Government Imports and Import Taxes in Monetary Analysis of Income and Imports

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THIS NOTE treats government imports and import taxes as additional autonomous variables in the "Polak" model of monetary analysis of income and imports,[1] and then applies the model to explain the imports of a selected country, Ceylon. It also evaluates the direct and induced impact of a government's financial operations on imports, and uses the example to illustrate the use of the Polak model as a predictive tool for framing contracyclical fiscal and monetary policy in countries dependent upon primary products.

I. Government Imports and Import Taxes as Autonomous Variables

The impact of governmental operations on imports is felt in three ways. Firstly, the government imports goods and services for its own use, as part of its general expenditure. Secondly, import taxes and subsidies affect import prices to domestic consumers and thus the competitiveness of imports with domestic products, which in turn affects import volumes and values. The effect on imports of this competitiveness factor will depend on the elasticity of substitution of import goods for domestic goods. If the market prices of import goods are changed by an amount equal to the import tax or subsidy, and the foreign supply price of imports and the prices of domestic goods remain unchanged, then, if an elasticity of substitution of unity is assumed, the import outlay will be changed by an amount equal to the total import tax collected or subsidy paid. This price substitution effect is likely to be felt without a time lag, so that im-

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[1] J. J. Polak, "Monetary Analysis of Income Formation and Payments Problems," *Staff Papers*, Vol. VI (1957-58), pp. 1-50; J. J. Polak and Lorette Boissonneault, "Monetary Analysis of Income and Imports and Its Statistical Application," *Staff Papers*, Vol. VII (1959-60), pp. 349-415.

ports are changed by an amount equal to the import tax collected in the same time period—and not over a period of time. In contrast, the import effect induced by the primary change in the private sector's income stream caused by a bank-financed government deficit is felt with a time lag and not entirely in the time period in which the deficit occurred. This last is the third kind of import effect of government operations.[2]

Of the three kinds of import effect, only the third, viz., the changes in imports induced by the primary and secondary changes in the gross national product caused by government financial operations, can clearly be considered a function of the gross national product (GNP) which fits into the Polak explanatory model. In terms of the Polak model, this induced effect on imports is determined by the income velocity of money, and the ratio of imports to income, both assumed to be stable. The existence of government imports, including imports caused by changes in import taxes and subsidies, has two implications for the model. Firstly, it means that only actual imports less government imports (i.e., "adjusted imports") are explainable through the model. Secondly, the import ratio relevant to the model is the ratio of adjusted imports to GNP. Table 1 shows that when adjusted imports are substituted for actual imports in the computations for Ceylon made by Polak and Boissonneault[3] there is an improvement in the correlation between GNP and (adjusted) imports, as well as in the variability of the (adjusted) import/GNP ratio. For the 11 years, 1948-58, GNP showed a correlation coefficient of +.93 with adjusted imports, compared with a coefficient of +.87 with total imports. Also, as shown in Table 1, for the period 1948-57 the total of deviations (ignoring signs) of annual imports from the estimates on the basis of a constant average (or marginal) import/GNP ratio (i.e., *MA* in Table 1) is reduced by 38 per cent when the ratio used is that of adjusted imports to GNP rather than that of total imports to GNP. The annual values of *MA* based on the two import ratios are compared in Chart 1.

[2] The distinction between government expenditures on domestic and on foreign goods and services (i.e., between the first and third of the effects classified) would not be necessary if any "inflationary" budget deficits caused by either type of expenditure produced an equal and immediate increase in imports. This will almost never occur, since domestic expenditures financed through bank credit will cause an increase in imports only with a time lag, depending basically, according to the Polak model, on the prevailing import/income ratio and the income velocity of money. Likewise, the distinction between government tax receipts (or subsidies) based on imports and other net tax receipts is made here because their impact on imports, insofar as they reduce (or enlarge) bank-financed budget deficits, will be felt differently over time.

[3] *Op. cit.*, p. 380.

TABLE 1. CEYLON: BASIC DATA[1]

	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
1. X	1,089	1,177	1,520	1,857	1,530	1,672	1,876	2,037	1,919	1,832	1,875	1,990	2,200[2]
2. C_p	55	−44	27	2	82	−52	−48	−77	−47	−83	−39	−3	−50[2]
3. C_g	....	....	....	....	....	14	96	26	33	40	25	24	
4. M	1,072	1,189	1,382	1,767	1,976	1,844	1,590	1,722	1,856	2,006	2,010	2,198	
5. MA_g[3]	−23	−53	−53	14	127	24	−102	−94	−32	3	21	−18	
6. $MI(4-5)$	1,095	1,242	1,435	1,753	1,849	1,820	1,692	1,816	1,888	2,009	2,031	2,216	
7. ΔR_p	78	1	145	68	−373	−133	345	202	20	−210	−66	−153	
8. ΔR_g[4]	−6	−57	20	24	9	−77	−11	62	29	−7	−82	−34	
9. MO	607	649	911	1,006	896	827	957	1,073	1,127	1,040	1,077	1,180	
10. ΔMO	45	42	262	95	−110	−69	130	116	54	−87	37	103	
11. ΔDA_p	−22	26	5	38	−17	9	−24	−3	41	3	8	−95	
12. ΔDA_g	−11	15	112	−11	280	55	−191	−83	−7	120	95	351	
13. Y[5]	2,768	3,048	4,116	4,753	4,493	4,679	4,951	5,547	5,088	5,331	5,623	5,996	
14. $G(=12-5+3-8)$	17	125	145	−49	144	122	18	−25	29	163	181	427	
15. $Q(1+2+11+14)$	1,139	1,284	1,697	1,848	1,739	1,751	1,822	1,932	1,942	1,915	2,026	2,322	
16. MI/Y	39.6	40.7	34.9	36.9	41.3	38.9	34.2	32.7	37.1	37.7	36.1	37.0	
17. Y/MO	4.79	5.52	4.87	4.59	5.12	5.82	5.48	4.96	4.62	5.27			
18. $-MA$	46	−15	118	−5	−180	−94	117	175	−37	−84	−16		
19. V		90	−95	−58	103	114	−45	−103	−75	139			

(1) $M = 294 + .306Y$ (1948–58) (2) $Y = 5.10MO$ (1948–57)

	t	$t-1$	$t-2$	$t-3$
Import Coefficients	0.53	0.35	0.09	0.03
Income Coefficients[6]	1.73	1.14	0.29	0.10

[1] For a summary of symbols, see text footnote 6. For a detailed explanation of the basis on which the monetary and balance of payments data were compiled, see J. J. Polak and Lorette Boissonneault, "Monetary Analysis of Income and Imports and Its Statistical Application," *Staff Papers*, Vol. VII (1959–60), pp. 349–415. Except for ratios, figures are in millions of rupees.

[2] Assumed.

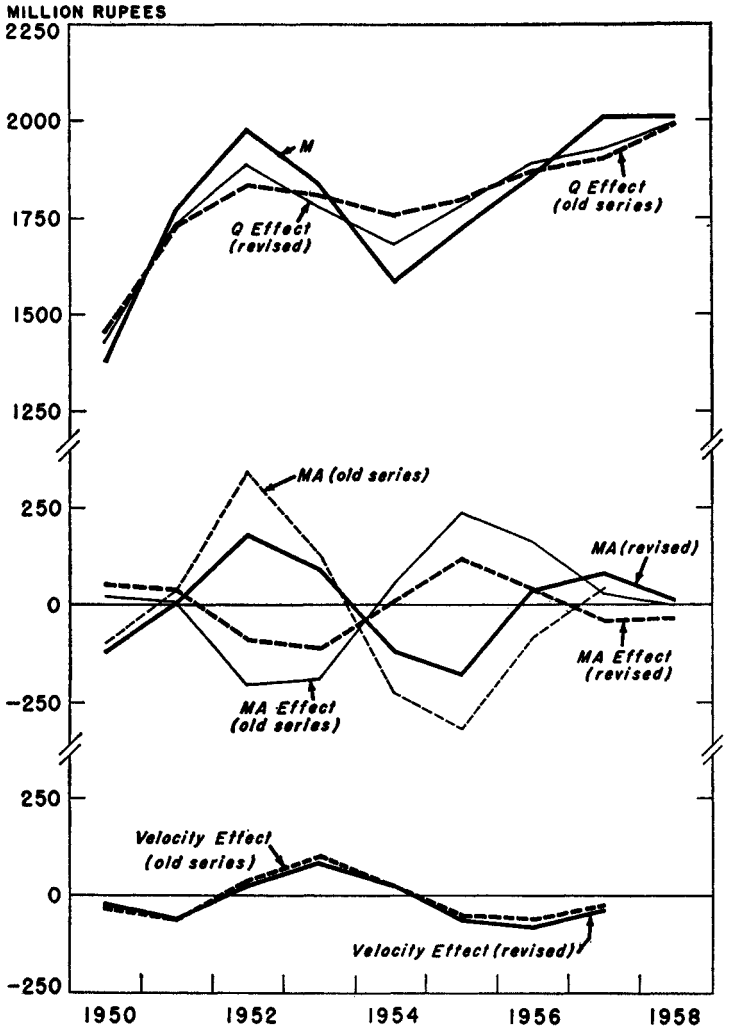
[3] See Table 4.

[4] Including balance in the payments agreement with China (Mainland).

[5] GNP figures have been revised since they were quoted in Polak and Boissonneault, *op. cit.*, p. 380. See International Monetary Fund, *International Financial Statistics*.

[6] The income coefficients are the ratios of the induced change in money income, in each period, to the primary change in money income in period t. Since the import ratio $\left(\frac{M}{Y}\right)$ is assumed constant, the income coefficient is a constant multiple (equal to the inverse of the import ratio) of the import coefficient.

CHART 1.



In estimating the import effect of changes in import taxes and subsidies, a unit elasticity of demand for imports has been assumed. Such a simplifying assumption is implicit in the Polak model.[4] In the present note it follows that, for years when there were net receipts from import taxes, it is assumed that imports were reduced by the same amount, by the price substitution effect; and, for years when there was a net import subsidy, as a result of the large subsidy on imported rice, it is assumed that the price change brought about an increase in imports of the same amount as the net subsidy.[5]

II. Income-Induced Import Effect of Government Operations

The induced effect of government operations on imports, explained by the model, depends on the net primary addition to the income stream (G), and on import coefficients derived from the average income velocity of money and the average (or marginal) ratio of adjusted imports to GNP.[6]

[4] J. J. Polak, *op. cit.*, p. 17. The unit elasticity of substitution refers to the substitution of imported goods for domestic goods, defined by Polak as both the substitution effect in the narrow sense and the income effect of price changes. It could perhaps be argued that only the substitution effect in the narrow sense caused by relative price changes will cause an immediate impact on imports, while the income effect will be felt only with a time lag. However, no allowance is made for this factor in the computation presented in this note.

[5] Government finance data are available only by financial years, October-September; the calendar year figures for import subsidy and tax are estimates obtained by averaging.

[6] It may be useful to summarize the symbols used in this paper:

a = Import coefficient.
C = Net capital receipts from abroad ($= C_g + C_p$).
C_g = Net capital receipts of the government.
C_p = Net private capital receipts.
ΔDA = Total net bank credit ($= \Delta DA_g + \Delta DA_p$).
ΔDA_g = Net bank credit to the government.
ΔDA_p = Net bank credit to the private sector.
G = Net primary impact on income of government operations $\{= \Delta DA_g - (MA_g + \Delta R_g - C_g)\}$.
k = Inverse of income velocity $\left(\frac{Y}{MO}\right)$.
M = Total imports ($= MA + MI$).
MA = Autonomous imports ($= MA_g + MA_p$).
MA_g = Autonomous government imports.
MA_p = Autonomous private imports (associated principally in this paper with the impact of quantitative import restrictions).
MI = Income-induced imports.
ΔMO = Change in money supply ($= \Delta DA + \Delta R_p$).
o (as suffix) = Base year.

The net primary impact on income caused by government operations (G) is equal to the net bank credit to government when, and only when, the government does not directly enter into any foreign transactions. Net bank credit to government is then equal to the excess of government purchases of goods and services over net current transfers from the nonbank public to the government, including those arising from purchases of claims on government.[7] When the government engages directly in external transactions, G becomes equal to the net bank credit to government *less* the excess of government payments for direct imports of goods and services over its external receipts from net grants and loans and from the running down of its own external reserves. If, as a further step, the government influences the country's import payments indirectly, by manipulating import taxes and subsidies, then (given unit elasticity of demand for imports) such taxes and subsidies will have the same effect as the reduction of, or addition to, the government's direct import expenditure by the same amount. Then G becomes equal to the net bank credit to government *less* the excess of the government's external payments (direct as well as through net import subsidies) over its external receipts.

Defined thus, the primary impact on income of government operations, G, will be as follows:

$$G = \Delta DA_g - (MA_g - C_g + \Delta R_g), \tag{1}$$

where ΔDA_g is net bank credit to government, MA_g is the total autonomous import effect caused by direct imports as well as by net import subsidies, C_g is net government capital receipts, and ΔR_g is the change in government-held external reserves.

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p = Price level.
Q = Net primary impact on income of governmental and private operations ($= X + C_p + \Delta DA_p + G$).
ΔR = Net change in reserves ($= \Delta R_g + \Delta R_p$).
ΔR_g = Net change in foreign assets of the government.
ΔR_p = Net change in foreign assets of the banking system.
t = Year to which coefficients relate.
V = Autonomous change in MO resulting from fluctuations in income velocity $\left(\frac{Y}{MO}\right)$.
X = Export receipts.
Y = GNP.
YI = Induced GNP.
y = Production in real terms.

[7] Thus nonbank purchases of government securities financed by bank advances will be counted as part of net bank credit to the private sector.

The total primary impact on income, Q, is as follows:

$$Q = X + C_p + \Delta DA_p + G,$$

where X represents receipts from exports, C_p net private capital receipts from abroad, and ΔDA_p net bank credit to the private sector.[8]

Substituting for G from equation (1), we have

$$Q = X + C + \Delta DA - MA_g - \Delta R_g. \quad \ldots \quad (2)$$

In Table 1, G and Q have been computed on this basis for Ceylon.[9] In Table 2, the imports induced by Q have been computed by applying the import coefficient derived from the marginal import ratio (the ratio of nonautonomous imports, MI, to GNP) and average income velocity. To derive the total of computed imports, total autonomous imports caused by government operations have been added to the computed "induced" imports. For purposes of comparison, Table 3 gives the computed imports derived on the original basis, viz., using the total primary increase in income unadjusted for MA_g and ΔR_g and the ratio of total imports to GNP, but with the same figure for average income velocity. The total (ignoring signs) of unexplained imports in Table 2 is about a quarter less than that in Table 3. However, as may be seen from Chart 1, the reduction is more marked in years when large unexplained imports are revealed in Table 3.

Table 4 summarizes the total impact of government-financed operations on imports. It shows separately the government autonomous and induced imports, each of which has a distinct significance for contracyclical fiscal policy, as will be shown in the following section.

[8] In Ceylon (and some other sterling area countries, at least), the government and official nonbanking institutions hold foreign reserves which have undergone substantial changes in some years (see Table 1). To the extent that this is true, the change in money supply (ΔMO) is equal to the total of changes in net domestic credit creation (ΔDA) and in foreign assets of the banking system (ΔR_p); and the total primary increase in income, even if there were no autonomous imports, is equal to

$$(X + C + \Delta DA - \Delta R_g).$$

[9] The data on direct government imports for the earlier years were taken from Peter Newman, *Studies in the Import Structure of Ceylon* (Planning Secretariat, Colombo, 1958). Similar data are currently included in the *Ceylon Customs Returns* (Customs Department, Colombo). The data on import taxes and subsidies were taken from government finance statistics; government capital receipts and external reserves, from balance of payments statistics; and net credit to government, from banking statistics. Figures of private capital receipts (C_p), changes in banks' external reserves (ΔR_p), and net bank credit to the private sector (ΔDA_p) were derived as residuals by subtracting the values of government operations from the respective totals as used by Polak and Boissonneault, *op. cit.*, p. 380.

TABLE 2. CEYLON: COMPUTED IMPORTS[1]

(In millions of rupees)

	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Q	1,139	1,284	1,697	1,848	1,739	1,751	1,822	1,932	1,942	1,915	2,026	2,322	
0.53 Q_t	604	680	899	979	922	928	966	1,024	1,029	1,015	1,074	1,231	
0.35 Q_{t-1}		399	449	594	647	609	613	638	676	680	670	709	813
0.09 Q_{t-2}			102	115	153	166	156	157	164	174	175	172	182
0.03 Q_{t-3}			30[2]	34	38	51	55	52	52	55	58	59	57
Computed induced imports[3]			1,480	1,722	1,760	1,754	1,790	1,871	1,921	1,924	1,977	2,171	
Autonomous government imports (MA_g)		−53	−53	14	127	24	−102	−94	−32	3	21	−18	
Total computed imports			1,427	1,736	1,887	1,778	1,688	1,777	1,889	1,927	1,998	2,153	
Total actual imports (M)			1,382	1,767	1,976	1,844	1,590	1,722	1,856	2,006	2,010	2,198	
Unexplained imports			−45	31	89	66	−98	−55	−33	79	12	45	

[1] For summary of symbols, see text footnote 6.
[2] Estimate.
[3] Total of $a_tQ_t + a_{t-1}Q_{t-1} + a_{t-2}Q_{t-2} + a_{t-3}Q_{t-3}$.

TABLE 3. CEYLON: COMPUTED IMPORTS, ORIGINAL SERIES[1]

(In millions of rupees)

	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Q	1,117	1,231	1,644	1,862	1,866	1,775	1,728	1,838	1,910	1,919	2,047
0.57 Q_t	637	702	937	1,061	1,064	1,012	984	1,048	1,089	1,094	1,167
0.34 Q_{t-1}		380	418	559	633	634	603	587	625	645	652
0.07 Q_{t-2}			78	86	115	130	131	124	121	129	134
0.02 Q_{t-3}			20[2]	22	25	33	37	37	36	35	37
Total computed imports			1,453	1,728	1,837	1,809	1,755	1,796	1,871	1,903	1,990
Total actual imports (M)			1,382	1,767	1,976	1,844	1,590	1,722	1,856	2,006	2,010
Unexplained imports			−71	39	139	35	−165	−74	−15	103	20
$-MA$	−62	−76	95	−39	−338	−132	223	315	83	−42	....
V		82	−98	−52	106	116	−44	−83	−51	....	....

(1) $M = .364Y$ (1948–57) (2) $Y = 5.16MO$ (1949–56)

[1] Based on statistics published in J. J. Polak and Lorette Boissonneault, "Monetary Analysis of Income and Imports and Its Statistical Application," *Staff Papers*, Vol. VII (1959–60), p. 380.
[2] Estimate.

TABLE 4. CEYLON: GOVERNMENT IMPORTS AND IMPORT EFFECT OF GOVERNMENT OPERATIONS[1]

(In millions of rupees)

	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
I. Autonomous government imports (MA_g)												
1. Merchandise imports[2]	56	53	55	68	130	136	96	115	130	152	160	148
2. Services[3]	25	25	39	34	37	39	40	36	44	45	46	48
3. Food subsidies[5]	75	51	60	161	218	98	9	20	85	107	114	158
4. Import taxes	178	182	207	249	258	249	247	265	291	301	299	372
5. Lines 1 plus 2 plus 3 minus 4	−23	−53	−53	14	127	24	−102	−94	−32	3	21	−18
II. G	17	125	145	−49	144	122	18	−25	29	163	181	427
0.53 G_t	9	66	77	−26	76	65	9	−13	15	86	96	226
0.35 G_{t-1}		6	44	51	−17	50	43	6	−9	10	57	63
0.09 G_{t-2}			2	11	13	−4	13	11	2	−2	3	15
0.03 G_{t-3}				1	4	4	−1	4	4	1	−1	1
Government income-induced imports			123	37	76	115	64	8	12	95	155	305
III. Total import effect of government operations			70	51	203	139	−38	−86	−20	98	176	287

[1] For summary of symbols, see text footnote 6.
[2] Based on data from Peter Newman, *Studies in the Import Structure of Ceylon* (Planning Secretariat, Colombo, 1958), p. 15.
[3] Including estimated interest payments.
[4] Estimate.
[5] Derived from *Accounts of the Government of Ceylon* (Colombo).

III. The Polak Model as a Predictive Tool for Monetary and Fiscal Policy

The cyclical problem in countries dependent upon primary products is caused by fluctuations in export earnings (X) and in private capital flows from abroad (C_p). The objective of contracyclical monetary and fiscal policies in such countries is, therefore, to achieve some stability in the domestic money supply, in prices, and in imports. In terms of the model, the policy objective may be defined as the achievement of a target rate of growth in money supply (MO), imports (M), and external reserves (R), either individually or together, in the face of given fluctuations in private external receipts ($X+C_p$).

Let us assume that the target is a certain percentage increase in the money supply for the next year[10] determined by the projected growth in real production (y) and a permissible percentage change in the price level (p) during the year, as income velocity remains unchanged. The target change in MO in absolute terms may be determined through the following equation, derived (ignoring cross products) from the equation of exchange, $MO = ypk$, where k is the inverse of income velocity:[11]

$$\Delta MO = \frac{\Delta y}{y} MO_o + \frac{\Delta p}{p} MO_o + \frac{\Delta k}{k} MO_o. \tag{3}$$

If a second identity, i.e., $\Delta MO = \Delta DA + \Delta R_p$, is used, the following can be derived:[12]

$$\Delta MO = \Delta DA + (X + C_p) - (MA_g + \Delta R_g - C_g) - MI \ . \ . \ . \ . \tag{4}$$

$(X + C_p)$ is the projected total of private external receipts, and

[10] The estimates of $(X + C_p)$ and real income and price changes may be reviewed at intervals (e.g., quarterly) as the year progresses, and the magnitudes of the target and policy variables changed, if necessary.

[11] If income velocity is constant, $\frac{\Delta k}{k} MO_o$ in equation (3) will obviously be equal to zero. If, however, a change in the income velocity is anticipated, then an offsetting change in the target money supply can be allowed for, through the equation of exchange.

[12] $\Delta MO = \Delta DA + \Delta R_p$
$= \Delta DA + \Delta R - \Delta R_g$
$= \Delta DA + (X + C - M) - \Delta R_g$
$= \Delta DA + (X + C_p + C_g - MI - MA_g) - \Delta R_g$
$= \Delta DA + (X + C_p) - (MA_g + \Delta R_g - C_g) - MI.$

This equation assumes MA_p to be nil or negligible. If, on the other hand, there are quantitative import restrictions, then the equation will have to be altered (as in equations 11, 12, and 13 of the text) to include MA_p and would then read as follows:

$$\Delta MO = \Delta DA + (X + C_p) - (MA_g + MA_p + \Delta R_g - C_g) - MI.$$

($\Delta DA_p + \Delta DA_g$) and ($MA_g + \Delta R_g - C_g$) are the policy variables with which a level of induced imports (MI) that will result in the target value of MO, may be produced. According to the Polak model, MI in the current period t reflects the total primary impact on income (Q) in the current and past periods, and the import coefficient a (derived from the assumed constant GNP/nonautonomous import ratio and the average income velocity of money). Thus, when the definition of Q in equation (2) is used,

$$MI_t = a_t(X + C_p + \Delta DA - MA_g + C_g - \Delta R_g)_t + a_{t-1}(Q)_{t-1} + a_{t-2}(Q)_{t-2} + \ldots . \quad (5)$$

Therefore, from equations (4) and (5),

$$\begin{aligned}\Delta MO &= (X + C_p + \Delta DA - MA_g + C_g - \Delta R_g)_t - a_t(X + C_p + \Delta DA - MA_g + C_g - \Delta R_g)_t \\ &\quad - [a_{t-1}(Q)_{t-1} + a_{t-2}(Q)_{t-2} + \ldots] \\ &= (X + C_p)_t(1 - a_t) + (\Delta DA_p + \Delta DA_g)_t(1 - a_t) - (MA_g + \Delta R_g - C_g)_t(1 - a_t) \\ &\quad - [a_{t-1}(Q)_{t-1} + a_{t-2}(Q)_{t-2} + \ldots] \ldots . \quad (6)\end{aligned}$$

Of this last equation the import coefficients, a, a_{t-1}, a_{t-2}, a_{t-3}, . . ., based on the assumed constant import ratio and income velocity, are known in advance. For example, for Ceylon, as given in Table 1, they are 0.53, 0.35, 0.09, and 0.03, respectively. Q_{t-1}, Q_{t-2} . . ., being based on banking and balance of payments records, are also likely to be known as soon as each period is over, and are therefore part of the given data on which the policy decision can be made. The third component of the given data is the estimate of ($X + C_p$) during the ensuing year. With these data available, the total magnitude of the policy variables ΔDA and ($MA_g + \Delta R_g - C_g$) appropriate for a target ΔMO can be easily determined with the help of equation (6). The allocation of this total magnitude between ΔDA and ($MA_g + \Delta R_g - C_g$) is a second policy decision on which will depend ΔR_p, as will be seen from the following equation, derived from equation (4):

$$\Delta R_p = (X + C_p) - (MA_g + \Delta R_g - C_g) - MI.$$

Substituting for MI from equation (5) and rearranging, we derive

$$\begin{aligned}\Delta R_p &= (X + C_p)_t(1 - a_t) - (MA_g + \Delta R_g - C_g)_t(1 - a_t) - (\Delta DA)_t a_t \\ &\quad - [a_{t-1}(Q)_{t-1} + a_{t-2}(Q)_{t-2} + \ldots] \ldots . \quad (7)\end{aligned}$$

It also follows from equation (7) that, if the target variable were ΔR_p, the appropriate magnitude of either policy variable, ΔDA or ($MA_g + \Delta R_g - C_g$), may be determined only when the other is part of the given data. Since ($MA_g + \Delta R_g - C_g$) is more a function of government expenditure programs for the following year, a plausible assumption is that it is also known in advance. Then the magnitude

of the only policy variable, ΔDA, needed for a target ΔR_p is easily determined from equation (7).

In the statement below, the two equations are applied to Ceylon for the purpose of forecasting the amount of domestic credit creation in 1960 that would be appropriate for different target changes in money supply and external reserves respectively, on the assumption that (1) the forecast of $(X + C_p)$ for the year is Rs 2,150 million, and (2) the estimate of $(MA_g + \Delta R_g - C_g)$ for 1960 is minus Rs 55 million.[13]

Given data	$(X + C_p) - (MA_g + \Delta R_g - C_g)$	2,205	2,205	2,205	2,205	2,205
Target variable	ΔMO	−50	−25	0	+25	+50
Policy variable	ΔDA	−72	−19	34	87	140
By-product	ΔR_g	22	−6	−34	−62	−90
	MI	2,183	2,211	2,239	2,267	2,295
	YI	6,177	6,268	6,360	6,452	6,543
Target variable	ΔR_g	−50	−25	0	+25	+50
Policy variable	ΔDA	63	16	−31	−78	−125
By-product	ΔMO	13	−9	−31	−53	−75
	MI	2,255	2,230	2,205	2,180	2,155
	YI	6,412	6,330	6,248	6,166	6,084

Tables 5 and 6 apply equations (6) and (7) for the years 1948-59 to explain the observed changes in MO and in R_p in terms of the actual $(X+C_p)$ and $(MA_g + \Delta R_g - C_g)$, considered as the given data, and the actual ΔDA, considered as the policy variable.

It is clear that often the domestic credit creation associated with a target ΔMO may produce an unacceptable ΔR_p (and imports), and vice versa. If credit creation is the sole policy variable, then the best that can be done is to fix it at such a level as to achieve the best combination of ΔR_p and ΔMO. If, however, a second policy variable, e.g., $(MA_g + \Delta R_g - C_g)$, is available, then target changes in R_p and MO may be aimed at simultaneously. Thus in the above tabulations, if both an increase in MO of 50 and an increase in R_p of 25 are aimed at for 1960, the appropriate magnitudes of the two policy variables, ΔDA and $(MA_g + \Delta R_g - C_g)$ will be +25 and −170, respectively, obtained by solving the following simultaneous equations, derived in turn from equations (6) and (7), respectively:

$$\Delta MO = 50 = 0.47[2{,}150^{14} - (MA_g + \Delta R_g - C_g) + \Delta DA] - 1{,}052;^{15} \quad (8)$$

$$\Delta R_p = 25 = 0.47[2{,}150 - (MA_g + \Delta R_g - C_g)] - 0.53\Delta DA - 1{,}052. \quad (9)$$

[13] This paper was prepared early in 1960, which accounts for the fact that the 1960 data are forecasts.

[14] $(X + C_p)$; see Table 1, column for 1960.

[15] $[a_{t-1}(Q)_{t-1} + a_{t-2}(Q)_{t-2} + \ldots]$; see Table 2, column for 1960.

TABLE 5. CEYLON: APPLICATION OF THE POLAK MODEL WITH TARGET ΔMO

$$\Delta MO = (1-a_t)[(X+C_p)-(MA_g+\Delta R_g-C_g)+\Delta DA]_t-[a_{t-1}(Q)_{t-1}+a_{t-2}(Q)_{t-2}+\ldots\ldots]^1$$

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
GIVEN DATA										
1. Table 6, line 6	162	113	−144	−38	133	101	6	−66	1	29
POLICY VARIABLE										
2. ΔDA	117	27	263	64	−215	−86	34	123	103	256
3. Line 2 × $(1-a_t)$	55	13	124	30	−101	−40	16	58	48	120
TARGET VARIABLE										
4. ΔMO (line 1 plus line 3)	217	126	−20	−8	32	61	22	−8	49	149
5. Unexplained imports (Table 2)	−45	31	89	66	−98	−55	−33	79	12	45
6. Actual ΔMO (line 4 minus line 5)	262	95	−109	−74	130	116	55	−87	37	104

[1] See equation (6), p. 422. Data are in millions of rupees.

TABLE 6. CEYLON: APPLICATION OF THE POLAK MODEL WITH TARGET ΔR_p

$$\Delta R_p = (1-a_t)[(X+C_p)-(MA_g+\Delta R_g-C_g)]_t-a_t(\Delta DA_t)-[a_{t-1}(Q)_{t-1}+a_{t-2}(Q)_{t-2}+\ldots]^1$$

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
GIVEN DATA										
1. $(X+C_p)$	1,547	1,859	1,612	1,610	1,828	1,960	1,872	1,749	1,837	1,987
2. $(MA+\Delta R_g-C_g)$	−33	38	136	−67	−209	−58	−36	−44	−86	−76
3. Line 1 minus line 2	1,580	1,821	1,476	1,677	2,037	2,018	1,908	1,793	1,923	2,063
4. Line 3 × $(1-a_t)$	743	856	694	788	957	948	898	843	904	969
5. $[(a_{t-1}(Q)_{t-1})+(a_{t-2}(Q)_{t-2})+(a_{t-3}(Q)_{t-3})]$	581	743	838	826	824	847	892	909	903	940
6. Line 4 minus line 5	162	113	−144	−38	133	101	6	−66	1	29
POLICY VARIABLE										
7. ΔDA	117	27	263	64	−215	−86	34	123	103	256
8. Line 7 × a_t	62	14	139	34	−114	−45	18	65	54	136
TARGET VARIABLE										
9. ΔR_p (line 6 minus line 8)	100	99	−283	−72	247	146	−12	−131	−53	−107
10. Unexplained imports (Table 2)	−45	31	89	66	−98	−55	−33	79	12	45
11. Actual ΔR_p (line 9 minus line 10)	145	68	−372	−138	345	201	21	−210	−65	−152

[1] See equation (7), p. 422. Data are in millions of rupees.

$(MA_g + \Delta R_g - C_g)$ is a composite variable, and a change in its magnitude may be achieved by changing any one or all of its component parts. Thus, to change it from –55 to –170, government's autonomous imports may be reduced and $(C_g - \Delta R_g)$ may be increased.

The induced imports, MI, associated with ΔDA and $(MA_g + \Delta R_g - C_g)$ of +25 and –170 may be easily ascertained by applying equation (5):

$$MI = a_t[(X + C_p)_t + \Delta DA_t - (MA_g + \Delta R_g - C_g)_t] + [a_{t-1}(Q)_{t-1} + a_{t-2}(Q)_{t-2} + \ldots]$$
$$= 0.53[2{,}150 + 170 + 25] + 1{,}052 = 2{,}295.$$

It should be remembered that total imports, M, are equal to the sum of autonomous and induced imports:

$$M = MI + MA. \tag{10}$$

If a particular target for total imports, e.g., 2,200, is aimed at, jointly with a target of +50 for MO and +25 for R_p, a third policy variable, like import restrictions, would be needed. Such restrictions and changes in them would influence total autonomous imports, MA, of which MA_g would be a part. Autonomous imports (government or others) can be treated in the model as reducing the primary increase in money income,[16] Q, caused by the other autonomous variables in the model, viz., exports, capital receipts, and credit creation and changes in government's external reserves. Thus, the three equations may be written as follows:

$$\Delta MO = 50 = 0.47[2{,}150 - MA - (\Delta R_g - C_g) + \Delta DA] - 1{,}052; \tag{11}$$
$$\Delta R_p = 25 = 0.47[2{,}150 - MA - (\Delta R_g - C_g)] - 0.53\Delta DA - 1{,}052; \tag{12}$$
$$M = 2{,}200 = 0.53[2{,}150 - MA - (\Delta R_g - C_g) + \Delta DA] + 1{,}052 + MA. \tag{13}$$

Solving these equations gives for the three policy variables, ΔDA, MA, and $(\Delta R_g - C_g)$, the values of +25, –95, and –75, respectively. If these magnitudes for the policy variables are not acceptable or practical, then the target variables will need to be altered so as to produce an acceptable combination of the policy and target variables.

In most circumstances, however, a target ΔMO, determined on the basis of a projected rate of growth in the real product and the desired change in prices, together with a target ΔR_p, would be sufficient criteria for a compensatory fiscal and monetary policy in countries dependent on primary products. The necessary policy variables would therefore be only the net credit creation, ΔDA, and govern-

[16] See Polak and Boissonneault, *op. cit.*, p. 365. The GNP/nonautonomous import ratio is again assumed to be constant.

ment's deficit on its external transactions, $(MA_g + \Delta R_g - C_g)$. Other target variables, and as many policy variables, like import restrictions, price controls, etc., may be expected to be needed when there is a pronounced economic disequilibrium, resulting, for example, from inflation.

The fiscal policy variables in the model are two, namely, ΔDA_g and $(MA_g + \Delta R_g - C_g)$. There are other aspects of fiscal policy, e.g., its impact on import propensity, the distribution of income, and the demand for money, which do not fit into the simplified model in its present form, since this assumes a constant import ratio and income velocity. However, the very simplicity of the model, and the fact that the data on the limited number of variables involved are available without time lag, enhances its practical usefulness as a predictive tool.