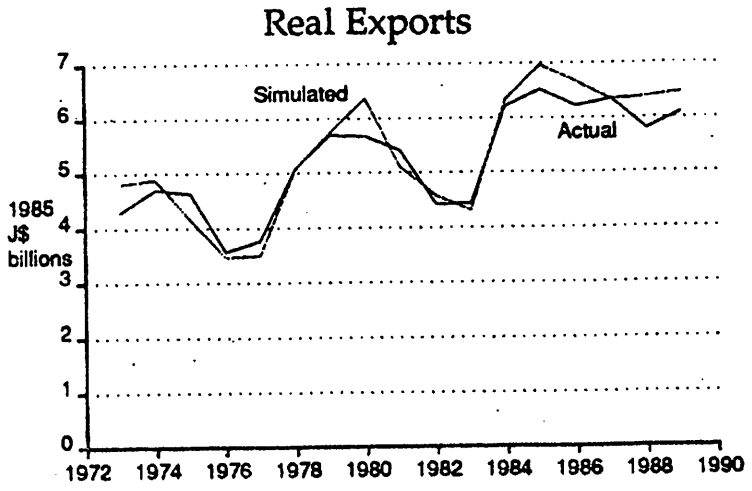


Figure 3.11

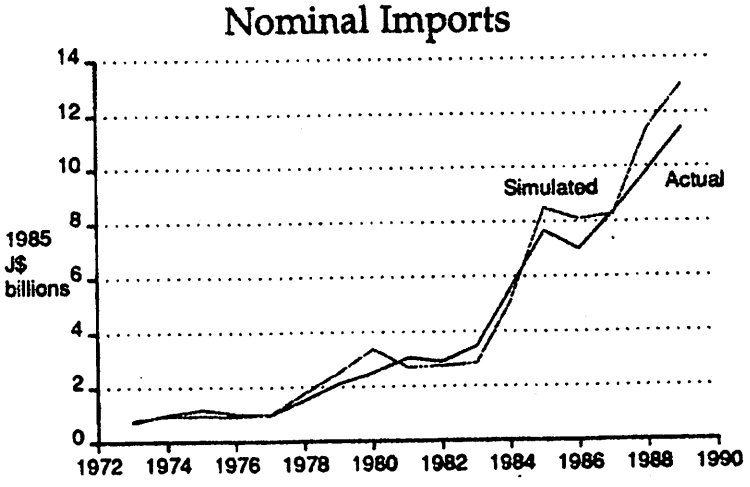


Figure 3.12

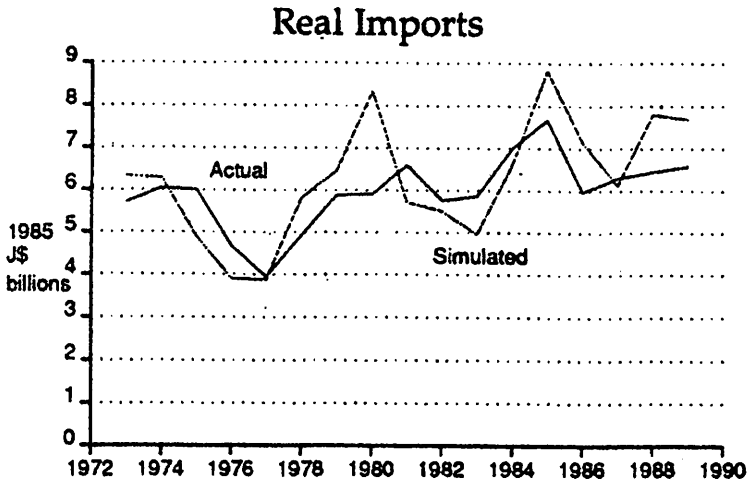


Figure 3.13

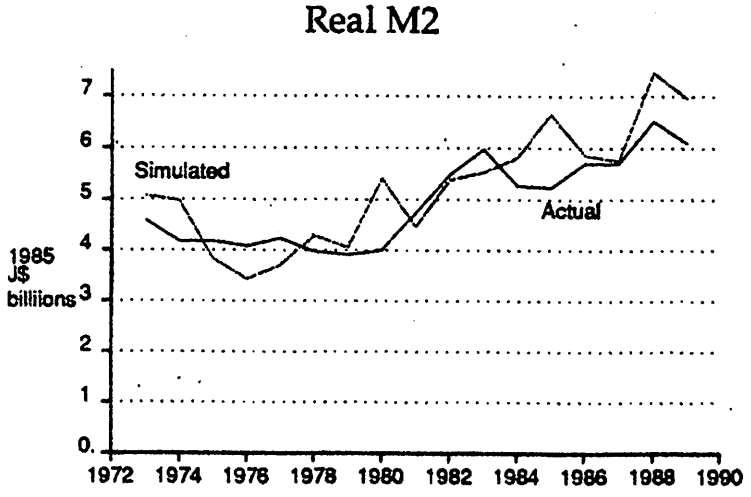
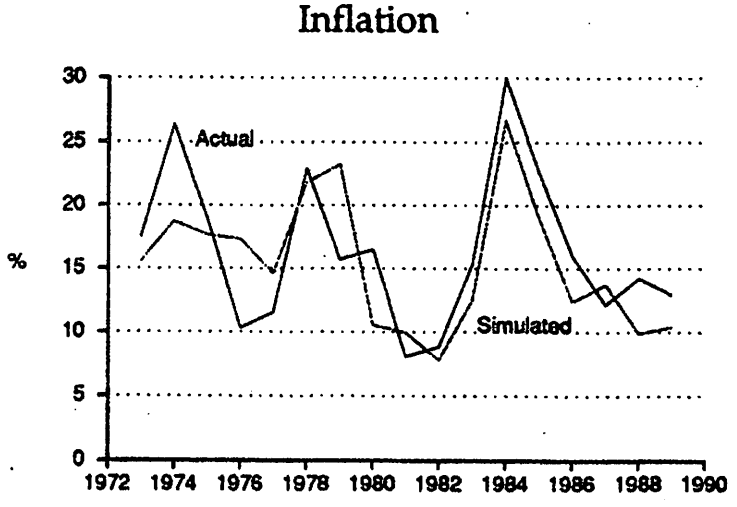


Figure 3.14

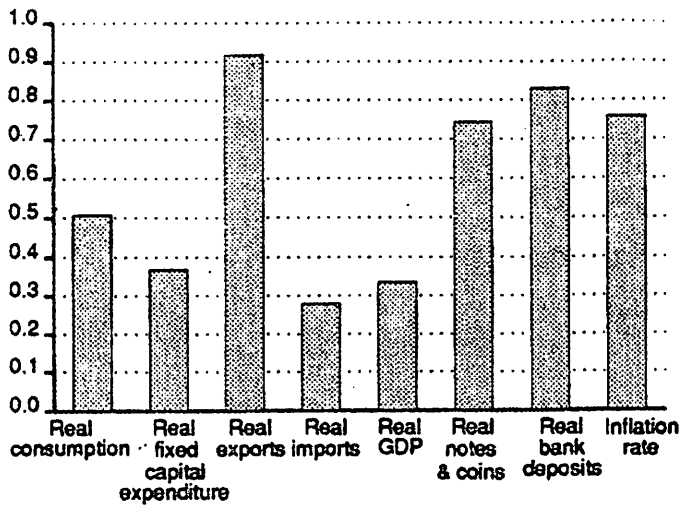


It will be seen that the simulations which are made in nominal terms are usually close to the actual values. This is partly because both the simulated and the actual have inflation in common. A tougher challenge for the model is to simulate the real behaviour of the economy; in this the model is reasonably successful, by the standards by which such models are judged. The money supply, exports and imports, are particularly well simulated.

A harder test for the model is to forecast the real economy one year ahead. The results are shown in Figure 3.15, where it can be seen that the model is particularly capable of predicting monetary variables, inflation, and real exports.

Figure 3.15

Correlation between forecasts one period ahead and out-turn



3.5 Conclusions

We have found it possible to model the Jamaican economy successfully, despite the problems with data, in a way which accords with economic theory and with what we understand of the economy. The ability of the model to track and predict the Jamaican economy is reassuring.

4. Simulating Exchange Control Liberalisation

The purpose of the model is to allow us to draw conclusions about the effect of exchange rate controls on the economic performance of Jamaica, and conversely, the effects of removing them.

To simulate the performance of the economy in the absence of exchange controls, we define exchange controls within the context of the model as having their primary influence on the exchange rate and on imports.

During the period of study the exchange rate has been heavily controlled by the monetary authorities. Their intervention in defence of the Jamaican dollar has taken two main forms:

- controlling access to foreign currencies for imports
- controlling access for overseas capital investment.

As a consequence, both the current account and the capital movements in the balance of payments have been significantly distorted.

The three scenarios we have simulated are:

1. the base-case, historical scenario;
2. a freely floating exchange rate with trade liberalisation, but retaining capital controls;
3. a freely floating exchange rate with both trade and capital movements liberalised.

The first scenario corresponds to actual history and is reported as a basis for comparison.

In the second scenario, where we have liberalised imports, we have made the assumption, without any firm evidence to support it, that if imports were no longer constrained, they would be higher by 25%, for any given level of national income.

We considered taking as a guide to the import behaviour, the import behaviour of the economy in the period 1962-72, when quantitative controls on foreign transactions were less stringent. Imports then were predictably much more responsive to income (see Annex E for an analysis of this). However, other factors would have been different, too. We therefore simply shifted the whole import relationship so as to increase imports by 25%, with no (initial) change in any other variable.

This will have consequences for the balance of payments. In a fully liberalised situation one would expect the exchange rate to settle at a level at which the deficit on current account reached a sustainable level i.e. at which it was balanced by net capital inflows which markets and institutions were willing to make in Jamaica.

The third scenario allows full liberalisation. The simulation of capital controls poses greater difficulties. Firstly, the only capital movements which are recorded relate solely to official capital movements and direct capital investment. Short term portfolio investment - the wild card in this analysis - is not recorded. In Section 2 we derived an indirect way of estimating these movements, for particular years only, and showed how, in broad terms, they responded to exchange rate movements and to interest rates. Figure 2.6 indicated that currency over-valuation, and hence the prospect of a devaluation, encouraged capital flight. Unfortunately we do not have sufficient data to model, and hence simulate, private capital movements statistically so we have simply experimented with different, but plausible, capital inflows and outflows.

4.1 Simulated Outcomes

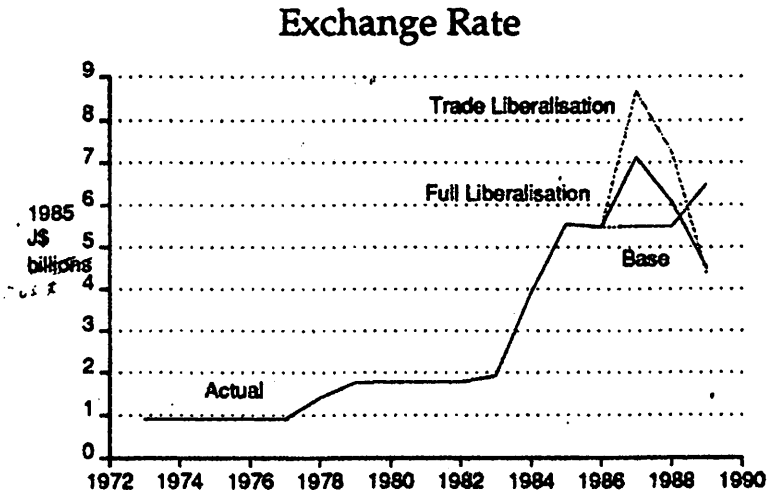
Table 4.1 and the figures below describe four outcomes for the economy, for 1987-89:

- the actual outcome;
- the outcome simulated dynamically by the model;
- "trade-only liberalisation", in which imports rose by 25% (i.e. without any change in the factors which explain imports, consumption and fixed capital investment);
- "full liberalisation", in which, in addition to the trade effect described above, there was a net capital outflow in 1987 and 1988, equal to 5% of bank deposits in those years.

To put these outflows in perspective, they are about one quarter of the size as a share of total deposits, of the inflow which (according to our model) was associated with Mr Seaga's election in 1980. They are by no means implausible numbers.

Looking first at what would have happened to the exchange rate in Figure 4.1, we see that the exchange rate would have first depreciated, to almost J$ 9/ US$, but would have then stabilised at less than J$ 5/US$.

Figure 4.1



The third scenario allows full liberalization. The simulation of capital controls poses greater difficulties. Firstly, the only capital movements which are restricted relate solely to official capital movements and direct capital investment. Portfolio and investment [illegible] in this analysis is not recorded in [illegible] an indirect way, assuming that movements, for particular years, only and shown [illegible] recorded in exchange rate movements and in interest rates. Figure 2.6 indicated that currency over-valuation and hence the prospect of a devaluation, encouraged capital flight. Unfortunately we do not have sufficient data to model and hence explain the capital movements satisfactorily or we have simply concentrated with otherwise but possibly capital inflows and movements.

4.2 Simulation Outcomes

Table 6 summarizes the simulation outcomes for our cases for the economy for 1987-90 [illegible] without any [illegible]

- the current account simulated dynamically by the model;
- "trade-only liberalization", in which exports rose by 10% (i.e. without any exchange in the rubber which explain imports, consumption and fixed capital [illegible]
- full liberalization, in which, in addition to trade-related identified above, there was a net capital inflow of 100 units in 1987 and equal to 5% of total deposits in the system.

In all these outcomes [illegible] they are equal [illegible] of a stock of [illegible] in the inflow [illegible] according to our model was associated with [illegible] in 1987. They are in no sense implausible [illegible].

Looking just at what would have happened to the exchange rate in figure 2.6, we see that the exchange rate would have fallen dramatically, to almost 1/3 of its 1987 level, but would have stabilized at this level [illegible].

Figure 2.6

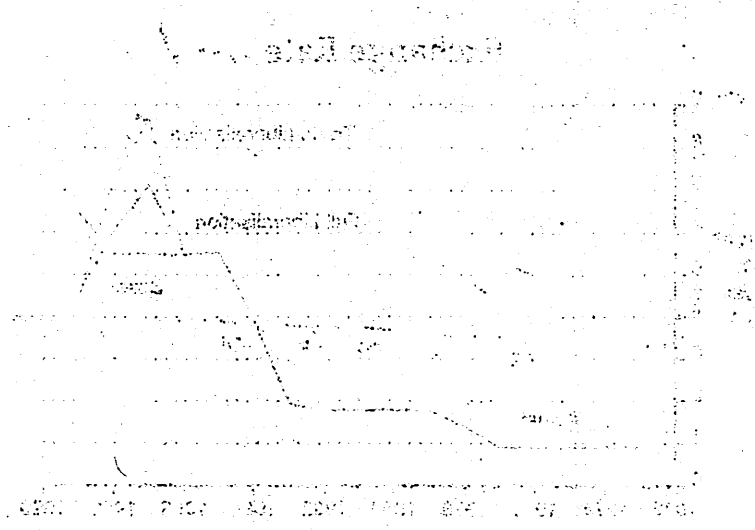


Table 4.1

Simulated outcomes compared to actual outcomes

		Actual	Base	Trade Liberalisation	Full Liberalisation		
					(A)*	(B)*	(C)*
real	1987	12079	11499	8765	8768	8723	8610
income	1988	12275	11796	9328	8992	10247	9986
(1975 J$ mn)	1989	12840	11493	8976	8333	10206	9934
real private	1987	7398	7363	5642	5644	5614	5544
consumption	1988	7704	7623	6036	5825	6614	6448
(1975 J$ mn)	1989	7749	7472	5845	5436	6631	6456
real	1987	3055	2488	2850	2243	4389	4206
investment	1988	4028	3112	3089	2260	4734	4567
(1975 J$ mn)	1989	5092	3330	2546	2302	2734	2625
exchange	1987	5.49	5.49	8.66	7.12	12.36	11.04
rate	1988	5.49	5.49	7.27	6.07	8.68	8.21
(J$/US$)	1989	6.50	6.50	4.33	4.50	3.75	3.69
real	1987	6707	6799	10728	8822	15312	13679
exports	1988	4985	5283	6999	5840	8356	7907
(1985 J$ mn)	1989	6829	7056	4704	4888	4072	4008
real	1987	6478	6415	10437	8351	15590	14002
imports	1988	7173	7058	9050	7308	11535	10954
(1985 J$ mn)	1989	8333	7924	5312	5520	4598	4526
inflation	1987	6.4	13.5	29.0	24.5	37.4	35.0
(%)	1988	7.9	12.7	12.5	12.2	9.0	9.9
	1989	13.4	14.1	2.0	4.0	0.0	1.0

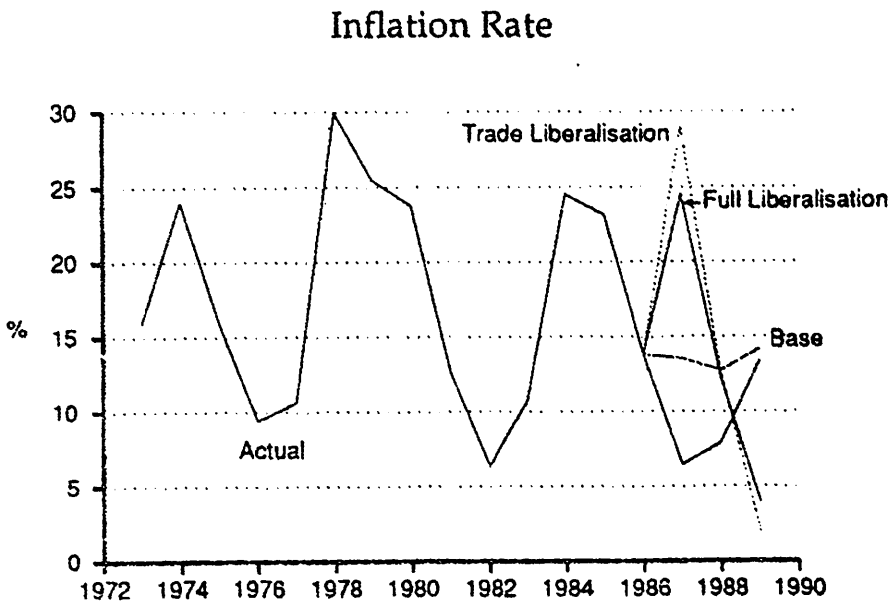
*(A) Capital outflow

*(B) Capital inflow

*(C) Capital inflow + direct investment

In Figure 4.2 we see that the effects on inflation mirror the effects on the exchange rate, as higher import prices feed their way through.

Figure 4.2



The effects on exports and imports, shown at Figures 4.3 and 4.4, are also very similar, and follow the path of the exchange rate. Both rise at first, and then settle at a lower level than they were before liberalisation.

Figure 4.3

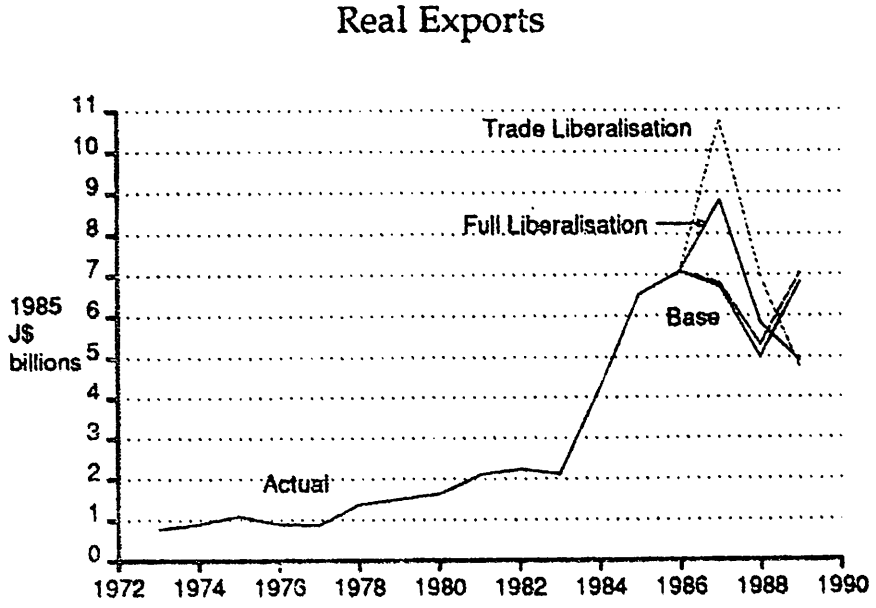
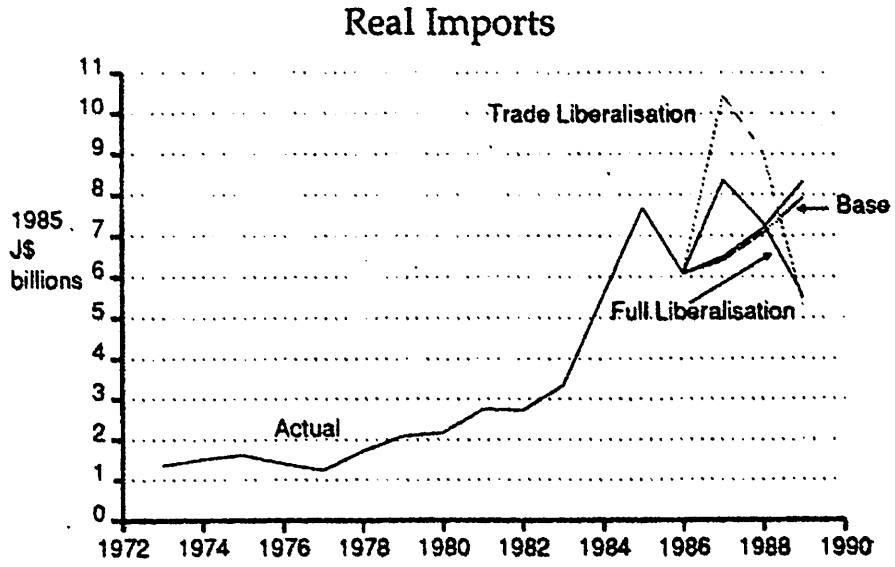
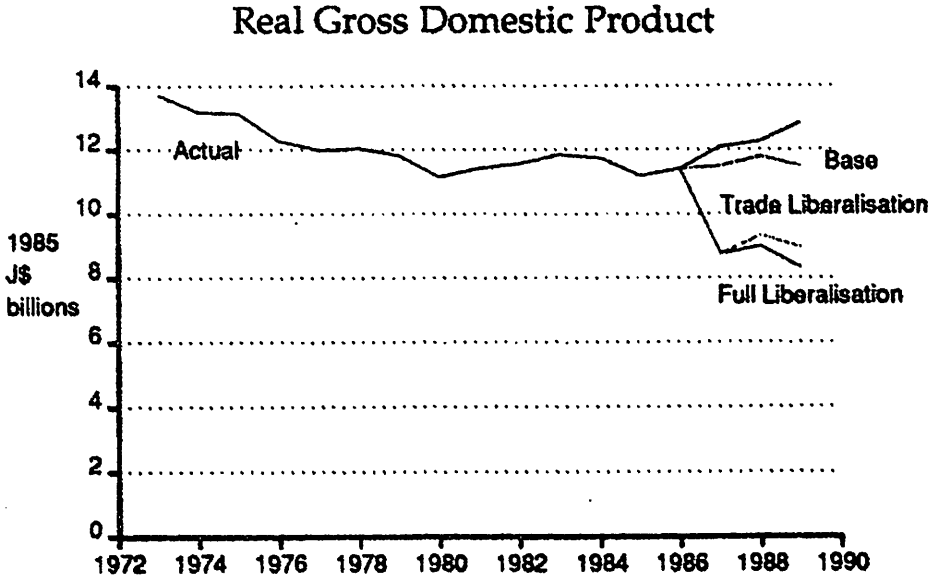


Figure 4.4



The most important result concerns real GDP, shown at Figure 4.5. GDP is significantly lower under liberalisation, both in relation to the actual and the simulated outcomes.

Figure 4.5



The key to understanding these results is the export relationship in the model. Real exports (i.e. exports measured in Jamaican dollars, deflated by the export price index) do not respond to the exchange rate. They are best explained as being determined by factors outside the economy ("exogenously" in the jargon) - namely, the relative prices of commodities and industrial goods in the world economy. This is not to say that exports are sluggish; on the contrary, they doubled in terms of nominal US$ between 1985/86 and 1989/90; it is simply that they do not appear to be particularly responsive to the exchange rate.

We have experimented exhaustively to explain exports in terms of the exchange rate, for example, by the ratio of the Jamaican dollar equivalent of foreign prices to domestic prices. One can indeed explain exports in this way, and they do respond to a depreciation in the manner one would expect - a depreciation leads to higher real exports, but lower export values in terms of US$. However, this effect is always weak, and moreover, the version of the model formulated in this way is noticeably less able to simulate the economy.

The fact that real exports are in effect influenced by factors outside Jamaica in the simulations explains, more than any other factor, the simulation results. If the foreign exchange market were to be liberalised, it would have to find a market clearing exchange rate. Thus if Jamaicans rush to purchase more cars and consumer goods in response to trade liberalisation, and exports remain unchanged in real terms, some other component of imports has to give, in order that the external balance is maintained.

Imports depend on investment and consumption, and on the exchange rate. This means that an external equilibrium could be restored by some combination of lower investment, lower consumption or a depreciation of the exchange rate. Note that in the model, real imports fall when the exchange rate depreciates, because imports become more expensive to Jamaicans, but they are not particularly sensitive to their price, relative to the domestic price level. This means that quite large movements in the exchange rate, evident in Figure 4.1, would be required in order to bring imports back into line with exports.

The other mechanism by which imports would be brought back into line is by a lower level of economic activity in Jamaica. Imports respond positively to consumption and investment. A reduction in either of these quantities (or in both), will lead to a reduction in imports.

The model indicates that devaluation would affect investment in two ways. First, the direct, relative price effect discourages investment because investment goods, which are almost entirely imported, would become more expensive relative to output. On the other hand, devaluation increases profitability and hence the attractiveness of investing in new enterprises.

It is not possible in general to predict which of the two effects is the stronger. When we simulated the effect of a 1% devaluation of the Jamaican dollar in 1987 it turned out that the net effect of these two opposing forces was positive for investment. Devaluation will increase investment; the overall elasticity of real investment with respect to the exchange rate is 0.8.

On the import side, the same sort of exercise indicated that, once both price and activity effects are taken into account, real imports will increase by 0.4% as a consequence of a 1% devaluation. These two results, together with the fact that real exports are insensitive to the exchange rate, indicate that the price mechanism (devaluation) by itself will not be enough to correct external imbalances.

4.2 Capital inflows or capital outflows?

Full liberalisation is now examined more closely to see how the results depend on whether capital flows out of or into Jamaica, as a consequence of liberalisation. We look at three possibilities, all of which feature trade liberalisation, but which allow capital flows to alter direction:

1. Scenario A, ("full liberalisation" as described above), in which there is a net outflow of capital, equal to 5% of bank deposits, in both 1987 and 1988, ceasing in 1989.

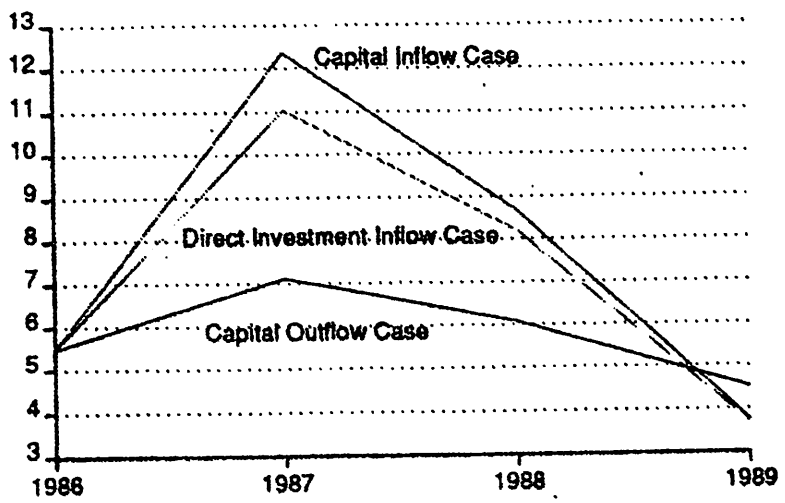
2. Scenario B, in which there is a net inflow of capital, equal to 15% of bank deposits in both 1987 and 1988, ceasing in 1989, and these inflows remain within the banking system.

3. Scenario C, which is the same as B, except that 50% of the additional net inflow are used for fixed capital investment in Jamaica.

Looking first at the effects on the exchange rate and the rate of inflation, in Figures 4.6 and 4.7, we see that in all three Scenarios the exchange rate depreciates in the first year, but soon stabilises, and indeed, begins to appreciate. Contrary to what one might have expected, the capital inflow in Scenarios, B and C cause a larger initial depreciation than the outflow in Scenario A.

Figure 4.6

Exchange rate



Under the capital outflow scenario, inflation rises by 10 percentage points in the first year; under the capital inflow scenarios it more than doubles.

Figure 4.7

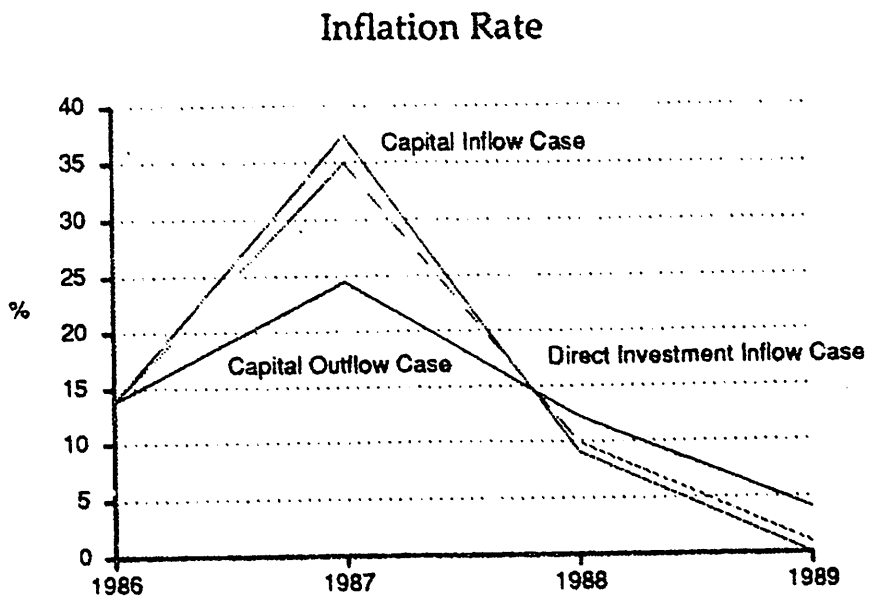
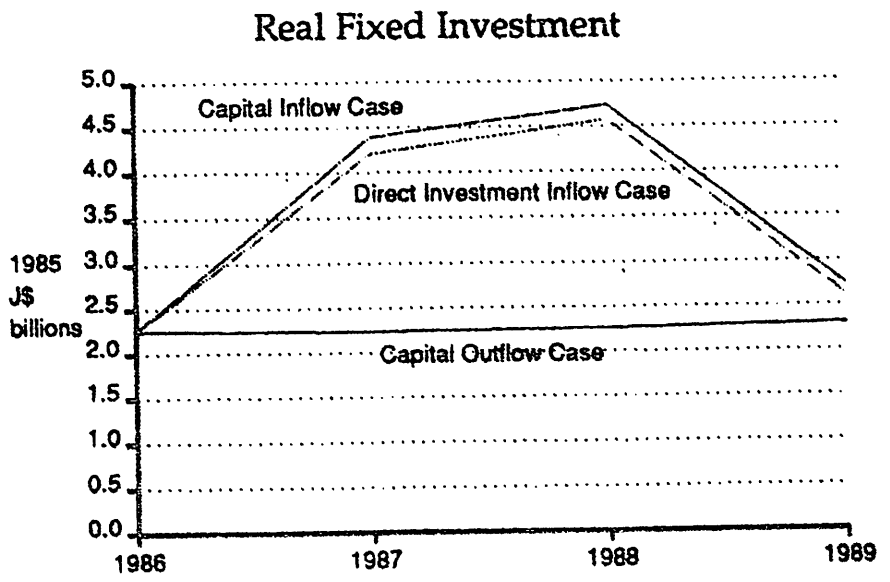


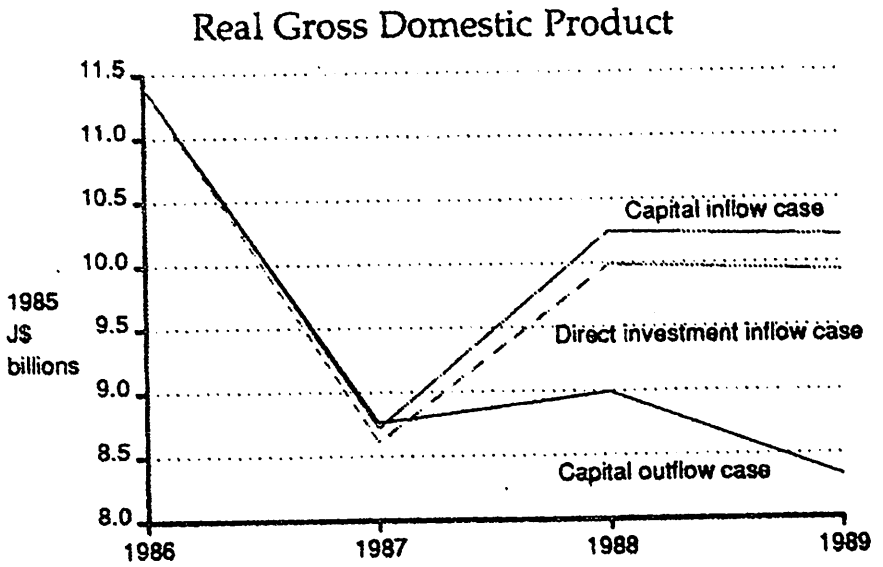
Figure 4.8 shows that real fixed capital investment rises when capital flows into Jamaica, the more so when part of it flows directly into fixed capital investment, rather than to bank deposits. However, the extent to which this capital is channelled to investment does not greatly affect the results.

Figure 4.8



Looking finally at the results for real GDP, in Figure 4.9, we see that real GDP fell less under the net inflow scenarios than it did under the outflow scenario. Surprisingly, GDP performed worse when the inflow boosted real investment (Scenario C), than it did when it simply added to (Scenario B), even though real investment was marginally higher under Scenario C.

Figure 4.9



Why, then, is the picture not more rosy if liberalisation encourages a net capital inflow, and more particularly, if 50% of that inflow adds to fixed capital investment? The answer given by the model is that this fixed capital investment would feed strongly through to imports, but does not appear to have any noticeable effect on exports. It is only if capital investment can boost exports, and thereby loosen the balance of payments constraint, that liberalisation can create room for GDP to grow.

5. Conclusions

The Efficiency Advantages of Liberalisation

We began by noting that there is a powerful efficiency argument for exchange rate liberalisation. Full trade liberalisation (which we do not believe has yet been achieved) would inject more competition and efficiency into an economy which could benefit from both. Liberalisation of the capital account would also improve efficiency. These efficiency improvements would take various forms. On the capital side, Jamaicans would be able to diversify, and optimise, their investment portfolios; foreign investors would find Jamaica more attractive; and companies would be free to find the balance between equity and borrowing which best suited their needs.

There is little hard evidence to demonstrate the importance of these and other benefits for Jamaica, nor were we able to produce new evidence. However, we were impressed by the fact that an outstanding international comparisons study on the subject found that the greater the level of distortion in foreign exchange markets, the more damage is caused to a country's rate of growth. In short, there are strong reasons - derived both from economic theory and international research - for supposing that controls damage efficiency, and hence economic growth, in Jamaica.

The Modelling Results

The key policy question is whether and how the *transition* from the regulated state to the liberalised state can be managed. If it cannot be managed without severe problems of exchange rate instability, and a fall in GDP, the efficiency gains, undoubted but unmeasurable, will be swamped, at least in the short to medium term. For this reason we needed to understand, for example:

- how exports and imports would respond to changes in the exchange rate
- the effect of capital flight
- whether and by how much Jamaica's GDP would rise, or fall.

The study focuses on these aspects because the efficiency benefits of liberalisation could not be relied upon in themselves to solve such problems if the latter were of major proportions.

We noted that other countries, similar in structure and culture to Jamaica, have experimented with liberalisation of exchange rates, with mixed results, which offer little guidance.

In this study we have modelled the behaviour of the economy since 1973, to see how it has behaved, and by inference, how it could be expected to behave in a liberalised environment.

We conclude that the economy has not been particularly responsive to prices of any kind, whether they be interest rates or exchange rates. It is true, and encouraging, that the volume of exports and imports have responded as we would predict to changes in

prices. However these responses have not been particularly strong. If the exchange rate were permitted to float, it would have therefore to depreciate a long way in order to maintain a balance on the external account, in the face of a surge in imports or a flight of capital. This would raise inflation significantly and could generate unhelpful expectations.

Policy Implications

If the economy responded strongly to exchange rate changes, liberalisation would be very much less risky, in the sense that the exchange rate, and the rate of inflation, would be stabilised without intervention by the authorities.

Should, then, exchange rate liberalisation proceed no further? This study draws attention to a problem facing economies like Jamaica's, which have been heavily regulated for a long time. Such economies are bound to be insensitive to economic signals. Perhaps it is no surprise to the Jamaican reader that exports have been insensitive to the exchange rate. The output of the alumina industry is governed more by the price of alumina than by the Jamaican dollar. The sugar and banana industries have been constrained by factors other than the exchange rate. Tourism may have been influenced more by changes in foreign perceptions of Jamaica as a resort.

The model identifies the problem in Jamaica: exports are insufficiently responsive both to demand side pull, in the shape of the incentives created by depreciation, and to supply side push, in the shape of increases in fixed capital investment.

These results are consistent with casual observation of the Jamaican economy: when Jamaica succeeds in negotiating a guaranteed export market, it is not always able to take advantage of it. Only 50 % of the banana quota has been used in recent years; less than 50% of the majority of garment quotas available to Jamaica in 1990 were reported as being used. Many of the world's devotees of the justly famous Blue Mountain coffee wait in vain for supplies; the Japanese resorted to direct investment in order to increase the supply.

In short, the problem of supply seems to have more to do with culture, institutions and regulation, than with prices. Since exchange rate liberalisation would work largely (but not wholly) through prices, it cannot succeed alone. It would need to be coupled with supply side measures which would encourage greater levels of entrepreneurship, responsiveness and competition in the economy. As microeconomic reform proceeds, the Jamaican economy can be expected to become more responsive.

The dilemma for the government is how to manage the transition to a more dynamic and liberalised economy, without aggravating problems with its balance of payments, its debt and its inflation, to mention just three. There is, in other words, a problem of ordering policies in the right sequence.

Our suggestion is that deregulation should be accelerated, to provide the incentive structure and the environment for more competitive and dynamic economic behaviour. This involves privatisation, dismantling institutional barriers, tax reform and economic pricing.

A number of economic indicators suggest that the economy is moving in the right direction: GDP is growing, debt is falling, savings and investment ratios are rising. As soon as there is firm evidence that the economy has become more responsive to price signals, exchange rate liberalisation should feature as part of that policy.

An argument for the earliest prudent liberalisation of exchange controls is that many Jamaicans appear, long since, to have arranged their own "liberalisation", if the size of capital assets reputed to be held overseas held by Jamaican residents is any guide. If this is indeed so, then it might be argued that the economy's long term performance is not much of an advertisement for liberalisation. What we observe is what the model predicts - a weak balance of payments, and a tight fiscal and monetary stance to deal with it. It would help to explain why Jamaican interest rates are so high - between 30% and 40% - even though funds are officially held "captive" by exchange controls.

If this interpretation is correct, it is an argument for the abolition of exchange controls at the earliest prudent opportunity. It would make a respectable citizen of current behaviour. Weakly enforced controls may actually combine some of the problems of liberalisation which we have identified in this study - a weak balance of payments and restrictive government policies to deal with it - with the discouraging effects of controls on inward investment.

The mechanics of liberalisation

As to the form and mechanics of liberalisation itself, the conventional view would give priority to trade liberalisation, on the grounds that it generates more tangible welfare benefits than the transfer of funds. We do not agree. It is not obvious why it should be thought intrinsically better for the economy if Jamaicans import cars rather than invest abroad. And to the extent that capital liberalisation would encourage foreign investment, and would allows more efficient investment choices, of all kinds, it has distinct benefits to confer. Our modelling suggests that the economy would respond better to full liberalisation than to trade-only liberalisation.

On the question of how much reserves the authorities would need in order to liberalise, our view is that liberalisation should only be adopted when there are grounds for confidence that the exchange would be reasonably stable, with minimal intervention by the authorities. Under such circumstances, it would be possible to liberalise on the basis of managed floating, with very limited reserve requirements.

If these conditions are not met, it would be inadvisable to liberalise at all, least of all on the basis of a pegged currency. If there are not sufficient grounds for confidence that the exchange market will be reasonably stable without intervention, do not liberalise. The question, then, of the size of the reserves which are necessary to liberalise is both unanswerable, and irrelevant. The reserve position is only relevant if the intention is to peg the exchange rate at a rate other than that suggested by the market, and it is difficult to see the point of liberalising if this is the intention.

Annex A

Administrative Framework for Jamaica's Foreign Exchange Controls

The Jamaican Government has operated a system whereby the so-called traditional export industries - bauxite/alumina, bananas and sugar - lodged their export earnings directly with the BoJ. Inflows from other industries were purchased by commercial banks as agents for the Bank of Jamaica (BoJ), and sold to the BoJ on a daily basis.

The BoJ used part of this foreign exchange to service the official external debt and to pay for imports purchased via a public sector agency, the JCTC (petroleum products, foodstuffs and pharmaceuticals). These payments amount to around US$ 1 billion a year.

The balance of the foreign exchange was sold to the private sector for approved imports and remittances. From 1983 to 1989 the exchange rate was determined by a twice-weekly auction. The auction was suspended in November 1989, whereafter the BoJ fixed the rate and allocated eligible bids on a first-come, first-served basis, subject to considerable delay if, as usually was the case, total bids exceeded the foreign exchange available.

In parallel with the official market, a forward market also operated. This market was supplied with foreign exchange only by the "non-traditional" export industries and was operated by the commercial banks. The term "forward" market was something of a misnomer: although transactions were for periods of between 30 and 180 days forward from the date of the transaction, in practice most of the transactions were concluded at the minimum 30 days forward. The forward market operated in effect as a parallel foreign exchange market.

Access to this market was restricted to those eligible to apply for spot foreign exchange from the BoJ. Most forward purchases are for capital remittances, such as management fees and dividends. Importers were reported to be accorded priority in the official market because foreign lines of credit would be stretched to breaking point if delays in payment were too great (as indeed occurred in early 1990).

This market was suspended in September 1988, following Hurricane Gilbert in order to divert the inflow of foreign exchange from insurance claims through the official market, but was reopened in September 1989.

The forward rate has consistently stood at a premium from the official rate. The premium at September 1990 was around 14% (J$ 8, compared to the official rate of J$7).

A third foreign exchange market is known variously as the parallel, black or street market. This is supplied by recycled foreign capital from emigrants, leakages from exports and from tourism, and from illegal earnings from marijuana. In September 1990, the parallel rate was in line with the forward rate.

In September 1990 these arrangements were transferred to, and united within, the banking system.

Annex B The IMF Model

The IMF model contains four sectors:

- the private sector
- the monetary authority sector
- the government sector
- the foreign sector.

The banking system is not modelled separately from the monetary authorities so that in effect the only financial asset in the economy is money. Hence interest rates are not included in the model. This is a shortcoming because it means that the key relationship from the IMF's viewpoint - the demand for money - is poorly defined.

B.1 The performance of the IMF model

Because this model derives from an exposition by IMF authors[14], it is helpful at this point to explain the flavour of the IMF/World Bank thinking. The IMF's mandate is to finance temporary balance of payments problems. It therefore needs a model which can suggests ways of predicting, and controlling, the balance of payments, so that the IMF can set appropriate conditions to countries which borrow from the Fund. This model needs to find a link between the monetary sector and the balance of payments.

The key to the IMF's model is a stable demand for money. This does not mean that the quantity of money (in notes and demand deposits) which is held by the (non-bank) public is constant, nor does it mean that the velocity of money circulation is constant. It means that the velocity has to be well determined by a limited number of variables.

If such a relationship exists, an important consequence follows: there is a direct linkage between money supply and the balance of payments. If in turn there is a close relationship between the money supply and the financing of public expenditure by the issue of public debt, the control of public sector deficits will be the key to solving a balance of payments deficit, and the IMF will feel confident in making such control a condition for assistance in that endeavour. This, in essence, is the monetary approach to the balance of payments.

The World Bank has a different concern - to do with a country's economic development, and with how it can be financed. Its standard model (the Revised Minimum Standard Model - RMSM) is concerned with the relationships between savings, foreign capital inflows, investment, and growth. Its emphasis is on real variables.

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14 "Adjustment with Growth: Relating the Analytical Approaches of the IMF and the World Bank", Mohsin Khan, Peter Montiel and Nadeem Haque, Journal of Development Economics, 32(1990).

From this simple account, it is clear that the two agencies have different purposes, and different models; that each model assumes as given, or ignores, what the other seeks to find out. The IMF model regards the level and growth of real national income as given, and seeks to explain the rate of inflation and the balance of payments. The World Bank's model takes the rate of inflation and the balance payments as given, and seeks to explain the rate of growth (or alternatively, to calculate the financing costs of a higher growth rate).

Staff economists at the IMF have integrated these two approaches into a simple model. This model is not a bad starting point for a study of Jamaica, because since the late seventies, the Jamaican economy has been managed in agreement with and often under the supervision of the IMF.

The model specification and the results from instrumental variable estimation of the model for the period 1975-1988 are shown in Table B.1. Table B.1 lists the correlation coefficients between the actual values of the endogenous variables and the values obtained by simulating the model. They are not encouraging. While almost all the coefficients are statistically significant, the goodness of fit of the model is quite poor. The equations for GDP growth, investment and inflation suffer from serious mis-specification. The value of the Durbin-Watson (DW) statistic is quite low (less than unity). This indicates that important variables are missing or that functional forms are mis-specified, rather than simply that first degree autocorrelation is present.

Table B.1

IMF / World Bank Model

		DW
(1)	$\Delta y = \rho\, \Delta K / (P_{-1} + \Delta P)$	0.18
(2)	$\Delta K = s\,(Y_{-1} + \Delta Y - T) = \Delta M^d - \Delta F_P - \Delta D_P$	0.07
(3)	$T = G - \Delta F_G + \Delta D_G$	
(4)	$\Delta Y = P_{-1}\, \Delta y + y_{-1}\, \Delta P$	
(5)	$\Delta P = (1-\theta)\, \Delta P_D + \theta \Delta P_F$	0.19
(6)	$\Delta M^d = vdY$	0.36
(7)	$\Delta M^S = \Delta R + \Delta D_P + \Delta D_G$	
(8)	$\Delta M^S = \Delta M^d$	
(9)	$\Delta R = X - Z - \Delta F_P - \Delta F_G$	
(10)	$x = x_{-1} + (x_{-1} + c)\, \Delta P_F - C\, \Delta P_D$	2.90
(11)	$z = z_{-1} + (z_{-1} - b)\, \Delta P_F + b\, \Delta P_D + a\, dy$	2.81

(12) $X = x\,(P_{-1} + \Delta P)$

(13) $Z = z\,(P_{-1} + \Delta P)$

Simultaneous Equation Estimation Results

Endogenous Variables	Parameters	Value	t-stat
Δy	ρ	= 2.58	(6.22)
ΔP	θ	= 0.03	(1.08)
ΔR^D	v	= 1.39	(13.25)
ΔY	a	= -23.99	(-5.02)
ΔP	b	= 62.75	(14.72)
ΔM^d	c	= -48.55	(-22.53)
ΔM^S	s	= 0.25	(6,25)
x			
z			
X			
Z			
ΔK			
T			

The foreign trade equations have DW statistics which are marginally better, even if the proportion of the variances of exports and imports that they are able to explain are negligible.

The demand for money equation is the only relationship in the model which appears to perform quite well, and it indicates that the velocity of money circulation is quite stable[15].

Given the above considerations, it is not surprising that over the period 1975-1988, simulations from the model give a fairly unsatisfactory description of the economy. No correlation coefficient between actual and simulated values is higher that 0.65 and 5 out of 10 of them are below 0.3, implying that the proportion of the variance explained by the model is lower than 10%.

The reason for these shortcomings may be that the model has been developed over the years as a general tool for the analysis of developing countries' economies. Its limited ability to track the Jamaican economy may indicate that the latter's economy, and its problems, may be distinct. Whatever the reason, there seems to be no doubt, in view of the poor results yielded by the (simple) model of the IMF/World Bank type, that we need a version designed specifically for Jamaica.

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15 This is reassuring, given the IMF's monetary approach to the balance of payments.

Annex C

Sources of Variables Used

CODE	SOURCE	COVERAGE	DESCRIPTION
MARKUPnn	LE	1975-89	Profits, indirect taxes, subsidy and financial costs in sector nn (= TOTOUTnn - COMEMPnn - INTINPnn)
TOTUOTnn	STATIN	1975-89	Value of total output in socot nb
FC	PIOJ	1969-89	Final consumption expenditure
PC	PIOJ	1969-89	Private final consumption expenditure
GFCF	PIOJ	1969-89	Gross fixed capital formation
INS	PIOJ	1969-89	Increase in stocks
EX	PIOJ	1969-89	Exports of goods & services
IM	PIOJ	1969-89	Imports of goods & services
GDP	PIOJ	1969-89	Gross domestic product in purchasers' values
GDPD	PIOJ	1969-89	GDP Deflator (1974 = 1)
CFC	PIOJ	1969-89	Consumption of fixed capital
SG	PIOJ	1969-89	Saving of general government
RG	PIOJ	1969-89	Current receipts of general government
IT	PIOJ	1969-89	Indirect taxes
S	PIOJ	1969-89	Subsidies
G	PIOJ	1969-89	Current disbursement of general government
EXTLOA	FINMIN	1975-90	External loans by central government
DOMLOA	FINMIN	1975-90	Domestic loans by central government
NINTRS	PSOJ	1979-89	Net international reserves
NOFFRS	PSOJ	1979-89	Net official reserves
TINTRS	PSOJ	1979-89	Total international reserves
M1	IMF-IFS	1969-88	Money M1
QM	IMF-IFS	1969-88	Quasi-money
M2	IMF-IFS	1969-88	Money M2
LABFOR	PSOJ	1974-89	Labour force
EMPLOY	PSOJ	1974-89	Employment
UNEMPL	PSOJ	1974-89	Unemployment
UNEMPR	PSOJ	1974-89	Unemployment rate
NCAPMOV	PSOJ	1974-89	Net capital movements
CPI	PSOJ	1969-88	Consumer price index (1985 = 100)
DCPI	LE	1969-88	Inflation rate (based on CPI)
CPIUS	IMF-IFS	1969-88	Consumer price index in the USA (1985 = 100)

DCPIUS	IMF-IFS	1969-88	Inflation rate in the USA (based on CPIUS)
PPIUS	IMF-IFS	1969-88	Producer price index in the USA (1985 = 100)
DPPIUS	IMF-IFS	1969-88	Inflation rate in the USA (based on PPIUS)
TBILRT	IMF-IFS	1969-88	Treasury bill rate
ERTAVG	IMF-IFS	1969-89	Exchange rate J$s per US$, period average
DCRGOV	IMF-IFS	1969-88	Domestic credit to the central government
GCRPRS	IMF-IFS	1969-88	Domestic credit to the private sector
FAMONA	IMF-IFS	1969-88	Foreign assets of the monetary authorities
FLMONA	IMF-IFS	1969-88	Foreign liabilities of the monetary authorities
RESMON	IMF-IFS	1969-88	Reserve money (base money)
CIRCOL	IMF-IFS	1969-88	Currency in circulation with the public
FABANK	IMF-IFS	1969-88	Foreign assets of commercial banks
FLBANK	IMF-IFS	1969-88	Foreign liabilities of commercial banks
CRG	IMF-IFS	1969-88	Monetary authorities' claim on central government
CRP	IMF-IFS	1969-88	Commercial banks' claim on the private sector
BDG	IMF-IFS	1969-88	Central government deposits with the commercial banks
DEMDEP	IMF-IFS	1969-88	Demand deposits at commercial banks
TIMDEP	IMF-IFS	1969-88	Saving and time deposits at commercial banks
MSFA	IMF-IFS	1969-88	Monetary survey: foreign assets
MSCRPS	IMF-IFS	1969-88	Monetary survey: domestic credit to the private sector
MSCRCG	IMF-IFS	1969-88	Monetary survey: domestic credit to the central government
MSCRLG	IMF-IFS	1969-88	Monetary survey: domestic credit to local government
MSCRPE	IMF-IFS	1969-88	Monetary survey: domestic credit to non-financial public entities
MSCRFI	IMF-IFS	1969-88	Monetary survey: domestic credit to other financial institutions
CGSURP	IMF-IFS	1969-86	Central government: surplus
CGBORR	IMF-IFS	1969-84	Central government: net borrowing
CGCBAL	IMF-IFS	1969-86	Central government: use of cash balances
CGINTD	IMF-IFS	1969-86	Central government: internal debt
TRADEB	IMF-IFS	1969-87	Trade balance (US$)
SERVCR	IMF-IFS	1969-87	Other goods & services income: creditors (US$)

SERVDB	IMF-IFS	1969-87	Other goods & services income: debtors (US$)
PRIVTR	IMF-IFS	1969-87	Private unrequited transfers (US$)
OFFITR	IMF-IFS	1969-87	Official unrequited transfers (US$)
CURACC	IMF-IFS	1969-87	Current account balance (US$)
DIRINV	IMF-IFS	1969-87	Direct investment (US$)
PORINV	IMF-IFS	1969-87	Portfolio investment (US$)
OTHLTC	IMF-IFS	1969-87	Other long-term capital movements (US$)
OTHSTC	IMF-IFS	1969-87	Other short-term capital movements (US$)
BOPEAO	IMF-IFS	1969-87	Errors and omissions in the balance of payments (US$)
BOP	IMF-IFS	1969-87	Balance of payments (US$)
CURACB	STATIN	1969-89	Current account balance (US$)
CAPMOV	STATIN	1969-89	Capital movements (US$)
BOP2	STATIN	1969-89	Balance of payments (US$)
DUTY	STATIN	1975-88	Total duty collected
IMCPGD	STATIN	1973-88	Imports of capital goods
IMRWMT	STATIN	1973-88	Imports of raw materials
IMCNGD	STATIN	1973-88	Imports of consumer goods
IMTOT	STATIN	1973-88	Total imports (IMCPGD + IMRWMT + IMCNGD)
DUTYRT	LE	1975-88	Duty rate (DUTY / IMTOT)
BDRT	IMF-IFS	1969-88	Commercial banks deposit rate
MACRCG	IMF-IFS	1969-88	Monetary authorities: credit to the central government
MACRPS	IMF-IFS	1969-88	Monetary authorities: credit to the private sector
CBAVGD	BOJ-SD	1978-88	Commercial banks' average deposits
CBCASH	BOJ-SD	1978-88	Commercial banks' cash reserves
CBLIQA	BOJ-SD	1978-88	Commercial banks' liquid assets
CBCRCG	BOJ-SD	1969-88	Commercial banks' credit to the central government
CBCRPE	BOJ-SD	1969-88	Commercial banks' credit to non-financial public enterprises
CBRMLA	BOJ-SD	1978-88	Commercial banks' required minimum liquid assets
CBRES	IMF-IFS	1969-88	Commercial banks' reserves
BLRT	IMF-IFS	1979-89	Commercial banks' lending rate
TBRUS	IMF-IFS	1969-88	Treasury bill rate in the USA

List of Sources:

STATIN	The Statistical Institute of Jamaica - data supplied on disk
	The Jamaican Economy 1985
	External Trade
PIOJ	The Planning Institute of Jamaica - data supplied on disk based on:
	STATIN: National Income and Product
FINMIN	The Ministry of Finance - data supplied on disk
PSOJ	The Private Sector Organisation of Jamaica - data supplied on disk
IMF-IFS	International Monetary Fund
	International Financial Statistics
BOJ-SD	Bank of Jamaica
	Statistical Digest
LE	London Economics' calculations based on other series

Annex D Data used in Modelling

Variable name:

in the model	PC	Y	E	OS	M2
in the database	(PC)	(GDP)	(ERTAVG)	(OS)	(M2)
	J$m	J$m	J$/US$	J$m	J$m
1970	709.30	1166.30	0.83	365.20	379.00
1971	800.00	1275.60	0.83	400.80	471.00
1972	958.40	1430.80	0.77	408.50	529.00
1973	1080.40	1725.40	0.91	472.30	577.00
1974	1468.70	2159.20	0.91	604.20	686.00
1975	1722.50	2600.60	0.91	681.00	828.00
1976	1881.60	2696.30	0.91	680.40	897.00
1977	2024.20	2954.30	0.91	801.50	1044.00
1978	2375.30	3737.40	1.41	1180.30	1235.00
1979	2713.50	4293.40	1.76	1362.20	1422.00
1980	3146.80	4773.10	1.78	1535.80	1713.00
1981	3681.90	5306.80	1.78	1588.90	2197.00
1982	4033.70	5867.10	1.78	1538.10	2773.00
1983	4874.20	6993.10	1.93	2219.30	3527.00
1984	6277.10	9358.40	3.94	3247.60	4197.00
1985	7771.70	11202.50	5.56	4192.70	5238.00
1986	8400.70	13388.50	5.48	4608.60	6688.00
1987	9801.00	16002.19	5.49	5448.30	7527.00
1988	11767.10	18748.00	5.49	6577.10	9958.00

	CIRC	BD	P	PF	R
	(CIRCOL)	(DEMDEP+(CPI)	(PPIUS)	(TBILRT)	TIMDEP)
	J$m	J$m	1974=1.001985=100		J$m
1970	46.00	333.00	0.59	35.70	4.0%
1971	58.00	413.00	0.63	36.90	3.8%
1972	72.00	457.00	0.65	38.60	4.3%
1973	82.00	495.00	0.77	43.60	5.5%
1974	102.00	584.00	1.00	51.80	7.2%
1975	127.00	701.00	1.21	56.60	6.9%
1976	138.00	759.00	1.34	59.30	7.2%
1977	182.00	862.00	1.50	62.90	7.2%
1978	173.00	1062.00	1.89	67.80	8.3%

1979	220.00	1202.00	2.21	76.30	9.3%
1980	260.00	1453.00	2.61	87.10	10.0%
1981	282.00	1915.00	2.83	95.00	9.8%
1982	316.00	2457.00	3.09	96.90	8.6%
1983	375.00	3152.00	3.60	98.10	12.4%
1984	436.00	3761.00	4.86	100.50	13.3%
1985	540.00	4698.00	6.10	100.00	19.0%
1986	729.00	5959.00	7.16	97.10	20.9%
1987	884.00	6643.00	8.08	99.50	18.2%
1988	1288.00	8670.00	9.32	103.60	18.5%

	I	X	Z	GDP0IC	BM
	(GFCF+IN)	(EX)	(IM)	(GDP0IC)	(RESMON)
	J$m	J$m	J$m	1985=100	J$m
1970	368.70	389.00	438.00	65.20	75.00
1971	407.80	433.70	525.00	67.30	96.00
1972	394.50	471.70	591.00	70.60	109.00
1973	541.80	540.10	717.10	74.60	140.00
1974	525.20	770.30	991.20	75.30	170.00
1975	670.10	917.00	1186.10	74.90	202.00
1976	491.10	783.20	1021.70	78.40	234.00
1977	361.20	928.30	971.80	81.20	273.00
1978	562.30	1575.20	1525.20	84.60	302.00
1979	822.50	2065.00	2132.60	87.40	362.00
1980	759.20	2425.80	2524.90	88.60	510.00
1981	1077.20	2510.30	3057.60	89.90	489.00
1982	1224.40	2239.90	2918.90	89.60	433.00
1983	1556.60	2621.10	3465.00	91.90	744.00
1984	2163.90	4955.50	5579.60	96.50	1427.00
1985	2837.20	6521.40	7669.30	100.00	1926.00
1986	2574.00	7294.00	7001.30	102.80	2285.00
1987	3704.80	8404.50	8344.20	106.30	2763.00
1988	4963.90	8849.40	9848.00	110.70	3752.00

	DUTYRT* (DUTYRT) %	G (RG-SG) J$m	SG (SG) J$m
1970	0.0%	172.30	50.90
1971	0.0%	201.10	64.80
1972	0.0%	257.60	42.70
1973	0.0%	343.90	17.30
1974	0.0%	476.20	118.90
1975	2.0%	598.70	69.80
1976	6.0%	716.30	-24.30
1977	2.0%	934.00	-91.90
1978	2.0%	1197.20	-104.70
1979	4.0%	1287.70	-68.00
1980	3.0%	1495.90	-149.70
1981	3.0%	1679.10	-174.20
1982	5.0%	1979.20	-322.90
1983	5.0%	2335.70	-457.70
1984	3.0%	2891.00	-245.00
1985	4.0%	3524.80	-652.60
1986	4.0%	4448.70	-22.90
1987	5.0%	5420.70	-38.30
1988	6.0%	6042.20	111.30

* Data for the 1970-4 period are missing and are assumed as 0% in estimation and simulation

Annex E
Analysis of a Structural Break in Import Behaviour

An earlier version of the import equation was run for two separate periods - 1961 to 1973 and 1973 to 1988 - to see whether exchange controls from 1973 onwards acted differently on imports from whatever form of controls were in operation prior to that. The results indicate that there is indeed a structural break in 1973.

The form of the equation

For the first period (1961-73) we ran two specifications, to see whether imposing restrictions on the coefficients on prices and the nominal exchange rate was justified:

1. $z = c + a1*y + a2*I + a3*p + a4*pf + a5*e$

2. $z = c + a1*y + a2*I + a3*p/pf + a4*e$

The log of likelihood functions were -61.0 and -62.95 respectively. We used the Akaike Information Criterion (AIK) to choose the better of the two specifications. The result is that with the difference between the log likelihoods being greater than 1, the decrease in the log likelihood is not small enough to warrant the imposition of the restriction, so the first form is preferred.

We ran the regression for the two periods either side of 1973, and also for the entire period 1961 to 1988, using the likelihood ratio test to see whether there was statistical evidence for a structural break, using the Cochrane - Orcutt iterative technique to correct for serial correlation[16].

The results were:

period	log likelihood
1961-73	-61.0
1973-88	-94.6
1961-88	-164.7

16 This is a slightly different method from that employed in the model, where the lagged dependent variable was used to cope with autocorrelation. The structure of the two is basically the same, but we found that the break could best be investigated using the former technique.

The total log likelihood for the unrestricted version (the two periods taken separately) is -(61.0 + 94.6) = -155.6. The log of the likelihood ratio is therefore 164.7 - 155.6 = 9.1. To derive a statistic that follows a chi-squared with 5 degrees of freedom (the number of restrictions imposed) we double this and arrive at 18.2. The critical value is 15.1 at the 1% significance level, so we reject the hypothesis that the specification is the same in both periods, indicating that there was indeed a structural break.

The two equations are:

1961-72

$$z = 51.6 + 1.36y - 1.2I - 2430.7p - 4.3pf + 1002.6e$$

t-stat	(.1)	(2.4)	(1.6)	(1.7)	(.16)	(1.93)

R-squared = .90

DJ = 1.87

1973-88

$$z = -1003.6 - .41y - 1.4I + 643.7p + 16.6pf + 711.6e$$

t-stat	(4.0)	(1.4)	(8.0)	(1.1)	(4.5)	(6.5)

R-squared = .999

DJ = 2.3

As domestic GDP rises, one expects more imports to be sucked in. We would therefore expect a positive income coefficient for imports. We find it in the first period, but not in the second. The negative and insignificant coefficient in the second period is almost certainly a distortion caused by controls post-1973.