Income Velocity and Pakistan's Second Plan

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An attempt is made in this paper to appraise the extent to which the income velocity concept[1] is a useful tool in the financial planning of the Second Five Year Plan. For many years now, economists have been skeptical of the efficacy of velocity analysis, but most of this skepticism derives from its disastrous failure in the depression of the 1930s. Theorists generally concede its applicability in full-capacity situations[2], and it is in just such a situation that it is being applied in current analyses of the financial implications of Pakistan's Second Plan.

Nevertheless, the basic reason why the quantity theory is being revived in Pakistan, and in many other developing countries, is not so much its theoretical relevance as its great practicability. "Modern" Keynesian gap analysis is just not feasible where data on consumption and investment (not to mention their functional determinants) are totally lacking. Since data do exist for velocity analysis[3], it is used for want of a better.

The conclusion of this paper, summarised in a sentence, is that resort to velocity analysis to avoid inflation is unnecessary, uncertain and misleading. The statistical estimates seem to "explain" movements in real money balances quite well and conform to *a priori* predilections very satisfactorily, but grave uncertainties are incurred when these historical fits are used to predict the future.

Velocity analysis may be misleading if it suggests that the supply of money is a variable completely independent of its demand. In Pakistan

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1. The concepts, income velocity, quantity theory, liquidity preference and real money balance schedule are merely different ways of viewing a hypothesized relation between money and income. In this paper, the latter is preferred, but the terms are used interchangeably.

2. For a comprehensive discussion and extensive bibliography on the quantity theory of money *see* D. Patinkin, *Money, Interest and Prices* (1956), especially Chapters 8 and 10. Also *see* M. Friedman's introductory essay in *Studies in the Quantity Theory of Money* (1956).

3. Though, as will be seen, such data may not be sufficiently accurate, plentiful, or rich (*i.e.*, varied) to yield meaningful income-velocity estimates.

today, it is very probable that the supply of money adjusts, at least partially, to its demand; this may mean that price levels are not determined by the demand for money but the reverse, that the money supply adjusts to the demand forthcoming at a particular price level. It is not only useless but dangerous to use a theory based upon the assumption of an exogeneous money supply and an endogenous price level when the reverse may be true. And finally, it is suggested that the "new" approach of the Planning Commission may successfully avoid the need to use velocity (or Keynesian) concepts to insure stable price levels during the Second Plan.

That application of quantity theory in Pakistan is uncertain should not be surprising to anyone; and to attack believers in a unique and meaningful income velocity is, admittedly, to annihilate straw men. Nevertheless, a rigorous analysis of the reasons for holding money balances in low-income economies and of the statistical evidence of the 1950s is an extremely useful prelude to the other problems of income velocity. The majority of the paper (Sections I-IV) is devoted to an examination of the theory, data and statistical estimates concerning income velocity in Pakistan. Although the final two sections argue that this work is not only unhelpful but even dangerous from the viewpoint of planning price stability during the Plan Period, the historical analysis does yield some interesting insights into the Pakistan economy of the 1950s.

I. Income Velocity in an Underdeveloped Economy

The first problem that arises in the use of the income velocity of money concept is that of definition, of "money" and of "income". In industrialized countries, economists devote far more attention to the appropriate definition of money, while, curiously, in under-developed economies, it is the definition of income that gives the greater difficulty.

To define money, one must decide just how liquid an asset should be if it is to be included with currency as part of the money supply. It is generally conceded, even in nations where the banking habit is relatively under-developed, that current account (or demand) deposits may be considered perfectly liquid[4]. The question arises, the world over, whether time (or saving) deposits should also be included. The answer in Pakistan is, I think, a very definite *no*. There are too many assets that are generally held in large (and often unknown) quantities that are at least as liquid as time deposits —for example, gold, government saving certificates, prize bonds, cooperative shares, and (at least somewhat) durable commodities. Time deposits are not

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4. The relationship of demand deposits to currency has, in any case, been so stable over the period to be considered that it matters little whether one, the other, or both are made the basis of analysis.

considered, by most people, as the next most liquid asset after currency and demand deposits[5]; if they are included in the "money" supply, then the other assets listed above should not be neglected. But such an expansion of the concept of money leads not only to theoretical difficulties but, more critically, to something quite impossible to measure. It would be foolhardy to neglect the most accurate economic data published in Pakistan; money supply is therefore taken as currency in circulation (outside banks) and demand deposits (of other than governments).

In most studies of income velocity, some time is spent deciding between the various measures of income, GNP, NNP, National Income, and Disposable Income. The usual conclusion is that any of the first three are equally desirable. In countries where around, or less than, 10 per cent of the national income is traded in kind or self-consumed, the problems of income definition are easily solved. In Pakistan where perhaps 50 per cent is generated and disposed of without the use of money, one must consider carefully the reasons for a relationship between money and income before deciding on the appropriate definition of the latter.

Keynes suggested three reasons why individuals, and businesses, wish to hold money balances, the now famous trinity of transactions, speculative and precautionary demands. The first is clearly related to the number and amount of money transactions that people make; and these transactions, in turn, may be considered closely related to that part of income which is not bartered or self-consumed. The second Keynesian motive, speculative, is concerned with the alternative interest-earning and capital-gain-making opportunities foregone by holding money. The demand for precautionary balances is the most nebulous (though not so controversial as the speculative balances) of the three in the *General Theory;* Keynes says nothing of their determinants except that precautionary balances are probably not affected by interest rates[6].

What Keynes calls the precautionary motive is probably, in Pakistan, very important. Many people live sufficiently near the margin of subsistence that they must make careful provision for emergency money needs. And the unreliability of the markets for conversion of assets to money, makes it desirable that much of one's wealth-for-emergencies be held in the form of money. While the division of money between balances for transactions and balances for precaution is an unnecessary dichotomy, there is little doubt that much money is held here that is rarely required for money transactions.

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5. To many people, gold is far more liquid than even demand deposits.

6. J.M. Keynes, *The General Theory of Employment, Interest and Money*, p. 171.

Precautionary, or emergency, money balances probably form a not insignificant fraction of total wealth of individuals.

In the controversy over the "Pigou effect", one further determinant of desired money balances was suggested, namely, anticipated changes in price levels. In countries where gold, shares or commodities provide a ready hedge against the deterioration of wealth through inflation, expected price rises will reduce the willingness of the public to hold its wealth in the form of money; and, *mutatis mutandis*, expected price declines will increase it.

These four reasons for holding, or determinants of the demand for, money balances may be summarized in equation form:

$$(1) \quad \frac{M^D}{P} = f\left(\frac{Y-N}{P}\right) + g\left(\frac{W}{P}\right) + h(i) + j(P_e)$$

where MD is demand for money balances, P is the price level, Y is national income, N is the part of national income produced and distributed in the non-monetized sector, W is wealth, i is the interest rate, and P_e is expected price changes. f, g, h, and j represent functions.[7]. The first function, f, indicates the desire for transactions balances; the second, g, for precautionary balances; the third, h, for interest-speculative balances; and the fourth, j, for price-speculative balances.

All four of these determinants are not, in Pakistan, of equal importance. Interest rates have varied little since 1948; hence there is little reason to believe the interest-speculative effect to have been large. Similarly prices, while they have moved greatly, have recorded erratic trends since Pakistan's inception; only recently has the economy's price level moved in the same direction for as many as four years. Since studies have indicated that the public requires continued price change for some time before its demand for money is affected[8], we might reasonably neglect this possible influence, except possibly in 1959-60. On the other hand, there are two conceivable reasons why the demand for money may be influenced very quickly by changes in prices, but we will defer their consideration to Section IV.

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[7]. The aggregation problem is neglected, and it is assumed that the functional form relevant to individuals (and business) is equally relevant to the sum of all individuals (and businesses). Also, interaction effects between the independent variables are neglected, but this simplifies the exposition (and would have to be neglected in the statistical work anyway).

[8]. Cf. P. Cagan, "The Monetary Dynamics of Hyper-inflation," in *Studies in the Quantity Theory of Money*: "Indeed, the reason why issuing money on a grand scale does not almost immediately lead to extreme flight from the currency is not due to inelasticity in the demand for it but to individuals' lingering confidence in its future value. Their confidence maintains the lag in expectations, whereby the expected rates of price change do not at first keep pace with the rapidly rising actual rates." (P. 88).

Thus, two of the four determinants, transactions and precautionary demands, may be considered primary; equation (1) may then be rewritten

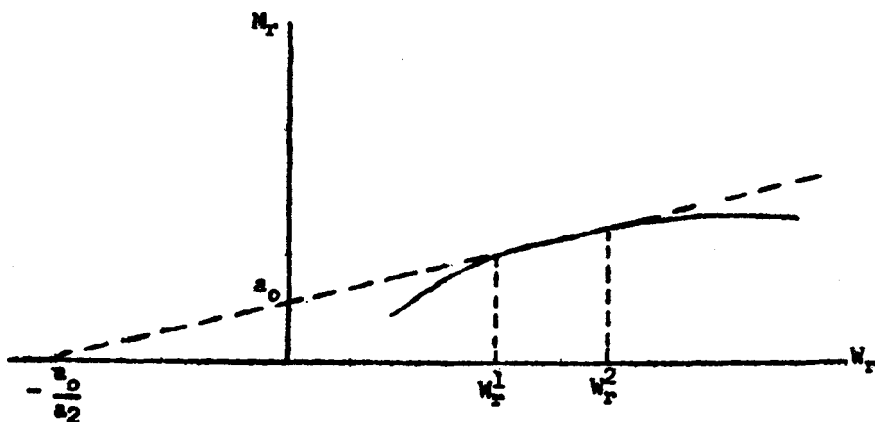$$(2) \quad \frac{M^D}{P} = f\left(\frac{Y-N}{P}\right) + g\left(\frac{W}{P}\right)$$

Since we generally think that the demand for money adjusts to its autonomously determined supply[9], there is no reason for retaining the superscript D over the M, and it may be dropped. Finally, since all the variables are now divided by the price level, i.e., are in real terms, we may omit the explicit consideration of P and write a subscript r to mean "real value of" the variable. Then equation (2) may be rewritten

$$(3) \quad M_r = f(Y_r - N_r) + g(W_r)$$

It is this equation (3) which we must now examine more carefully.

Transactions balances are generally considered proportional to the total value of transactions and hence.[10]

Figure 1

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(4) $f(O) = O, f'(Y_r - N_r) > O, f''(Y_r - N_r) = O$

Received literature is neither so vast nor so clear concerning precautionary balances (*i.e.*, the money-to-wealth function, g). Common sense suggests that individuals will not hold a constant fraction of their wealth in the form of precautionary balances. Very poor people will usually hold a large fraction of their wealth as money[11]. Desired precautionary balances probably increase absolutely but decline relative to wealth as the latter increases; wealthier people have, moreover, greater and easier access to markets where non-money may be converted into money in emergencies. Thus, in the short-run, for economies as for individuals, it is likely that a given percentage increase in wealth will be matched by a smaller percentage increase in the desire to hold precautionary money balances. Or, in other words, the short-run elasticity of precautionary money balances with respect to wealth is positive but less than unity. Such a relationship is shown in Figure 1, the dotted line indicating a best-fit linear relation over the range of wealth, W_r^1 to W_r^2.

The general equation (3) may be approximated over reasonably narrow ranges of income and wealth by the linear relationship.

(5) $M_r = a_o + a_1 (Y_r - N_r) + a_2 W_r$

where a_o is a constant representing the positive intercept (*see* Figure 1) of precautionary balances. All three coefficients, a_o, a_1 and a_2, may be considered positive[12] and, in the short-run, fixed. Business demand for money balances have been neglected in the formation of equation (5) simply because the theory of its determination is so unfinished. Rather than attempt to create this theory, we will hope that the form of (5) is not significantly altered by business demand.[13]

Equation (5) would conclude our theoretical investigation if adequate data were available to permit statistical analysis of it.

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11. Sometimes a fraction greater than one if they borrow in order to hold money. Such a situation may be completely rational when we remember that these are precautionary balances; borrowing only when one needs money for an emergency may be a time-consuming or uncertain process.

12. a_2 may be assumed less than unity. It is possible, though unlikely, that a_1 is greater than unity.

13. The fact that the ratio of currency (primarily held by individuals) to deposits (largely held by businesses) has not changed much over the 1950s suggests that the determinants of each category are similar.

II. Limitations of the Data

In Pakistan over the years 1949-60, there are available (1) an accurate series of money supply (nominal, not real, of course), (2) a series of real national income, and (3) a sub-series of real national income derived from agriculture. There is nothing that will readily serve for N_r, real non-monetized national income, or W_r, real wealth, in equation (5). By using the national income deflator developed by the Institute of Development Economics, we can convert nominal into real money supply, although the deflator is probably not without inaccuracy.[14]

The part of national income created and distributed in the non-monetized sector has, by the consensus of most economists in Pakistan, not altered basically over the past decade (although year-to-year changes have surely occurred). Thus, we may approximate N_r by considering it to be some constant fraction of agricultural output, *i.e.*,

$$(6)\ N_r = kA_r$$

where A_r is real national income derived from agriculture and k is a constant $(0 < k < 1)$. More generally, one might recognize that some non-agricultural production occurs in the non-monetized sector, but surely it is, relative to the agricultural, a negligible component. Also more generally, we might try to capture the effect of year to year changes in A_r upon N_r by considering the possibility that the marginal influence is less than the average; in other words, while N_r is, on the average, a fraction (k) of A_r, N_r may change by much less than k times the change in A_r in the short-run. Unfortunately, this leads us into the problem of the determinants of the farmer's marketed output, a theoretical and empirical quagmire that will be here avoided.

Next, consider the relation between national output and national wealth. National wealth, as here used, is not total productive capital nor even total physical capital, but is larger than this latter. It is here the sum of the wealth (net of debt) of all individuals in the economy, and as such, includes currency and government securities (held by individuals). Thus, wealth as here defined, consists partly of productive physical capital, partly of non-productive physical capital and partly of non-productive, non-physical wealth. There is much evidence that productive capital and output change proportionally at the margin, though whether this marginal capital-output ratio is higher or lower than the average ratio is a question nearly

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impossible to answer. Nevertheless we have strong reasons for believing that the non-productive components of wealth increase more than proportionately with output. Thus, the relation between total wealth and national output, if it can be considered stable in the short-run, is probably as pictured in Figure 2, with the dotted line representing a straight line fit in the region from W_r^1 to W_r^2.

Figure 2
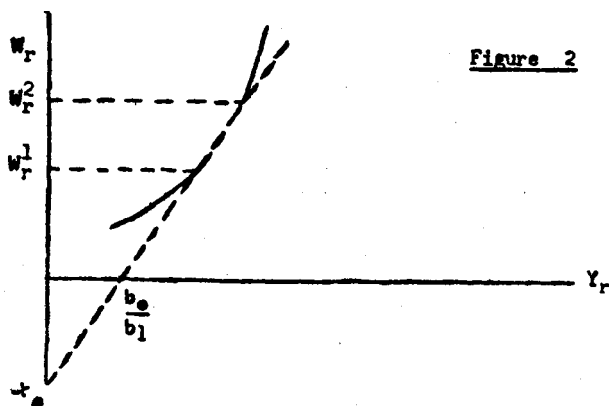
This permits us to use a (hopefully close) proxy for the unmeasurable variable, W_r, in equation (5):

(7) $W_r = -b_0 + b_1 Y_r$

where b_0 and b_1 may be considered positive constants, fixed in the short-run.

Substitution of (6) and (7) into equation (5) yields a statistically usable determinant of the real money supply:

(8) $M_r = (a_0 - a_2 b_0) + (a_1 + a_2 b_1) Y_r - (a_1 k) A_r$

III. The Statistical Estimates

In our quest for knowledge about equation (8), we are simultaneously hampered by too many parameters to be estimated and too few data to estimate with. There are six parameters in (8) and not the very best set of data would permit better than three (non-linear) equations with which to estimate them. Moreover, the data are far from ideal, being eleven annual observations[15] (1949-50 through 1959-60) of dubious accuracy. The C.S.O. is even now recomputing and revising its national income (and components) figures; and the deflator which converts nominal money supply into real money supply is an anchor dropped hopefully into a sea of uncertainty.[16]

Even if the possible inaccuracy of the data may be neglected, it fails for the statistician in another, very serious way. Real national income and the real national income share of agriculture correlate too well to be used simultaneously as independent variables in equation (8)[17]. The reason for this near perfect relation is partly obvious, that a majority of Pakistan's total output is agricultural (60 per cent during the 1950s), and partly insidious, that the various non-agricultural shares of national income are often "estimated" merely by adding a few per cent to the previous year's figure with the result that there can be no, or small, fluctuations in non-agricultural income to reduce the close relation of the agricultural share to national income[18]. Moreover, the share of some non-agricultural sectors[19] is estimated largely on the basis of the agricultural share, further raising the correlation between A_r and Y_r.[20]

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15. All data are presented in Appendix 1.

16. To the question, why use this deflator at all, it may be noted that one must either relate real money to real income or nominal money to current price income. The latter requires the deflator also, to convert constant price into current price income.

17. The correlation coefficient (r) is .96 and the regression equation is:
$$(9) \quad A_r = 2709 + .44Y_r$$

The fact that this coefficient is less than .50 scotches any hope of using non-agricultural real income, $Y_r - A_r$, as an independent variable in place of A_r, for $Y_r - A_r$ will be even better correlated with Y_r. The reasons are the same as those showing that linear consumption functions will have better fits than linear saving functions if the estimated marginal propensity to consume is greater than .50.

18. This estimating procedure applies to the small scale manufacturing and services sectors which together composed 36% of the non-agricultural national income in 1949-50 and 32% in 1959-60. It is very likely that this procedure greatly underestimates the share of these sectors in recent years.

19. Wholesale and retail trade, which was 24% of non-agricultural national income in 1949-50 and 22% in 1959-60.

20. The techniques of national income estimation are presented in the February 1955 issue of C.S.O. *Statistical Bulletin.*

Since A_1 and Y_r are not to be trusted together in the same equation, equation (8) may be written.

(10) $M_r^* = (a_o - a_2 b_o - a_1 k c_o) + (a_1 + a_2 b_1 - a_1 k c_1) Y_r$

where A_r of equation (8) is replaced by

(11) $A_r = c_o + c_1 Y_r$

If, for the moment, we neglect the clutter of parameters in (10), it may be rewritten very simply.

(12) $M_r^* = e_o + e_1 Y_r$

It should be noted that an asterisk has been inserted beside M_r of both (10) and (12); M_r^* should be read as *desired* real money balances. Whether the public is able to, or does, adjust its actual money balances to M_r^* without delay is important to the statistical form of equation (12).

Three hypotheses about the public's rate of adjustment of actual to desired money balances are offered: 1) that such adjustment occurs within the year,

(13) $M_r = M_r^* = e_o + e_1 Y_r$

2) that the adjustment occurs with a lag of a year.

(14) $M_r = M_r^{*-1} = e_o + e_1 Y_r^{-1}$

where the superscript (-1) represents a one-year lag; and 3) that actual balances are adjusted by a fraction, s, of their deficiency (or excess) in the previous year,

(15) $M_r - M_r^{-1} = s (M_1^{*-1} - M_r^{-1})$

or

(16) $M_r = s e_o + s e_1 Y_r^{-1} + (1-s) M_r^{-1}$

The least-squares fits of equations (13), (14) and (16) are as follows:

$$(13') \quad M_r = -5224 + .47Y_r$$
$$(.09)$$

Degrees of Freedom $= 9$, $n = 11$, $r = .88$

$$(14') \quad M_r = -5354 + .49Y_r^{-1}$$
$$(.07)$$

Degrees of Freedom $= 8$, $n = 10$, $r = .94$

$$(16') \quad M_r = -5239 + .48Y_r^{-1} + .02M_r^{-1}$$
$$(.15) \qquad (.26)$$

Degrees of Freedom $= 7$, $n = 10$, $r = .94$

where r is the correlation coefficient, n the number of observations, and the numbers of parentheses under the coefficients are their standard errors. Equation (16') is obviously inferior; the addition of M_r^{-1} adds almost nothing to the fit and its coefficient is almost zero. If the coefficient of M_r^{-1} is zero, s of equation (15) is equal to one and the third hypothesis becomes identical with the second.

There are two reasons for preferring equation (14) or (13). One is the higher correlation coefficient.[21] The other can be seen by inspecting the pattern of the residuals, *i.e.*, $M_r + 5224 - .47Y_r$ of equation (13') and $M_r + 5354 - 49Y_r^{-1}$ of equation (14'), or in other words actual minus estimated real money balances. These residuals, and the change in actual real money balances, are shown in Table 1. While there is no observable relation between the residuals of equation (14') and $\triangle M_r (= M_r - M_r^{-1})$ of that or the succeeding year, there is a very clear correlation between the residuals of equation (13') and M_r of the following year. In every year, a negative (positive) value of the residual in (13') is followed by a rise (fall) in real money balances in the next year. The residual is the difference between actual and *estimated* real money holdings; if one thinks of it more broadly

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21. The loss of a degree of freedom is not too important since it derives, not from the gain of a variable, but from the loss of an observation (Y is lagged a year).

TABLE I

Residuals

(*in Rs. million*)

Year		Equation (13') (1)	Equation (14') (2)	$M_r \cdot M_r^{-1}$ (3)
1950-51	...	—315.7	— 2.8	385.0
1951-52	...	246.9	— 47.8	486.0
1952-53	...	—295.1	—359.3	—391.2
1953-54	...	—226.3	6.1	522.4
1954-55	...	540.9	494.1	959.9
1955-56	...	683.7	276.1	— 17.5
1956-57	...	—282.3	73.4	—369.5
1957-58	...	— 16.2	—186.2	361.0
1958-59	...	230.3	— 66.6	215.9
1959-60	...	—375.3	—187.0	—147.3

Note: The sum of the figures in column (2) is zero except for rounding errors. The sum of those of column (1) is, except for rounding errors, equal to minus the omitted residual for 1949-50 (which is —190.3).

As the difference between actual and *desired* holdings, it becomes clear that a lagged adjustment model would be preferable. Even if one hesitates to identify estimated with desired balances, a second equation (relating M_r with the lagged residuals) or a new variable. (M_r^{-1}) would be needed to achieve a full explanation of M_r; equation (14') is probably a better choice.[22]

Equation (14') can be re-written, with (14),

$$(17) \quad M_r^* = -5354 + 49 \, Y_r$$

Can we learn from (17) anything of the original parameters of equation (10)? The estimates suggest

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22. The positive serial correlation of the residuals to equation (14') indicates that the estimate of e_1 (.49) will be biassed. Correlation of the first differences of M_r and Y_r^{-1} reduces the serial correlation of the residuals and yields slightly higher estimates of e_1 (.55 or .62, depending upon whether a constant term is used). With such a small sample, however, bias is unavoidable and first differencing is a specious sophistication.

(18) $a_o - a_2 b_o - a_1 k c_o = -5354$

(19) $a_1 + a_2 b_1 - a_1 k c_1 = .49$

We can surely not solve two equations for eight parameters[23]; in fact, the only thing that we can do is check various values of the parameters to insure that the .49 estimate does no violence to common sense.

Consider the definition of real wealth here used as the sum of money (M_r), productive physical capital[24] (C_r) and a remainder of all other wealth (R_r):

(19) $$W_r = M_r + C_r + R_r$$

The derivative of (19) with respect to Y_r yields another definition:

(20) $$\frac{dW_r}{dY_r} = \frac{dM_r}{dY_r} + \frac{dC_r}{dY_r} + \frac{dR_r}{dW_r} \cdot \frac{dW_r}{dY_r}$$

or

(21) $$\frac{dW_r}{dY_r} = \frac{\frac{dM_r}{dY_r} + \frac{dC_r}{dY_r}}{1 - \frac{dR_r}{dW_r}}$$

But dM_r/dY_r is about .50 (by the estimate of equation (14'), forgetting the lag); dC_r/dY_r is usually assumed to be around 3.5[25]; and dW_r/dY_r is b_1 of equation (7). Thus (21) can be approximated by

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23. Even if $c_o = 2709$ and $c_1 = .44$ from equation (9), there remain six parameters.

24. This, of course, includes equity in firms owning productive capital. We neglect here the fact that individuals do not really "own" all the physical capital of an economy. The physical capital of producing firms generally exceeds the equity outstanding with the result that the C_r held by individuals is less than that of the economy (and, correspondingly, the R_r is greater).

25. Such a "capital" - output figure is implicit in both the First and Second Five Year Plans.

Figure 3
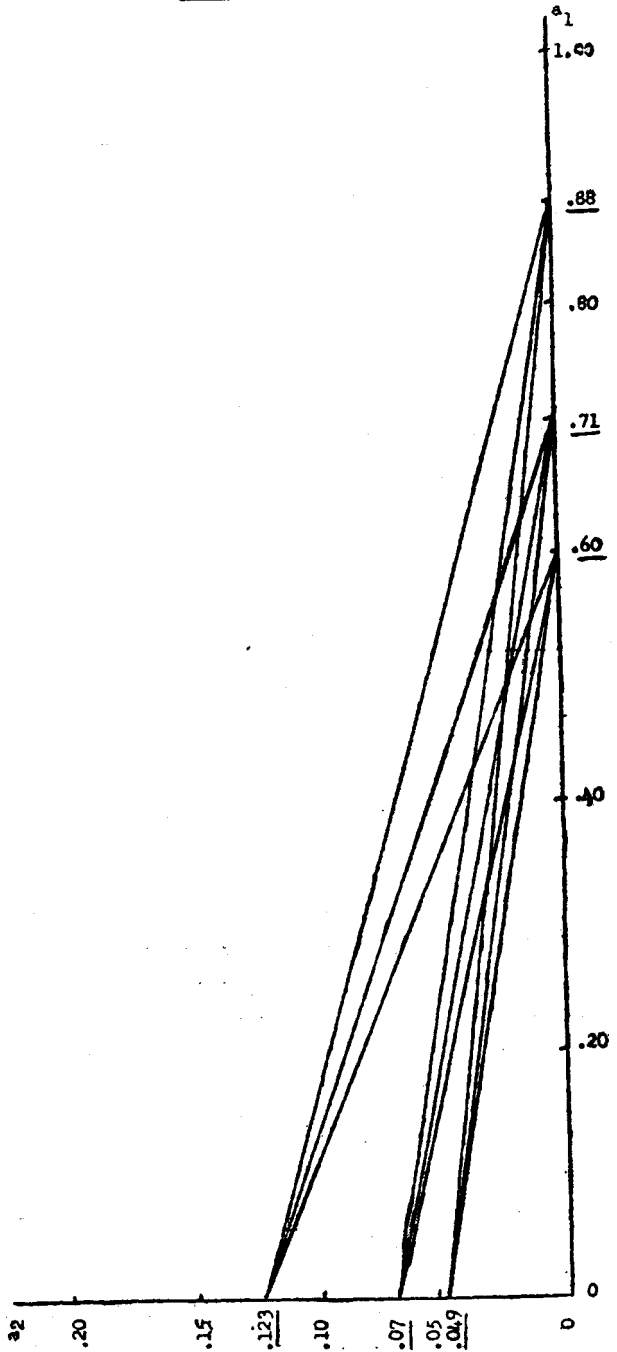
increase of wealth that the Pakistan public holds in the form of real non-transactions money balances is probably less than .10. Such a range appeals to common sense which is reassuring. It is unfortunate that Figure 3 is not so charitable as to give us also an indication of the value of a_1.

While the .49 estimate does no violence to our expectations, it must be remembered that any figure from perhaps as little as .10 up to about 2.0 could be justified, at least partially, in terms of equation (19). It would be extremely unlikely that the statistical estimates of equation (14') could fail to fall in this range.

IV. The Effects of the Rate of Price Change

In Section I, it was stated that the available evidence indicates a high degree of public confidence in the value of money; prices must rise and rise and *rise* before general speculation against money balances becomes significant. Pakistan has certainly undergone nothing approaching a hyper-inflation. Nevertheless, there are two reasons why money balances might be affected, quickly and significantly, by the rate of price change.

Prices in Pakistan turn upward (downward) sharply only in a year of large rice and/or wheat shortages (surpluses). This relationship is no secret and the success of the harvest is readily noticeable. There are many who are able, and prefer, to hold speculative cereal stockpiles to money in such years. Thus, the demand for real money balances on the part of potential grain speculators may change almost simultaneously with (or even ahead of) price movements. What is surprising is not the existence of such shifts (which are merely examples of traditional price-change-speculative balances), but the great rapidity with which expected prices alter. This follows from the fact that each wing is very near to a one-product economy—it is easy to forecast movements in the general price level on the basis of knowledge of only one commodity's supply situation. Forecasting price movements is not so easy in developed economies (with more diversified production), with the result that prices may continue to rise for some time before expectations of future price rises became widespread.

The second reason for sudden effects of price changes on desired money balances also derives from the fact that big rises (or falls) in the rate of change of prices occur when crops are unusually bad (or good). Thus, for most people a rise in prices is concurrent with a food shortage, and vice versa. If their food consumption is not to suffer (or suffer greatly), urban families must spend more of their money incomes on food. Increased food expenditure will be partly at the expense of other purchases, but also at the expense of

saving. After all, money balances (beyond transactions needs) are held for the very purpose of meeting such emergencies; hence, when food prices (and the price level) are rising, demand for real money balances will fall. This propensity will also occur among farmers, though in different guise. They will defend their food consumption by reducing the marketed fraction of their produce more than proportionately to their decline in output. This may or may not induce farmers to hold lower real money balances for pre-cautionary purposes; but it surely will raise the fraction of national income traded (or self-consumed) in the non-monetized sector. Thus, the demand for real money balances for transactions purposes will also be reduced at a time of food crop failures and rising prices (and vice versa).

There is no need to seek long, or even short, histories of price change in order to explain movements in the demand for real money balances on this account. The rate of price change in a given year, $\dot{P}\left(=\frac{P-P_{-1}}{P_{-1}}\right)$, may induce a change in desired real balances, $\overset{*}{M}_r$, without delay.[26]

Since the data of Section III suggest a one-year lag in the adjustment of actual to desired balances, i.e.,

$$(14) \quad M_r = \overset{*}{M}_r^{-1},$$

we can consider the residuals of equation (14') as the amount of real money balances desired for reasons other than transactions and wealth. These residuals, u (see Table 1, column 2), are the difference between desired real balances of the previous year, $\overset{*}{M}_r^{-1}$, and the desired balances explained by reference to real income. If we assume that real balances always adjust exactly to last year's desired level, then equation (14) can be re-written.

$$(23) \quad u = (M_r^{*-1}) - (e_o + e_1 Y_r^{-1})$$

In brief, u is a plausible measure of real balances desired for rate-of-price change reasons in the previous year.

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26. Alternatively, one might say that desired precautionary balances (M^*) are unchanged, but that actual balances (M_r) are altered.

The simplest and formulation of this relationship is

$$(24)\ u = m_o + m_1 \dot{P}^{-1}$$

where m_1 is expected to be negative. It should be noted that (24) is *not a* lagged relation since u refers to the lagged desired balances for other reasons (*see* equation (23)). But there are many other ways to formulate the relation and several are given in Table 3. The basic form of the Table 3 equations is

$$(25)\ u = n_o + n_1\ u^{-1} + n_2\ \dot{P} + n_3\dot{P}^{-1}$$

and several variations are fitted.

TABLE 3

Equation Number	Values of the Coefficients				Correlation Coefficient**	Degrees of*** Freedom
	n_o (1)	n_1 (2)	n_2 (3)	n_3 (4)	(5)	(6)
(24)	25.2	0*	0*	1208.0	.54	7
(26)	6.9	0*	—212.4	0*	.09	7
(27)	2.4	1*	0*	—1107.8	.09	7
(28)	33.4	1*	—1589.9	0*	.51	7
(29)	17.2	.35	0*	—1172.7	.64	6
(30)	26.4	.73	—1216.2	0*	.55	6

There is no need for an extensive discussion of these results since the number of degrees of freedom has dwindled to the point where significance is almost impossible. The signs are always negative of the $\dot{P}^{-1}$ (and $\dot{P}$) coefficients.[27] Thus, these equations are evidence of a rapid shift in the real

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*These coefficients are assumed 0 or 1; they are not estimated.
**Sign is neglected.
***Observations of u are from 1951-52 through 1959-60.

27. Clearly, $\dot{P}$ cannot affect last year's desired balances; in the regressions with $\dot{P}$, u must be interpreted as the residual between this year's actual balances and last year's desired balances, *i.e.*, $u = M_r - M_r^{*-1}$.

money balance schedule in the face of price change. It is possible that averages of several past price changes might offer a superior explanation, but with so few observations it would be foolish to waste more in lag-testing.

It should be recognized that this rapid adjustment of real balances (inversely) to changes in prices is a destabilizing influence in the economy. The rapid adjustment means that, when prices rise, there is speculative activity which is removing food from the economy and/or that inelastic food demands are being activitated through declines in money balances; any initial rise in food prices can thereby be sustained and even furthered by the money balances reduction. The movements of Pakistan prices in the 1950s, as crops fluctuate, suggest that such destabilizing movements have occurred. Fortunately, their cumulative effect is halted by the next crop.

V. A Time for Hesitation

There are several caveats that need expression concerning the work of the preceding two sections before any application is made. The first concerns the trustworthiness of the data that has been used. In Section II, doubts were advanced about the accuracy of both the national income (in constant prices) and the national income price index series. The former is even now under reappraisal and there is no reason why great improvement cannot be achieved. Of prices during the 1950s, we may never be accurately informed. When rationing, controlled prices and artificially cordoned purchasing and distributing regions co-exist with free, gray, and black markets, price becomes a hazy concept. Official prices may be meaningless, and official attempts to discover "the free price" are fraught with possible error.

Some indication is necessary of the sensitivity of the estimates of Section III to inaccuracy of data. Suppose that the "true" percentage annual changes of prices and real national income were 2 per cent and 1 per cent higher, respectively, than those recorded (*see* Appendix 1)[28]. The estimates of equation (14') then become

$$(31) \quad M_r = 21 + .18 Y_r^{-1} \qquad (r = .80)$$

The fit is quite respectable, and the coefficient of Y_r^{-1} is .18, only about one-third the value estimated in Section III. Small inaccuracies in the data
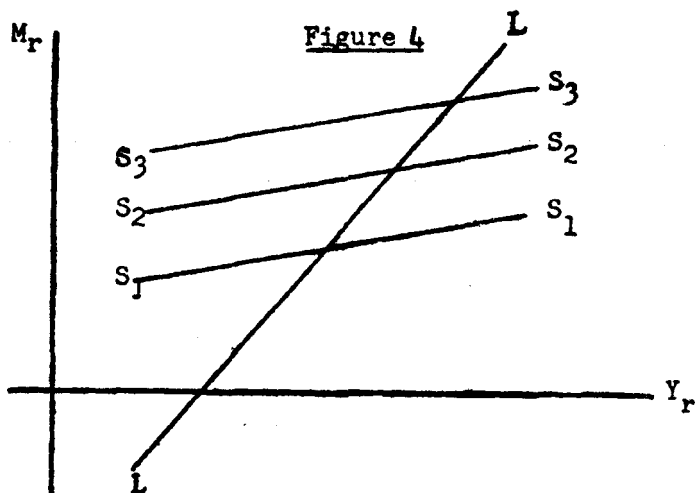
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[28]. *I.e.*,

$$\left(\frac{\Delta P}{P-1} \right)_{true} = \left(\frac{\Delta P}{P-1} \right)_{recorded} + .02$$

and similarly for real income, with Y_r replacing P and .01 replacing .02 in the above formula (Δ means absolute annual change). Nominal money is assumed correctly measured.

may generate large inaccuracies in the estimated values of the coefficients.[29]

It is probably more crucial to notice the problems that arise in the use of the estimates of Sections III and IV, even if the data is accepted as reasonably accurately measured. There are four primary reasons for skepticism concerning predictions from the estimates. The first applies generally to all such time-series estimates, but the other three result from the economic environment of Pakistan over the past ten years.

1.   When variables are related by means of time-series data, the assumption is implicitly made that the structural relationship has not changed, at least systematically, over the period of the observations. One must always recognise the possibility that a series of upward shifts in a function (S_1 S_1, S_2 S_2, etc. in Figure 4) will generate a locus relation (LL in Figure 4); the statistical estimates will, as a result, be of the locus and not the actual functions.


Figure 4

This problem is not always insurmountable. If one assumes that any upward shifts will continue in the future, the locus estimates (of LL) may be just as useful for prediction as is knowledge of the SS curves and their manner of shift. The dangers in such an assumption for Pakistan are patent; there is no reason for assuming that the public's desire for real money balances have shifted in any consistent pattern over the 1950s. A second way of avoiding the locus-fit is to include explicitly a time variable in the intercept (or slope, if rotation, rather than shifts, over time is suspected). Where the independent variable, Y_r, is so well correlated with time, however, such a technique is not feasible.

2. The use for prediction of an historically-estimated function requires the assumption, mentioned above, that the "structure" is unchanging or is changing in a consistent fashion. Pakistan's brief and turbulent economic history will not permit such assumptions. The observations begin in 1949-50, only two years after the tremendous political and social upheaval of independence and partition. Currency and bank deposits were probably not even the most liquid of assets, and they were certainly not the least risky. From a time when money balances were mistrusted and even eschewed, there was undoubtedly a long period of rising desires for real balances (and for those near-moneys which complement a stable political environment, *e.g.*, time deposits). This period has now ended, and it is very possible that a shift away from money balances has begun—a shift not to the near-moneys of flight, gold and jewellery, but to the near-moneys of safety, time deposits, cooperative shares, savings certificates, etc.

There is evidence for these suggestions in the residuals of equation (24). These residuals may be considered as that part of actual real money balances not explained by reference to real income or to rate of change of price levels; if we can further assume that this remainder represents the shift in tastes towards or away from real money balances as a form for wealth holding, then the pattern of these residuals over time is interesting. They are plotted in Figure 5[30]. These residuals suggest that tastes were moving to greater real money balances (apart from income and price change considerations) up to 1954-55, and then away from money thereafter. For the last three years there has been a drop each year in the residual, the average annual fall since 1954-55 being a not trivial 120 million rupees. The pattern of the residuals is not inconsistent with the possibility that the desired real balance schedule was rising, as S_1S_1 to S_3S_3 in Figure 4, in the early years, but has stabilized at S_3S_3 (or perhaps has been falling towards S_2S_2) in recent years.

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30. The values of the residuals, equal to $(u—25.2 + 1208.0\ P\text{-}1)$, are for the years 1951-52 through 1959-60 respectively: —120.6, —277.2, —49.5, 406.4, 71.8, 233.0, 59.0, —115.2, —207.5.

RESIDUALS OF
EQUATION (24)

FIGURE 5
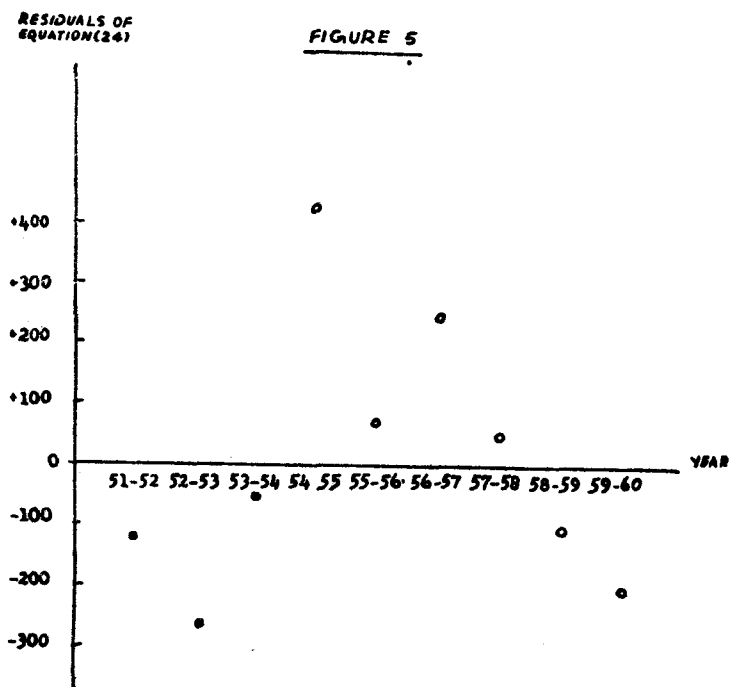
A simple test may be made of this possibility without consuming more than one degree of freedom. M_r rose greatly in 1954-55 (and Y_r in 1953-54). On the assumption that the intercept of the real money balances schedule changed at that time (but at no other time), we can re-estimate equation (14'):

$$(32) \qquad M_r = \qquad \begin{Bmatrix} -960 \\ \\ -244 \end{Bmatrix} + .24\, Y_r^{-1}$$

where, in the brackets, the upper constant term applies over 1950-51 through 1953-54 and the lower constant over 1954-55 through 1959-60. The correlation coefficient of (32) is .97. The scatter of (M_r, Y_r^{-1}) points are plotted in Figure 6 along with equation (14') and (32). While certainly not conclusive, this lends support to the above suggestion that equation (14') is the locus of two (or more) flatter but upward shifting real balance schedules.

3. The historical observations from which the estimates of Sections III and IV are made are largely drawn from times when prices (and purchases) were controlled to varying degrees. This fact may have had a large effect

FIGURE 6
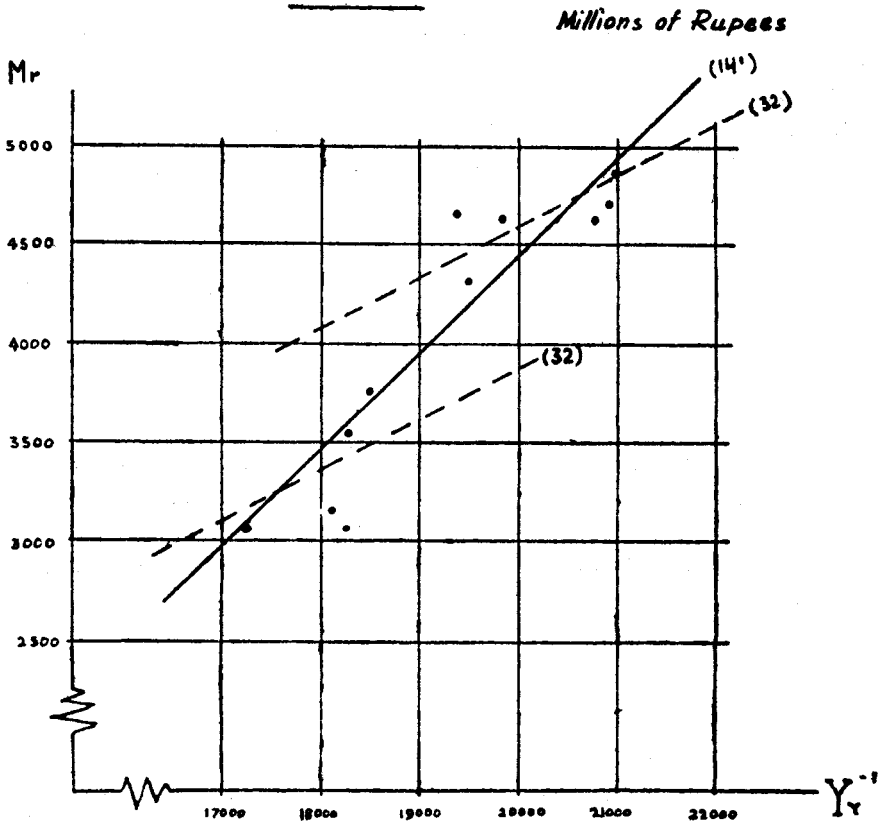
upon the size of desired money balances. Here, we will consider briefly two possible reactions to shortages at controlled prices (and high black market (prices on inessential "luxury" items: (i) that the situation is expected to be permanent; and (ii) that the shortages are expected to be temporary.[31]

i. If permanent shortages (on legal markets, and higher prices on black markets) are expected, there is reason for believing that real money balances will rise. Such balances are an economic good and, in these circumstances, their cost to the consumer, in terms of foregone consumption opportunities, is reduced. Another reason is that many individuals either will adjust slowly their consumption habits to the black market price or will prefer to wait for a chance to buy the article legally at the artificially low controlled price. Such queues may be of long duration, during which time higher cash balances will be held.[32]

ii. If the shortages are expected to be temporary, there is even greater reason to postpone purchases; and postponed consumption is present saving. Not only will savings rise more when the shortages are expected soon to pass, but a much greater proportion will be held in money balances, to be ready for imminent spending.

Controls on business imports for investment purposes have induced similar reactions. The growing time-lag between the investment decision and the actual import has probably meant much larger business money balances. And all these larger balances, of businesses and of individuals, are desired balances in the context of the control situation, however preferable other situations might be.

In the past year, more liberal import licensing and export bonus vouchers have reduced shortages of luxury goods, and it may well be that desired money balances will decline concomitantly. There is no way of knowing what part of the "desired money balances" we have estimated have been desired only in the context of the controls in force. That they have not been negligible is indicated by the data for 1960-61. The money supply rose by only about 4 per cent between 1959 and 1960 (December figures); the price level, by

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31. There is, of course, a third situation, that the shortages are expected to become worse. This possibility may, I think, be neglected in the present context.

32. Of course, physical queues outside a fair price shop seldom entail the holding of cash balances more than an hour or two. But there is the government licensing queue also, and the collection of the proper forms, licences and permissions may take months, even years.

33. C.S.O. figures on cost-of-living indicate that prices had already risen by 4% between June and August of 1960 in some parts of Pakistan.

almost any estimate, will surely, in 1960-61, rise by at least that.[33] It is not improbable that real money balances will have declined by 10 per cent during 1960-61 (from 4692 million rupees in December 1959)[34].

The theory of price controls and quantity restraints is in a very preliminary state, and these comments on their possible effects upon money balances are speculative (to say the best). Nevertheless, the warning is clear that the controls of the 1960s may be sufficiently different, in kind and in extent, that the experience of the 1950s may be inapplicable in the future.

4.   The final hesitation before prediction must be to ascertain that the appropriate variable is being predicted. In the present case, it is not so simple as it may seem. Presumably the purpose of our work is to find the increase in nominal money supply which the public would hold without bidding up prices when real income rises by a certain amount; in other words, we would like to predict change of money supply, given price change (zero) and real income change (20 per cent by the Plan).

But is this the way the Pakistan economy works? Does the public bid up and down prices to adjust the exogenously determined nominal money supply to their desired real holdings? Traditional economic thinking cries out "yes", but one is often tempted to think the actual process here is quite the reverse: price levels are determined by largely exogenous factors (*e.g.*, government controls, politically and sociologically determined wages, crop success, etc.) and the public later expands or contracts its nominal money balances to its desired real balances.[35] This is not as absurd at second glance as it seems at first—certainly no one would claim that the government or the State Bank has *determined completely* (or perhaps even primarily) the size of the nation's nominal money supply.

Without making an issue of this reversal of traditional causation, it is sufficient here to stress that there are other things that affect general price levels in Pakistan than the public's desired real balances,[36] and that the public is an important partner in the determination of the size of the money supply.

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34.   Some part of the decline in real money balances will be induced by the very rise in prices (*see* Section IV); but the probable extent of the decline strongly suggests a shift in the schedule as well.

35.   Initially, a price rise (fall) is made feasible by a fall (rise) in the real money balance schedule induced by the price change (*see* Section IV). Once prices stabilize at a new level, however, the public's demand for money balances returns to its original level and the money supply must expand (contract) if prices are not to change again.

36.   Of course, any change in price levels may be considered as a shift in the desired real money balances, but this avoids the issue of causation.

This means that, to insure stable price levels, one must look at much more than the desired real money balance schedule. Even if we *knew* that (say) equation (14') were absolutely accurate and that real income would rise 20 per cent over the Second Plan, one could not safely fix the appropriate money supply expansion. Prices might move despite an (initially) appropriate money supply expansion, and/or the money supply might move contrary to our intentions.

In an Alice-in-Wonderland world where the tail wags the dog, one must not doggedly expect that the law of gravity will keep the dog's feet on the ground.

VI. Money during the Second Plan

In order to put the preceding conclusion into the context of the next five years, it is interesting to consider two extreme positions. First, let us naively accept the estimates of Section III, and second, concern ourselves only with the fears expressed in Section V.

Equation (14') suggests that the public's desire for real money balances will rise by about one-half (.49) of any increase in real income.[37] This estimate was seen, in Section III, to be consistent with our a priory predilections—it might imply, for example, that the marginal propensity to hold wealth in money form for precautionary purposes (a_2) be .05 and that the transactions income velocity of money ($1/a_1$) be 5.0. And such values certainly do not violate our historical sensitivity.

But the implications of equation (14') for the Second Five Year Plan are astonishing. If real national income per annum rises, as anticipated by the Plan, by about 4,400 million rupees,[38] then desired real money balances should increase by some 2,200 million rupees. Translating this into nominal terms, on the assumption of stable prices (at the 1959-60 level[39]), this means that the money supply may expand by about 2,700 million rupees[40] without inducing the public to lower its real balances by driving up prices. This is an absurdly high estimate—few, if any, economists familiar with the Pakistan economy in 1961 would suggest that such a money expansion is consistent with price stability.

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37. This means also, of course, that the public's desire for *nominal* money balances will increase by about one-half of any rise in current price national income (prices unchanged).

38. Approximately one-fifth of the 1959-60 real national income.

39. This assumption has already been proven wrong, but this does not affect the present argument.

40. Approximately 1.23 times the real money expansion (1.23 being the price level in 1959-60).

The warnings of Section V are not to be neglected. In fact, careful heed of these warnings may lead to quite pessimistic views on the feasible expansion of the money supply. If one considers only the facts of price decontrol, import liberalization, present rapid rise in prices (in the near absence of deficit finance and the currently small rate of increase of the money supply,[41] and the great shock provided by the population census (which indicated that real per capita income has perhaps failed to grow during the 1950s), then it is not difficult to understand, if not to agree with, those disillusioned economists who cry out for a cessation of deficits and monetary expansion.

The Second Plan itself weaves a twisting path through these two extreme views. It sees the generally downward movement of income velocity during the 1950s as part of an expected trend in the development of an economy, but it also notes the recent interruption of this trend. It considers such short-run problems as the possibility of excess liquidity in the economy ("though its extent is probably not great," p. 61) and the decontrol of food grains. The final recommendation, that the money supply may be augmented, over 1960-65, by 1400 million rupees, is about half-way between the extremes of 2700 and zero, mentioned above.[42] All in all, it is an appealing compromise, sensibly and knowledgably argued in the Plan document.

But it misses the point. It implicitly assumes, if it is to have any meaning, that somewhere, someone stands ready to insure that the money supply grows by no more than 1400 million rupees. Moreover, it assumes that the price level is determined, in some predictable and stable way, by the money supply. The first assumption is, and probably will continue to be, factually inaccurate; and the second assumption is, as we have seen, at best tenuous. This latter uncertainty is recognized, and hedged at some length (pages 63-68), but it begs the question—either the money supply expansion is relevant, or it is not. And if it is relevant, it is either controllable, or it is not. I am afraid the negative applies to both questions.

In short, the only interpretation of the Plan's discussion of money (pages 57-63) is: if inflation does not occur, the public will probably increase its holdings of money by about 1400 million rupees, though the figure is very uncertain.

The recent revisions of the Plan, only now becoming public, seem to be infinitely more sensible about the chain of causation. The primary defense

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41. Income velocity rose by about 10 per cent in 1959-60 (see Appendix 1) and is probably rising further at present.

42. By coincidence (probably), the Plan estimate of the safe increase in the money supply is almost exactly that found by extrapolating equation (32) (see Figure 5).

against inflation is now seen as the PL-480 foodstuff stockpiles; by releasing these at varying rates, both the secular and the crop-failure pressures on cereal prices may be avoided. The money supply is relegated to its appropriate position as a not-very-important endogenous variable.

This new emphasis, if not new approach, not only is the only practical solution but also has theoretical justification. The Keynesian analysis uses the concept of aggregate demand (Y^d in Figure 7) in relation to aggregate supply (or national income; Y^S in Figure 7). If aggregate demand follows the schedule Y^d_1 and full-capacity national output is OE, then there is no impulse to higher prices. If, however, full-capacity output is only OA, an "inflationary gap" of BC appears; if it is not removed by appropriate fiscal and monetary measures (*i.e.*, aggregate demand reduced to Y^d_2), then prices will rise, at least by AE/OA per cent (if equilibrium is to be achieved) and by more if the economy lacks money illusion or wage lags.

FIGURE 7
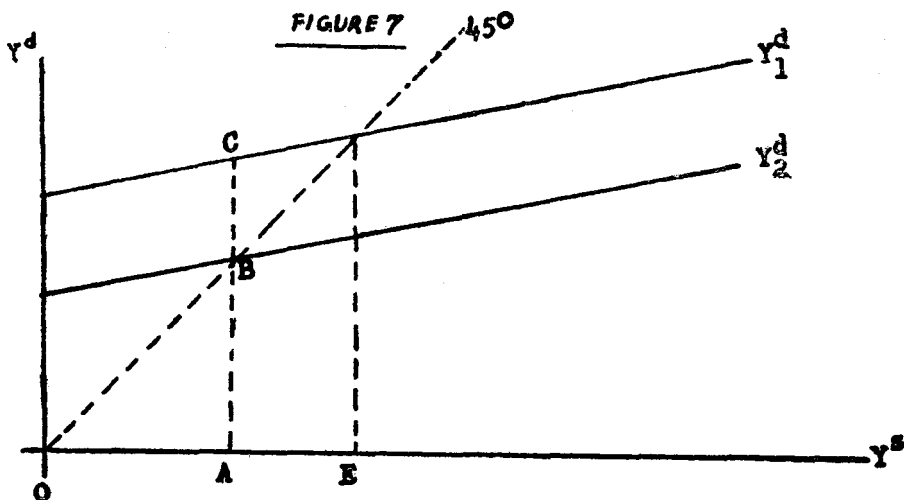
The income-velocity approach hypothesizes that variations in the public's real money balances will affect the aggregate demand functions.[43] Y^d_1 will apply with one real money supply; a lower real money supply will induce greater saving propensities and hence will correspond to, say, Y^d_2. Thus, if the inflationary gap (BC) exists, either prices must rise by x% or the money supply be reduced by x%—in either case, the real money balances are driven down, removing the gap.

Both of these approaches require knowledge about functional relations. The Planning Commission's new approach does not—rather it recognizes

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43. This is a neo-neo-classical approach (*i.e.*, Patinkin's) to the quantity theory.

that full-capacity output (maximum real Y^s) is a variable. With large PL-480 supplies available, the situation is identical with one where the maximum real national income of a nation is a controllable quantity. Thus if aggregate demand is at Y_1^d and present supplies of output at OA, prices will begin to rise; but the injection of AE of food-stuffs will stop the price movement. The only question is how much is AE, and the answer is simply as much as needed to stop price movements.

While trial-and-error would be adequate, the technique is potentially even more accurate than that, for the one function that is fairly accurately ascertainable in Pakistan is the cereals-needs function. One is often tempted to consider an income velocity of cereals in connection with the big infla-tionary surges in underdeveloped countries. Successful practise generally precedes theoretical rationalization, and the anti-inflationary food releases may be but another example of this adage. Where Keynesian gap analysis is nearly impossible, fiat controls undesirable, and traditional velocity analysis at best uncertain (and perhaps misleading), this new approach may be the solution to Pakistan's inflation problems—we are now equipped to remove quickly inflationary pressure of any reasonable size.

APPENDIX 1

Year		M	P	P	M_r	Y_r	A_r	k	V
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1949-50	...	2670.2	.99352	...	2687.6	17,238	10,462	.16	6.4
1950-51	...	2932.5	.95439	—.0394	3072.6	18,324	10,824	.17	6.0
1951-52	...	3697.8	1.03913	.0888	3558.6	18,161	10,495	.20	5.1
1952-53	...	3208.4	1.01295	—.0252	3167.4	18,482	10,945	.17	5.8
1953-54	...	3544.2	.96054	—.0517	3689.8	19,447	11,663	.19	5·4
1954-55	...	3803.7	.81805	—.1483	4649.7	19,857	11,630	.23	4.3
1955-56	...	4369.3	.94324	.1530	4632.2	19,516	11,225	.24	4.2
1956-57	...	4920.7	1.15437	.2238	4262.7	20,785	12.122	.21	4.9
1957-58	...	5233.7	1.13193	—.0194	4623.7	20,987	11,954	.22	4.5
1958-59	...	5502.1	1.13633	.0039	4842.0	20,927	11,735	.23	4.3
1959-60	...	5761.9	1.22796	.0806	4692.3	21,897	12,477	.21	4.7
1960-61	...	6170.1*							

SOURCES: (1) M. The nominal money supply. State Bank of Pakistan, *Report on Currency and Finance*, 1959-60, Table 29, page 141. The figures are for December (of 1949 through 1959) and are in millions of rupees. (Dec. 1960 figure (*) preliminary.)

(2) P. The national income deflator implicit in the Institute of Development Economics current price national income estimates (*see* I.D.E., *A Measure of Inflation in Pakistan*, 1951-60, Section IV). This price index is converted here to a 1949-53 (=1.00000) base to make it comparable with the real income base.

(3) P. The percentage change of P (column 2) with the previous year's value being used in the denominator; *i.e.*,

$$\dot{P} = \frac{P - P^{-1}}{P^{-1}}$$

(4) M_r The nominal money supply deflated by the price index; *i.e.*,

$$M_r = \frac{M}{P}$$

Figures are in millions of rupees.

(5) Y_r Real national income, with the prices of 1949-53. Government of Pakistan, Ministry of Finance, *The Budget*, 1960-61: *Economic Survey and Statistics*, Table 1, page 1 (of Statistics Section). Figures in millions of rupees.

(6) A_r The share of real national income derived from agriculture (major agricultural crops, minor agricultural crops, livestock, fisheries and forestry). Source is same as for Y_r. Figures in millions of rupees.

(7) k. Real money balances as a fraction of real national income; *i.e.*,

$$k = \frac{M_r}{Y_r}$$

(8) V. Income velocity of money (inverse of k).