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Devaluation: The Jamaican Experience

by

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"Throughout the history of econometric research in international trade no coefficients have proved more difficult to estimate satisfactorily than those of the price responsiveness of exports and imports".

From: D.G. Pierce and D.M. Shaw, Monetary Economics
Theories, Evidence and Policy, pp. 375

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I Introduction

Deficit on Merchandise Trade and Current Account was one of the realities of the Jamaican economy since the 1960's, and the beginning of a dismal era in the nation's balance of payments started in 1972. With the exception of 1974, there began a downward trend in net capital inflows and net foreign reserves. The situation deteriorated after 1975 as net capital inflows were unable to offset Current Account deficit. The consequence was that net foreign reserves were negative. That trend persisted long enough to justify the conclusion that a fundamental disequilibrium in the Balance of Payments existed. Among the policies enacted in the 1970's to correct the external imbalance were a series of exchange rate adjustments, consisting of devaluing the Jamaican dollar vis a vis the US dollar by 15.6 percent in 1973, by about 13.6 percent in January 1978 and by 32 percent in May 1978. The problem in the external sector is critical for the Jamaican economy. Availability of foreign reserves is crucial for economic development because of the high import content of the island's productive capacity: fuel, raw materials, chemicals, transport equipment, construction materials, etc., have to be imported.

The purpose of this paper is to develop a model which will enable us to analyse the impact of devaluation (exchange rate) on the demand for Jamaica's imports and exports. In Section II we present a general overview of the economic problems in the 1970's and the different policies which were enacted and which emphasised exchange rate adjustment. Section III deals with a brief discussion on the different approaches to

study and analysis of devaluation. In Section IV the model is presented. Section V presents and analyses the results and Section VI concludes with an evaluation of our results and the policy implications.

II Overview of the Economy in the 1970's

Throughout the 1970's the performance of the economy deteriorated rapidly. As indicated in Table 1, from 1969 to 1972, the deficits on Visible Trade and Current Account increased from \$128.5 mil. to \$189.1 mil. and from \$103 mil. to \$157.6 mil. respectively. However, from 1965 to 1971, net capital flows were able to offset Current Account deficit. Beginning 1972, there was a downward trend in net capital flows and net foreign reserves; within 1 year (from 1971 to 1972) Net Capital flows decreased from \$180.2 mil. to \$117 mil. while net foreign reserves decreased from \$182.2 mil. to \$69.7 mil. To correct the external balance, a 15.6% devaluation (which resulted in a drop in price of the Jamaican dollar from US\$1.20 to US\$1.10) was implemented in January 1973.

Economic conditions did not improve after 1973 as deficit on merchandise trade and current account continued and net capital movements and net foreign reserves declined rapidly. It must be noted that at that time, factors external to the economy such as world wide inflation, rising fuel prices, uncertainty in the international capital markets, could have contributed to such poor performance. By 1975, it was acknowledged that the economy was faced with a fundamental disequilibrium in its Balance of Payments position, and certain policies were implemented

Table 1: Visible Trade and Current Acct. Balance, Net Capital Flows,
Net Foreign Reserves and Real GDP, 1969-1980 (J\$mil.)

Year	Visible Trade Balance	Current Acct. Balance	Net Capital Flows	Net Reserves	Real GDP
1969	-128.5	-103.0	107.7	79.3	2139.5
1970	-152.1	-127.2	134.1	95.9	2230.6
1971	-175.8	-142.3	160.2	132.2	2502.5
1972	-199.1	-157.6	117.0	88.7	2540.4
1973	-249.8	-164.3	124.7	76.1	2756.5
1974	-186.3	-151.8	221.1	130.2	2695.7
1975	-247.3	-241.5	192.0	68.5	2721.3
1976	-254.8	-275.2	43.9	-181.4	2455.6
1977	-95.2	-61.9	51.7	-196.0	2415.0
1978	-187.8	-73.5	5.4	-447.4	2407.0
1979	-452.7	-142.6	-10.4	-758.5	2371.7
1980	-371.5	-204.2	171.0	-805.1	2243.2

- Sources: (i) Visible Trade Balance and Net Reserves, Statistical Digest (Bank of Jamaica)
- (ii) Current Acct. Balance and Net Capital Flows, Economic and Social Survey (National Planning Agency)
- (iii) Real GDP (1975 = 100) International Financial Statistics (I.M.F.)

Table 2: Exchange Rate Adjustments

Date	Adjustment	% change	Comments
Dec. 1971	J\$1.00 = US\$1.30	-	
Jan. 1973	J\$1.00 = US\$1.10	-15.6	designed to correct the imbalance in the external sector
April 1977	Basic: J\$1.00=US\$1.10 Special: J\$1.00=US\$0.90	-	Adoption of dual exchange rate system
Oct. 1977	Basic: J\$1.00=US\$1.10 Special: J\$1.00=US\$0.78	-	Minor adjustment in special rate
Jan. 1978	Basic: J\$1.00=US\$0.95 Special: J\$1.00=US\$0.75	-13.6 -5.1	Devaluation of both rates
May 1978	Basic: J\$1.00=US\$0.645 Special: J\$1.00=US\$0.645	-32.1 -12.8	Unification of special and basic rates
June 1978	J\$1.00 = US\$0.636	-1.5	Crawling regular adjustments
July 1978	J\$1.00 = US\$0.626	-1.5	Crawling regular adjustments
August 1978	J\$1.00 = US\$0.617	-1.5	Crawling regular adjustments

Source: Economic and Social Survey of Jamaica, 1978 (Table 6.7)

during the year. Among them were:

- (i) direct control over imports;
- (ii) tighter control over transactions which necessitated the use of foreign exchange;
- (iii) direct measures to stimulate exports, and
- (iv) measures to control the growth in factor prices.¹

The first two policies were also very important in the Anti-Inflation Package which was implemented later in the year.

International recession and world wide inflation also took heavy toll on the economy; beginning 1976, the economy experienced a negative growth rate as real GDP began to decline, mainly because of the decrease in demand for the major export items - bauxite, alumina, banana, sugar. The existence of a chronic imbalance, a depletion of foreign reserves, and a negative growth rate induced the government to start negotiation in 1977 with the International Monetary Fund (IMF) to provide foreign reserves.² Other important policies during the year:

- (i) continuation of import ceiling, and
- (ii) in April, the adoption of a dual exchange rate system where certain commodities were imported at the Basic (or original rate J\$1.00 = US\$1.10) and others at a special rate equivalent to a 37.5 percent devaluation (J\$1.00 = US\$0.60).

The objective of the dual exchange rate system was to further discourage the importation of certain types of goods and to provide incentive for exports, mainly non-traditional, since bauxite and alumina were not affected by the special rate.

Adjustment in the economy was poor and in 1978 a programme with the IMF assistance was implemented. Its main goals were to reduce consumption, contain imports and to stimulate exports. To achieve the goals, besides restrictive monetary and fiscal measures, exchange rate adjustment was a major policy instrument. A devaluation of both the Basic rate (by 13.6%) and the Special rate (by 5.1%) was instituted in January 1978; five months later both rates were Unified at a rate of J\$1.00 = US\$0.545 reflecting a devaluation of the basic rate by 32.1% and the special rate by 12.9 percent. A "crawling peg" regime with monthly devaluations between 1 and 1.5 percent then became effective.

III Approaches to the analysis of devaluation

Three broad analytical approaches to the analysis of devaluation can be considered.³ They are:

1. the Elasticity approach;
2. the Absorption approach;
3. the Monetary approach.

The elasticity approach emphasises the importance of the elasticity of demand for the devaluing country's exports and imports. A devaluation is expected to increase the price of importables (denominated in local currency) and lower the price of exportables (denominated in foreign currency) and thereby induces shifts in production and consumption so that the volume of exports increases and the volume of imports decreases. A devaluation will be considered successful if the volume effects (higher exports and lower imports)

offset the price effects (increase in the price of importables relative to the price of exportables), in other words, export revenue is greater than expenditure on imports. According to the Marshall-Lerner condition a devaluation will improve the trade account if the value of the sum of the demand elasticities for exports and imports exceeds unity.⁴

In the 1940's there was much scepticism among economists over the empirical measurement of demand elasticities. The reason was that several studies indicated low demand elasticities, close to unity or less. These findings contributed to the elasticity pessimism school of thought which doubted the effectiveness of devaluation as a policy instrument for improving external balance. However, in the 1950's and 1960's, elasticity pessimism was replaced by elasticity optimism as economists acknowledged that previous methods of estimating elasticities contained statistical bias which underestimated the true elasticities. Subsequent research on developed countries indicated that elasticities are high enough to make devaluation effective.⁵

The reluctance to use this approach in empirical work (on developing countries) lies in the fact that data and appropriate price indices are inadequate or unavailable to estimate the elasticities for most tradable goods.

Proponents of the Absorption approach argued that the elasticity approach only focused on the impact of devaluation on the Trade Balance whereas a successful devaluation or improvement in the Trade Balance increases national income. Thus they integrated the impact of the external

sector on National Income. An increase in national income usually causes domestic expenditure (domestic absorption) to increase. Defining Balance of Payments as the difference between total output and domestic absorption they contend that for devaluation to be successful the policy prescription requires output to be expanded and domestic absorption depressed.

The monetary approach views the Balance of Payments problem as purely a monetary phenomenon, and is thus critical of the two previous approaches for neglecting the monetary consequences of devaluation, mainly the impact of devaluation on capital movements.⁷ Proponents contend that the demand and supply of money are the main factors which determine a country's external balance, and also that the supply and demand for financial assets and price expectations have stronger influence on foreign exchange movements than merchandise trade flows. They view the economy from an integrative perspective in that the market for goods and services is intrinsically linked with the market for money and assets; therefore any analysis of a market in isolation will be misleading. Devaluation according to this approach, is ineffective. In the words of Laffer and Miles, "from the global monetarist perspective devaluation caused inflation without any corresponding benefits".⁸ To reiterate, the monetary approach is primarily interested in the changes in the excess demand for money in the economy that will affect the inflows of money into the country from abroad.

Model/Data

Our model focuses on estimating demand functions for Jamaica's exports and imports. Besides real income and price, we include exchange rate as an independent variable also to ascertain the responsiveness of the volume of exports and imports. The exchange rate as one of the determinants of trade flows has been used in empirical studies by Wainwright and Krainin,⁹ and Wilson and Takacs.¹⁰

Since import control and foreign exchange regulations were important aspects of trade policy during this period, we include foreign reserves as an independent variable also. According to Leamer and Ste

"the level of foreign exchange reserves may be relevant in particular to less developed countries where the reserve position can be considered indicative of the structures of control affecting imports. That is, imports may respond in these countries more to foreign exchange availability than to the level of real income".¹¹

We specify the import demand model as:

$$\text{Eq. 1} \quad Q_m = f(Yr, ER, P_m, FER)$$

where Q_m = Volume Index of each category of imports

Yr = Real Income (GNP deflated by C.P.I.)

ER = Exchange rate (price of a unit of foreign currency in domestic currency)

P_m = the import price index in domestic currency for each category of imports deflated by the C.P.I.

FER = Gross foreign reserves.

Expressed in double log form.

$$\text{Eq. 2} \quad \ln Q_m = a + b \ln Yr + c \ln ER + d \ln P_m + e \ln FER + U$$
$$b > 0, c < 0, d < 0, e > 0$$

The equation is estimated for the following categories of imports (1) All categories; (2) Consumer Durables; (3) Consumer Non-Durables; (4) Raw materials (fuel, chemicals, manufactured goods, other); (5) Capital Goods (transport and equipment, construction materials, machinery and equipment). Since the function is expressed in double log form, the estimated coefficient is the elasticity. The import price indices are deflated because of the assumption of the absence of "money illusion". The deflator used is the C.P.I., since it is the only one available. We acknowledge the biases inherent in the C.P.I. as the deflator.

For exports, we estimate separate functions for each of the main commodity items to the three major importing countries, i.e.: bauxite, sugar, and alumina to the U.S.A. and the U.K. and alumina to Canada. This study should also include an analysis of non-traditional exports because the export-led strategy of 1975 and the special-rate of exchange were implemented mainly to affect non-traditional exports. At the time of this study, adequate data on non-traditional exports were unavailable.

The export function is expressed:

$$\text{Eq. 3} \quad Q_x = f(Yr, P_x, ERA)$$

where Q_x = volume of exports

Yr = real income of the importing country

Px = the price index of the export commodity
expressed in foreign currency.

ERX = foreign exchange (the unit price of the J\$
in the respective importing country's currency).

Expressed in double log form:

Eq. 4 $\ln Q_x = a + b \ln Y_r + c \ln P_x + d \ln ERX + u$
 $b > 0, c < 0, d < 0.$

Like the import equation, the estimated coefficients are elasticities. Emphasis will be placed on ERX to analyse the responsiveness of exports to exchange rates.

This study should also include the impact of devaluation on Services (Transfer, Tourism, Transportation) rather than on merchandise trade alone since services transactions are also influenced by devaluation. The unavailability of appropriate data did not make this feasible.

The sources of data are:

- 1) Indices of External Trade, 1969-78, Dept. of Statistics
- 2) Economic Social Survey: Jamaica, National Planning Agency
- 3) International Financial Statistics - IMF

The data used for the estimation covered the period 1969-79. Since then, observations are relatively too short for a time series analysis, the results must be taken with a slight degree of caution. As soon as more recent data are available, the model will be re-estimated.

V. RESULTS

The results of the import demand equation are presented on Table 3. The test for the significance of the t values is at least the 80 percent confidence level. For total imports and its four major categories (Consumer Non-Durables, Consumer Durables, Raw materials and Capital Goods) the model performs well; although the values of R^2 are not large (ranging from 51.5% to 79.9%), the F values are all significant also the Standard Error of the equation (which measures the closeness of the fitted values to the actual values of the dependent variable) has the desirable property of being small in all instances. In the cases where the coefficient for foreign reserve is not significant, it has not been reported; instead it has been omitted from the equation which is re-estimated. Since the sample size is relatively small, we wish to maximize the degrees of freedom.

For total imports only, real income and price are significant in explaining the behaviour of imports; both variables show elasticities of near unity (real income = 0.82 and price = -0.83), which suggests that total imports are not very responsive to changes in real income and prices. At the disaggregated level, the results for the four categories of imports show that the exchange rate is significant only in determining the volume of Raw materials; the elasticity is low (-0.31) and significant at 90% confidence level. For the other three categories, foreign reserves is the significant variable; with elasticities of 0.25 (Consumer Non-Durables), 0.49 (Consumer Durables) and 0.41 (Capital Goods), all significant at the 90% level also. Real income and

	Constant	Real Income	Price	Exchange Rate	Foreign Reserves	R ²	F	SE	Location	Categories	Constant	Real Income	Price	Exchange Rate	F ²	r	SEE	D.
	1.10	0.82 (1.78)*	-0.53 (-2.26)**	0.06 (0.25)		60.0	2.8 ^a	0.05	A.	Bauxite	2.55	0.27 (0.45)	-0.21 (-2.1)**	-0.22 (-1.15) ^a	54.2	3.96**	0.04	2.
(Non-	3.05	-0.32 (-0.52)	0.26 (0.49)	0.44 (1.36)	0.25 (2.50)**	61.2	2.05 ^b	0.06		Sugar	125.2	-20.0 (1.21) ^c	1.55 (0.92) ^a	-5.47 (-1.14) ^a	15.0	0.59	1.34	2.
	0.82	0.92 (0.59)	-1.41 (-1.15)	0.26 (0.26)	0.49 (2.33)**	79.9	4.99**	0.13		Alumina	-33.4	5.09 (1.91)*	-0.14 (-0.32)	-1.39 (-1.34) ^a	34.5	1.76 ^a	0.23	1.
als	2.53	-0.20 (-0.63)	0.01 (0.05)	-0.31 (-1.72)*		51.5	2.12 ^a	0.04		Sugar	6.02	-0.04 (-0.02)	-0.47 (-3.35)**	-0.13 (-0.59)	92.3	15.5**	0.07	1.
	2.56	-0.37 (-1.09)	0.27 (1.53)	-0.51* (-1.65)		36.9	1.17	0.01		Bauxite	18.69	-3.29 (-0.07)	-0.06 (-0.10)	-0.26 (-0.50)	55.5	4.74**	0.19	0.
als	3.31	-0.31 (-0.58)	-0.13 (-0.55)	-0.09 (-0.23)		12.1	0.27	0.11		Alumina	17.09	-3.05 (-0.56)	0.39 (0.37)	-0.75 (-1.04) ^a	23.7	1.03	0.24	2.
stored	3.2	-1.06 (-4.15)**	0.76 (2.40)**	0.24 (1.04)	0.15 (1.92)**	90.3	11.75**	0.05	ada	Alumina	22.13	-3.6 (-0.54)	-0.51 (-0.72) ^a	-0.99 (-0.58)	25.4	1.14	0.32	1.
	1.6	0.37 (0.59)	-0.45 (-1.18)	-0.87 (-1.28) ^b		22.0	0.43	0.11										
oods	3.19	-0.23 (-0.56)	0.35 (0.55)	-0.31 (-0.52)	0.41 (2.45)**	77.1	4.23**	0.11										
ort	3.82	-0.76 (-1.10)	-0.07 (-0.17)	-0.35 (-0.81)	0.38 (2.11)**	74.2	3.59**	0.11										
uction	1.25	0.51 (0.77)	-0.85 (-1.19)	-0.22 (-0.50)	0.34 (2.61)**	69.2	2.81 ^b	0.05										
ary &	4.99	-2.25 (-2.31)**	1.81 (1.94)*	-0.52 (-0.94)	0.54 (3.03)**	86.1	7.77**	0.11										

denotes 20 percent level of significance
denotes 10 percent level of significance
denotes 25 percent level of significance

0 percent level of significance
0 percent level of significance
25 percent level of significance

prices did not have any significant impact on any of these categories. In some cases the coefficients have the "opposite" sign. We could rationalise the negative income elasticities from the evidence that during the period of negative growth rate the volume of certain categories of imports (Fuel, Manufactured Goods, Machinery and Equipment) rose.

The results for the four components of Raw materials (Fuel, Chemicals, Manufactured Goods and Other) show that although the exchange rate is significant in the cases of Fuel and Other, our model does not perform well (R^2 are low and insignificant). Our model also fails in explaining the behaviour of Chemicals. For Manufactured Goods, the exchange rate was not significant but foreign reserves were (in this case $R^2 = 80.3$ and highly significant).

The results of the components of Capital Goods exhibit a systematic pattern. The model is significant in all three cases, with R^2 ranging from 69.2% (Construction materials) to 85.1% (Machinery and Equipment). Foreign reserves alone is significant with the elasticity less than one and significant at 90 percent confidence. The coefficients for the exchange rate have the "correct" sign but are all insignificant while the real income and the price elasticities are insignificant.

The results of the demand for exports are presented on Table 2. Here we estimate the demand for the main export items by the three importing countries. Our model does not perform very satisfactorily in certain cases. The values of R^2 though low, are significant only in

four of the seven cases. They are bauxite and alumina to the U.S.A. and sugar and bauxite to the U.K.; however, in the case of bauxite to the U.K., the coefficients are not significant - an indication of multicollinearity.¹²

For the three significant cases, the exchange rate is significant only at an unusual 25 percent level in explaining the demand for bauxite and alumina by the U.S.A., the elasticities being -0.22 and -1.39 respectively. Price is significant in the cases of exports of sugar and bauxite to the U.K., while income is significant in the exports of alumina to the U.S.A. The export of sugar to the U.S.A. is indicated by a negative income elasticity; this could be explained in the rapid downward trend in the volume of sugar exported to the U.S.A. during the period.

A possible reason for the model to be unsatisfactory in some cases is that quantities and prices of some of these export items, namely sugar and banana are determined mainly by international agreement; as such it is possible that some variables in our model become insignificant.

We present a summary of the main aspects of our results:

- (a) The price elasticities of the demand for imports and for exports are less than one and insignificant in most cases.
- (b) The income elasticities of the demand for imports and for exports are insignificant and in most cases have the "wrong" sign.

- (c) Foreign Reserves is significant in explaining the demand for Consumer Durables, Capital Goods and Consumer Non-Durables with the elasticities of 0.49, 0.41 and 0.25, respectively. Note that the values are less than one.
- (d) Foreign exchange affects significantly our demand for Raw Materials with an elasticity of -0.31; and the demand by the U.S.A. for bauxite and alumina with elasticities -0.22 and -1.39 respectively.
- Note the inelasticity of the foreign exchange coefficients.

VI SUMMARY AND CONCLUSION

During the 1970's, a series of exchange rate adjustments (devaluation) were implemented to correct the external imbalance in the Jamaican economy. This paper analyses the effects of devaluation. We estimate import and export demand functions with the exchange rate as one of the dependent variables to examine the responsiveness of the volumes of imports and exports.

Our results reveal that the exchange rate is significant only in explaining the volume of raw materials imported, but with an elasticity far less than one, -0.31 (which means every 1% increase in the price of foreign currency (US\$) will cause the volume of imports to drop by 0.31). The value of raw materials as a percentage of total imports over the period was 43% or \$263.5 million in 1973, 49% or \$494.0 million in 1974, 62% or \$577.1 million in 1978.

On the export side, the foreign exchange is significant in determining the volume of bauxite and alumina exported to the U.S.A. with elasticities of -0.22 and -1.39 respectively (which translates to mean that a percentage drop in the price of the J\$ abroad causes the demand for bauxite to increase by only 0.22% and alumina by 1.39%. The value of the exports of bauxite and alumina as a percentage of total exports was 43% in 1976 (or \$120.8 million), 28% in 1975 (or \$213.9 million) and 45% in 1977 (or \$276.3 million).

Considering the low value of the foreign exchange elasticity for both import and export demand, and, the share of the value of total imports and exports affected by the significance of exchange rates, there is some doubt over the effectiveness of devaluation, ceteris paribus. Even when viewed from the elasticity approach, the low and insignificant price elasticities of import and export demand render devaluation, an ineffective policy instrument.

During this period also, both foreign exchange and import regulations became effective. To analyse the impact of this policy, we include foreign reserves as an independent variable also in our import demand equation. The results indicate that reserves were significant in explaining the behaviour of important categories of imports, however, with elasticities less than one.

FOOTNOTES

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For the proof, see Kindleberger and Lindert, op. cit. Appendix H.

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