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SOME MODELS OF FINANCIAL PLANNING*

INTRODUCTION:

There appears a considerable gap in current economic literature on models or schemes that link financial variables and real variables together in an integrated frame-work such that various inter-dependencies between these two sets of variables can be studied.

This is true of economic theory¹ and especially that branch of it which concerns the development of operational models that would be of use to the policy maker and economic planner.² Presumably the tradition that money and financial assets in general constitute some sort of Pigovian veil to be ripped apart in the study of structures that really matter dies hard. The rather widespread dereliction of financial assets can be attributed both to the ground rules of neo-classical economics which invariably postulates a well-equilibrated quantity-theoretic world as well as the concern of Keynesian economics with the determinants of the monetary rate of interest in its explanation of short-term income formation.

Questions that may ask for the quantitative implications of, say, a certain rate of credit creation on real economic variables such as gross domestic production or the quantitative effects of a certain rate of growth, for instance, on the level and composition of financial assets typically go begging for an answer. The development planner once he has carefully specified his targets

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and the volume of investments needed to meet them casts only a cursory glance at its financing and is more than satisfied if he can concoct a certain mix of taxes, public debt issues, foreign aid flows and credit-creation which gives rise to the magic total required.³

It is the contention of this paper that financial planning is as important as the planning of the real economy. The principles that would appear appropriate for the construction of financial planning models are briefly presented in Part II of this paper and illustrated in the form of a simple macro-economic model. Part I of this paper is devoted to an examination of a very interesting model constructed by J.J. Polak⁴ and which can under certain circumstances be used for a restricted variety of financial planning.

PART I

The Polak model provides a framework enabling a quantitative analysis of the effects of credit-creation on income in an open-economy setting. The basic postulate of the model consists of the Quantity theory of money identity - $MV=Y$. A theory of income-determination is worked into this identity by analogy with the development of multiplier analysis based on the ascription of a specific theory to the identity $Y = C + I$.

The model is briefly described as follows:

$$(1) MO(t) = R(t) + D(t)$$

The increase in the quantity of money equals the increase in net foreign assets (R) and in net domestic assets (D).

$$(2) R(t) = X(t) - M(t) + C(t)$$

or the balance of payments equation where

X = exports

M = imports

C = Capital movements

From (1) and (2) we obtain by substitution

$$(3) MC(t) = X(t) + C(t) - M(t) + D(t)$$

$$(4) M(t) = mY(t)$$

or the import function where m is the average propensity to import.

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$$(5) Y(t) = Y(t-1) + MC(t)$$

or the circular flow of income equation relating the period increase in income to an equivalent increase in money.

From (3), (4) and (5) we obtain by substitution

$$(6) Y(t) = \frac{X(t) + C(t) + D(t) + Y(t-1)}{1 + m}$$

In this model t refers to an income period which is the time taken by the stock of money to circulate once around the income circuit and is measured by the reciprocal of the velocity of circulation $\frac{1}{V}$.

What is to all appearances a simple model involves a rather deft use of economic concepts. The picture of the economy implied by these equations is, however, a simple one. Imagine a circular flow of income with one leak provided in the form of imports. Money bears a constant relation of proportionality to income which becomes one when income is measured over an income period. Credit-creation constitutes the sole exogenous variable of the model and is brought about by balance of payments surpluses as well as by domestic asset creation (e.g. advances). Increase the supply of credit and the standard quantity theory of money effects follow. Surplus money is disposed of which stimulates the economy and increases the income level resulting in greater imports which finally checks the rise. This is accomplished in such a manner, however, that the magnitude of V is maintained.

By considering income-periods the constancy of V can be easily allowed for if income-periods are taken of constant length. In any income period, the money stock in circulation and income are inextricably inter-twined. If we begin with equilibrium and postulate a permanent rise in exports then in tracing out the effects over each income period we would need to account for both the temporary increase in income that is dissipated by imports finally catching up with exports and that increase which is reflected by a permanent increase in foreign reserves brought about the lagged process in which imports do not instantaneously rise to the level of

exports but only after some income-periods have elapsed.

The distinction between credit-creation whether of the foreign or domestic variety and the actual rise in money-holdings is crucial and is sustainable by the import-leak. In a context where V can reasonably be assumed constant, the impact of a certain rate of credit creation on real variables or the requirements for credit creation imposed by a certain level of income can easily be established.

There are certain features of the model that restricts its generality and are to be traced to the assumption of a constant V . Given the circular flow of income process as expressed by equation (5) and the consequent requirement for a constant V the familiar Keynesian "gap" between the intentions of savers and those of investors can never arise since savings are instantaneously transmuted into investments. The designated exogenous variables which provide the only source of fluctuations in income, however, imply a fully-fledged debt-asset technology. Additional expenditure can only be financed through credit-creation which requires both an issuer and receiver of liabilities and thus implies a complete divorce between savers and investors. This constitutes an essential pre-condition for the emergence of the Keynesian "gap" which is bound to be activated when credit-creation is undertaken.

Since no mechanism is specified by Polak as to the bridging of this gap one has to assume that money constitutes the sole asset of the model so that it is only through its holding that potential conflicts between savers and investors can be resolved. This would impose a very serious constraint on the model. The holding of money performs the act of saving only once. In order to maintain a given level of investment even under conditions of steady state equilibrium the continuous creation of credit would be required and thus a declining V . When growth is provided for under normal capital-output ratios the requirement for savings exceeds in volume the increment in income that is brought about and if sole reliance is placed on money would imply a fractional V .

Were we to postulate financing through a wider range of assets then the possibility of leaks additional to those of imports must be

allowed for. This would, however, nullify the assumption of a constant V which permits the use of the circular flow of income device. If we were to assume internal financing in equilibrium supplemented by external financing to enable growth we would still be faced with a marginal V that is fractional when money is the sole asset.

The upshot of these remarks would be that we cannot simply assume a constant V but would need a theory that concerns the determination of V which is incorporated in the model. The approach adopted by Polak is both partial and extreme in that if V is subject to variation in the short-run to which the model is applied, the model breaks down. In the circumstances one would hesitate to accept the picture of causality taken as underlying the model since *ceteris* does not appear *paribus*.⁵

How then is one to explain the good "fit" obtained by Polak in the course of applying his model to a large number of countries? This may well be the result of a statistical illusion in the sense that all that is being tested for is the constancy of V . Movements in the net outstandings of domestic or foreign assets are related to movements in the money supply by way of an identity (equation 1). If the latter movements are taken as "caused" by pro-rata changes in domestic or foreign assets then to the extent that money holdings constitute a reasonably stable proportion of income a very close correspondence would be established between changes in these assets and changes in income. But even if no causality is assumed between changes in assets and in the liability - money - the same effects of correspondence would be present. The reasoning is circular.⁶ A proper test of the model would have been to take variations in these assets that cause money to depart from its constant relation to income and to then consider the manner in which money regains its equilibrium level. This, of course, is not possible when the model is applied to past data where the effects of credit creation have

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have worked themselves out so that only an equilibrium relation with money is obtainable.

We can, however, make projections⁷ with this model in the sense that we can trace out the implications of a certain rate of credit-creation on the net asset position of the issuing authority taking into account the import leak.⁸ On the assumption that V is a constant the process can be depicted in a manner such that V is preserved and the impact of credit creation on incomes thereby established. In a context where the paucity of data prevents even the fitting of the simple model presented in Part II the Polak Model can be of utility in tracing the logic of decisions regarding credit-creation and constitutes an important innovation in the integration of a financial asset in a real framework.

PART II

The inter-dependencies between the level and composition of financial assets and real economic variables are many and varied. This proposition can perhaps best be illustrated by considering a suitable sectoring of an economy which brings out the distribution of financial assets and liabilities.⁹ Thus we could sector an economy in the following manner:-

- (a) The Government Sector.
- (b) The Financial Sector.
- (c) The Foreign Trade Sector.
- (d) The Producing Sector.
- (e) The Consuming Sector.

For each of these sectors three separate sets of accounts can be presented viz. balance-sheet statements, income and product statements and flow of funds statements. The balance-sheet statement for each sector portrays the assets and liabilities of that sector and would naturally include financial assets and liabilities generated by the network of claims that arises in the course of economic activity between the sectors.

If the behaviour of sectors is taken to be subject to the same principles that govern the "rational economic man" then we may safely postulate reaction patterns on the part of these sectors directed towards the attainment of an optimum economic position involving both "stock" (i.e. balance-sheet) and "flow" (i.e. income and product) decisions. Sectors would aim at both a "desired" balance-sheet position as well as a "desired" level and pattern of current or income and product activity. These two desiderata would necessarily impinge on each other since in order to effect a certain stock position a number of flow decisions have also to be rendered and vice-versa. In this manner an intuitive justification can be provided for the proposition advanced earlier concerning the existence of inter-dependencies between financial variables on the one hand, which belong to the realm of stock decisions and real economic variables which involve both stock decisions (e.g. tangible assets) as well as flow decisions (e.g. investment, exports, etc.) on the other.

While financial assets can be unashamedly regarded in the same light as real economic goods they do preserve an important distinction. Whatever the multitude of reasons for which financial assets are held, on being purchased they constitute an act of saving since they release command over resources to the issuer. This is true whether the assets are merely held or circulated as long as they are not redeemed. Savings are, of course, only released once and new issues are called for in order to extract additional savings. Financial assets may or may not bear a price depending on the functions performed by them. Money functions both as a medium of exchange and as an easily convertible store of value which functions are deemed sufficiently worthwhile for no rate to be demanded in order to hold them, at any rate within certain ranges.

Financial transactions are performed in a manner analagous to those in real goods but affect the balance-sheet position

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of the decision-making unit unlike real transactions with the exception of those in physical capital and inventories. One can easily conceive for each financial asset schedules that relate quantities demanded or supplied to a number of real and financial variables e.g., income, the bond-rate etc. Such schedules are in principle feasible at all levels of aggregation as long as the distinction between issuer and holder is maintained, otherwise consolidation would wipe out financial assets leaving only tangibles and net worths (see footnote 9).

If we were to adopt a sectoring of the economy on the lines suggested earlier so that financial assets are preserved we could postulate for each of these sectors supply and demand schedules for financial assets. These schedules in conjunction with, and allowing for some interaction, the schedules governing real economic goods would normally, in a given institutional environment, call for equilibrating responses on the part of the sectors and the range of real and financial variables of the economy would be accordingly determined. What principles of sectoring are to be adopted is a matter of some discretion and concerns the purposes of the analysis as well as the availability of information. The sectoring adopted here is motivated by its convenience and suggestiveness.

Flow of funds statements and sectoral balance-sheet statements, especially the latter, are something of a novelty despite having been in existence for a few selected countries for a number of years. It seems that relatively little use has been made of these statements, least of all in the estimation of sectoral supply and demand schedules for financial assets. The quality of the data and its range may well be too limited to justify the application of sophisticated estimation procedures and any estimates to be obtained may be of questionable significance. Still, the apparent paucity of estimates does occasion some surprise.¹⁰

The model which is presented here purely for illustrative purposes is describable by the following set of linear

equations:-

$$F^* = aW - bC - gT + hi \quad (1)$$

$$W(1-a) - C(1-b) - T(1-g) + i(1-h) = 0 \quad (2)$$

$$B^* = I - P + i \quad (3)$$

$$A^* = B^* + R^* + D^* \quad (4)$$

$$F^* = A^* \quad (5)$$

$$C = cY \quad (6)$$

$$I = kY + j \quad (7)$$

$$\bar{W} = wY \quad (8)$$

$$P = pY \quad (9)$$

$$R^* = X - M \quad (10)$$

$$M = mY \quad (11)$$

$$G = T + D^* \quad (12)$$

Explanation of Variables:

F^* = Incremental demand for all financial assets

W = Total wage payments

C = Total consumption

T = Taxes

i = Interest payments on outstanding issues of bonds

B^* = Supply of bonds

I = Investment

P = Profits

A^* = Total supply of financial assets

R^* = Changes in foreign reserves

D^* = Changes in the public debt

M = Imports

X = Exports

G = Government expenditure

Equation (1) represents the incremental demand for all financial assets on the part of the consuming sector. Equation (2) represents the budget constraint on the consuming sector and states that the demand for total financial assets cannot exceed the surplus available to this sector after taxes and consumption. (3) is an identity relating the supply of bonds in any period to the deficit of the producing sector that arises in the financing

of investment and interest payments. (4) represents the fundamental identity of this model that the supply of all financial assets must equal the sum of primary bond issues, changes in reserves and any new public debt issues. This identity on substitution for each of its variables decomposes into the fundamental National Income Identity ($Y = W + P = C + I + G + X - M$) when taken in conjunction with equation (5). Equations (6) to (11) are self-explanatory. Equation (12) represents the identity that Government Expenditure in any period equals the sum of tax revenue and new public debt issues. All variables in this model are measured at constant prices and the unrealistic assumption that prices, with the exception of the rate of interest, do not matter is made.

The picture of the economy implied by this model is a very simple one and consequently somewhat extreme. There is a consuming sector which in return for the services it offers to the producing sector receives wages. Any surpluses this sector may enjoy on its income account are converted to financial assets. The producing sector finances its investment internally as far as possible and floats bonds to cover any short-falls. The monetary sector merely functions as an intermediary converting any bonds or public debt issues not directly held by the consuming sector into those financial assets this sector is willing to hold. The Government sector aims at a certain level of expenditure which it finances through a mixture of external financing (public debt) and internal financing (taxes) techniques. The foreign trade sector is affected by the producing and consuming activities of the economy in the form of exports and imports and gives rise to surpluses or deficits that affects the asset position of the monetary sector which is the only sector dealing in foreign assets and claims.

With this group of five sectors a set of inter-locking sectoral accounts can be presented. Given the two exogeneous variables of the model - exports and government expenditures - the model can be used to determine the relative degrees of reliance on external and internal financing. Whatever the level of

investments set by the model part of it will be financed from the producing sectors own profits and the remainder through bond-issues. The implied supply of financial assets may exceed demand and adjustments are made through changes in the rate of interest, taxes, public debt issues, etc. The model exhibits inter-dependencies between the level of taxes, changes in the public debt and the supply of financial assets generally. It can be made to provide a solution for that mix of taxation and public debt issues which would accommodate the given level of government expenditures and also satisfy part of the demand for financial assets. Given the value of the parameters and the exogeneous variables the solution of the model can be reflected in the sectoral balance-sheets in the form of mutually consistent adjustments in assets and liabilities.

There are many directions in which this model can be generalised to reflect the actual circumstances of an economy better. Modifications could be introduced to reflect the variety of financial assets available such as those that are in the nature of primary issues as well as those created through financial intermediation. Equation (1) could be decomposed into a set of separate demand schedules for all the financial assets to be found in the holdings of the consuming sector. In this model we have so far ignored the desires of other sectors for financial assets. The producing sector for instance may issue claims not only for the financing of an investment short-fall but also in order to add to its holdings of other financial assets giving rise to a mixed asset-debt position. The Government sector may wish to hold a certain volume of liquid assets in order to meet various transactions needs and similarly the monetary sector may desire a variety of financial assets for investment purposes. Such needs when incorporated in the form of demand schedules would add to those already implicit in equation (1) and would give rise to a number of additional budget constraints.

No specific behavioural equation is provided in this model covering the supply of financial assets except for what is implied

by the identity (4). Once again it is possible to conceive of a decomposition of (4) into a set of components each of which involves a supply function. However the identity only relates to the supply of primary financial assets. It is on this base of primary assets that the whole financial edifice is constructed. In order to focus on the inter-relations between real economic decisions and the financial ones one should include financial assets created by way of inter-mediation. This could easily be allowed for without affecting the fundamental identity (4). If the total supply of financial assets in whatever form, whether direct issues or the result of inter-mediation, is related to the sources of primary supply the inter-mediate steps in the inter-mediation are self-cancelling. If the supply were to be swelled by the inclusion of the products of inter-mediation the same items would appear on the other side of the identity. It would still reduce to the basic national income identity. This is to be expected since changes in the balance-sheet items are closely involved with changes on the income and product account and give rise to inter-statement identities.

Modifications in the case of the real equations can also be allowed for in the sense of specifying inter-dependencies with financial variables. *Just* as the investment function *which* incorporate the influence of the bond rate of interest and so forth. So far the interaction of financial and real variables in the determination of the general price level and relative prices has been put aside. We have assumed that with the exception of the Monetary rate of interest prices do not feature in the behavioural equations. As stated earlier this is an extreme assumption. A more proper formulation of the model would require the incorporation of a theory of price formation which would take into account the mutual interaction of prices with the other variables. In presenting an increasingly articulated set of equations which more accurately mirrors the economy one is beset with the lack of information for estimating the parameters of the equation and the model has to be

tailored to the availability of data.

The planning of the real ^{and financial} economy can be undertaken at several levels of aggregation and is found useful even at a high level since it enables tests of consistency to be applied to any manipulations of strategic variables by taking into account their direct and indirect repercussions on the economy. The procedure may be inverted and a policy model formulated which would provide a solution for the instrument variables so that the specified targets are attained. In conclusion we may state that were we to forego financial planning then this would be tantamount to an admission that inter-dependencies between financial and real variables do not exist or are highly unstable.

NOTES TO TEXT

The limited work of note in this area attempting such an integration is to be found in Tobin: "A Dynamic Aggregative Model" - Journal of Political Economy 1955, Gurley and Shaw in "Money in a Theory of Finance" as well as the mathematical appendix provided by A.C. Enthoven, and in Tobin: "Money and Economic Growth" Econometrica, 1965.

2. J.J. Polak in Monetary Analysis of Income formation and payments, I.M.F. Staff Papers Vol. 6 1957-58 voices the comment "Existing analytical studies rarely succeed in integrating monetary and credit factors in the explanation of income or of payments developments ..."

3. W.A. Lewis in a popular manual for planners entitled Development Planning 1966, suggests that "by projecting capital requirements on the one hand, and private savings, the budget surplus and the foreign balance on the other hand, one can check whether the required funds are likely to be available to finance the postulated growth." P. 175. This appears to exhaust the content of financial planning.

4. Ibid. The statistical application of this model is presented in a subsequent paper (with L. Bcissonault) in the I.M.F. Staff Papers Vol. 7 1960.

5. The author (Ibid) would regard his model as a sensible modification of Keynes which is presumably prompted by the presence of an import leak giving rise to effects similar to those in the Keynesian model. It would be difficult to determine the pedigree of the model were it not for the assumption of a constant V which militates against the standard Keynesian premises where a major role is conferred on the expectations of individuals and their inter-play in the money market in the derivation of the liquidity preference schedule. For V to be constant even when the rate of

interest is a constant both individual and market expectations must be of unitary elasticity. The import leak need not complicate the classification of this model which must rank in certain respects as a theoretical curiosum.

6. These and similar imputations of causality seem firmly esconced in the "oral" tradition at the I.M.F. They are to be found implicitly in such articles as those belonging to a collection entitled "Recent developments in Monetary Analysis," I.M.F. Staff Papers, Vo. V, 1956-1957, from M.W. Holtrop, Earl Hicks, Graeme S. Dorrance and Gerard R. Aubanel. They also bear many ramifications and appear to underly the compilation of the International Financial Statistics (IFS) as well as the Fund's Annual Report. The IFS which are designed to assist in the analysis of payments problems emphasize changes in the liquid asset holdings of the Government and Monetary Sectors which in conjunction with an implicitly assumed constant V easily enable the drawing of spurious conclusions regarding the causal processes giving rise to the payments problems. A justification for the system employed in the IFS is to be found in J.J. Polak: "Financial statistics and Financial Policy" and Earl Hicks: "The Theory and use of Financial Accounts" both in IMF Staff Papers, Vol. 7. 1959-1960.

7. One awaits with interest the forthcoming application by W. Newlyn of the Polak model to Uganda vide: "A theoretical basis for financial projections," E.D.R.P. No. 112, Nov. 1966 Makerere Institute of Social and Economic research. Newlyn however misinterprets Polak on occasion e.g.: (a) he cannot both assume away the Keynesian divorce between Savings and Investments and espouse the Polak Model which implies a complete divorce of these two functions p.9. (2) Nor is it true to say that the Polak model can be significantly modified in the direction of permitting any arbitrary value to be assigned to V since within certain wide ranges the timing of the process of adjustment is not affected. Both m and V feature as coefficients in the period analysis of changes in income consequent to initial changes in the autonomous variables and the unfolding of these effects in each year is different depending on the values taken by m and V . This will influence the total impact to be had on income if changes in autonomous variables are not of the same magnitude from year to year as is likely to be the case. For relatively high m the adjustment process dissipates itself within three years whatever the value of V within certain ranges. But this is equally true whatever the value of m above the critical level. Should we therefore modify the model by ignoring m as well?

8. Because this model is developed in terms of income-periods and because of the import leak only one leak is active - money and income which being two faces of the same coin are mutually self-adjusting and automatically preserve V . If there were no import leak then the requirement that V be a constant would constitute the leak and the rise in incomes consequent to an initial injection of credit would be limited to V times the initial impulse.

9. Such a sectoring is necessary if financial assets are to be brought into the picture for in a closed economy consolidation would eliminate them leaving only tangibles and net worths. The exclusive attention directed to the level and determination of national income requires such consolidation and has tended to obscure the role of financial assets. Gurley and Shaw (op. cit)

10. Almost all the work in this area seems to have been confined to the micro-level. See the review on Monetary Economics by H. Johnson appearing in the American Economic Review.

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