Income Velocity of Money: A Case Study of Pakistan

MOHAMMAD ZUBAIR KHAN*

INTRODUCTION

The aim of this paper is to analyse the policy of monetary expansion followed in Pakistan and examine the effect it had on the price-stability in the economy. Credit control policies, whose main objective is to influence expenditures on domestic and foreign goods, is rendered ineffective to a certain degree by the use of the existing savings of the private sector. This use of the savings can be measured in terms of changes in the velocity of money. Since the effectiveness of credit control policy depends on the decisions of savers, an analysis of the short-run behaviour of income velocity is crucial to monetary policy formulation.

The velocity of circulation of money is a flow concept, defined as the average number of transactions made with each unit of money. This concept distinguishes between the stock of money and the volume of use of the same stock. The effect of a changing velocity on the price level, given a constant money supply, is well demonstrated in the Fisherian identity $MV=PT$, where M=money, V=velocity, T=number of transactions and P=price-level of the same goods.

The meaning of velocity and therefore the analysis where the concept has any use, depends on the definitions of 'money' and 'transactions'. Velocity of money is $V=\frac{Y}{M}$ where Y could be all the transactions in the economy or only the transactions of purchasing final products and M would be the liquid monetary assets used for such transactions. If all transactions in the economy are included we call it the transactions velocity of money, while if only final product transactions are included, the concept is called income velocity of money.

*The author is a Staff Economist at the Pakistan Institute of Development Economics, Islamabad.

In this paper as we are concerned with the effect of a changing volume and use of money on the price-level, the relevant concept for our analysis is transactions velocity of money. However, finding the total number and magnitude of all transactions (including intermediate) in the economy is not feasible. As an alternative we assume that in the short-run the average number of intermediate product and financial transactions per final product transactions remains constant for the economy. Since we are only concerned with the effect of changes in the transactions velocity on final-product prices, we can, therefore, safely use the income-velocity ratio as a linear transformation of the former.

In the following pages, Section I describes how monetary expansion can have a direct bearing on the price-level if it is in excess of what changes in velocity and real income will permit. Section II examines the institutional factors determining the velocity of money.

I. MONEY EXPANSION AND THE PRICE LEVEL

After an era of relative price-stability both in comparison with the latter period and the experience of other countries, Pakistan's economy has been hit by inflation since 1965 with varying degrees of price rises each year. The price-level changes in 1972 and 1973 have been especially alarming, rising by 13.0% and 52.9% wholesale price-index units over the previous year. To a certain degree, the price hike is a result of the leakage of world inflation into our economy, but to some extent there are other factors at work. In this section an attempt is made to demonstrate the influence of the excess monetary expansion on prices.

The velocity of circulation has already been defined as the relation between the stock of money and the value of transactions performed with that money in a given period of time. However, to give more precise meaning to the concept of velocity as used in this paper, we need to define more exactly the terms 'money' and 'income'.

The numerator of the velocity ratio should be a magnitude on which the money stock in the denominator is spent. The relevant measure in Pakistan is Gross Domestic Expenditure because, firstly, it includes only final transactions in relevance to the income velocity concept, and secondly, it includes imports and excludes exports, which implies that it takes account of only those transactions in which the domestic supply of money is used.

The definition of money is a controversial issue. In this paper, since we are dealing with an expenditure theory, our criteria for including an asset in the definition is based on the degree of liquidity of the asset. Normally only cash and demand deposits are included in the definition of money, but in this paper time-deposits and savings deposits are also included. Apart from the reasons given by Friedman [5] for this broader definition of money, in Pakistan the banking procedure necessitates the inclusion of time-deposits in the definition. Time deposits have two components; savings bank deposits which can be used for current transactions purposes with the same ease as demand

deposits because they too can be withdrawn by cheques. The other component is the deposit which cannot be withdrawn before a fixed time. These deposits have also acquired liquidity, through the practice of banks to allow premature withdrawals in case the interest on the deposit is foregone and also by the fact that banks would give an advance against these deposits of equivalent amounts. The definition of money we have chosen is also in line with some broader considerations. First it does not blur the analysis of the various motives for holding cash and second, it covers the areas over which the monetary authorities have direct control.

Having defined money and income, we are now in a position to show with the help of the Fisherian identity, the limit of monetary expansion which may not be detrimental to price stability.

$$M_o \; V_o = P_o \; T_o \ldots\ldots\ldots (i)$$

This is the Fisherian identity with time-subscripts.

M stands for nominal money supply,
V is the income velocity,
T is the real final transactions,
P is the price-level for T.

Since, we are concerned here primarily with monetary expansions, assuming a policy objective of maintaining price stability, while GNP grows in real terms over time and velocity changes to V_1, the new money supply should be M_1^*, where

$$M_1^* = \frac{P_o \quad T_1}{V_1}$$

the subscript 1 refers to the next time period after o, and superscript * implies ex-ante value of the variables.

Hence the warranted change in money supply (Mw), or the monetary absorptive capacity of an economy is

$$M_w = M_1^* - M_o = \frac{P_o \quad T_1}{V_1^*} - \frac{P_o \quad T_o}{V_o} \ldots\ldots (ii)$$

The deviation of the actual increase in money supply in particular year, from the warranted change of money supply in that year, is called here the excess money supply

$$M_E = M_A - M_W = (M_1 - M_o) - (M_1^* - M_o) = M_1 - M_1^* \ldots\ldots\ldots (iii)$$

From equation (ii) it follows that for increases in actual money supply in excess of the warranted change, the price-level will rise. However to be able to determine the correct monetary expansion for the future year t, M_W is estimated from projections of T and V where V_t^* is estimated from the regression model of Section II, determined by factors other than M_t (i.e. money supply

in year t). On testing the contention that there is correlation between M_B and the price changes, a high degree of correlation was observed. The direction of causation is a matter of controversy, but in the classical theory [6] as in the rest of this paper, prices are the dependent variable. This is relevant even in terms of real life, if the money supply is autonomously determined and not prices.

Table I

Excess Money-Supply in West Pakistan

(Figures in Rs. crores)

Year	Actual Changes in Money Supply[1] M_A	Warranted Changes in Supply[2] M_W	Excess Money Supply[2] M_B
1960—61	26	1.93	27.93
1961—62	48	41.75	6.25
1962—63	112	117.21	—5.21
1963—64	83	55.62	27.38
1964—65	113	45.59	67.41
1965—66	150	163.21	—13.21
1966—67	89	—31.35	120.35
1967—68	110	83.56	26.64
1968—69	146	66.99	76.01
1969—70	179	140.66	38.34
1970—71	—91	—134.76	43.76
1971—72	545	309.08	235.92
1972—73	379	—215.45	594.45

[1]Estimates made by Arif Ayub [2]

[2]Columns calculated on the basis of equations (ii) and (iii).

The period covered in this analysis is 1960-61 to 1972-73. Data for West Pakistan regarding the variables, price-indexes, and national accounts are available. However, there are no official published data on the money-supply in West Pakistan.

The State Bank of Pakistan has not yet announced the estimated proportion of the total money supply of Pakistan that was circulating in West Pakistan before December, 1971. Data on increases in money supply since then, which obviously pertains to West Pakistan alone, are available. Various estimates on the distribution of money supply between the two wings have been made. The reliability of the estimates is questionable but have been used for lack of a better alternative. Arif Ayub [2] at the PIDE has made an estimate based on the simplifying assumption that the total currency was distributed between the Wings in the same ratio as the ratio of demand deposits in West and East Pakistan. The usefulness of this estimate is limited by the fact that the proportion of total money supply that was in West Pakistan had changed over the years due to capital flight. Otherwise if the proportion of money in the two

Wings had remained constant, any wrong estimation of the shares, whatever they had been, would not have given us, at least, a biased trend in the data on changes in money supply.

With excess money supply as the independent variable and the rate of change of prices as the dependent variable, regressions were run with and without a one year time-lag.

$$\begin{aligned} P'_t &= 1.192+0.055\ ME \\ R^2 &= 0.95,\ t\text{-statistic}=13.81 \\ P'_{t+1} &= 1.18+0.099\ ME_t \\ R^2 &= 0.49,\ t-\text{statistic}=3.14 \end{aligned}$$

where

P'_t = rate of change of prices $= \dfrac{P_t - P_{t-1}}{P_{t-1}}$

ME = excess money supply

t subscript stands for time.

Some further observations indicate that nominal money supply is highly correlated with money income. Income could be affected by changing velocity as well, but since the trend in velocity is opposite to that of money supply, the movement in money income Ym is affected by the movements in money supply. This implies that the money supply was so great that the dampening effect of velocity was more than offset.

$$Ym=691.2+2.035\ M \qquad R^2 = 0.95,\quad t = 16.1$$

It is also observed that the movements in money income are more highly correlated with money supply than movements of real income Y_R. This implies that the money supply affects the price-level reflected in the movement of money income.

$$Y_R = 1567.3+0.75\ M \qquad R^2=0.61,\quad t=3.14$$

A diagrammatic exposition of the original contention that prices are influenced to a great degree by excess money supply brings out some more points.

It is observed that any downward movement of the price index has been associated with a negative 'excess' money supply. However, very large fluctuations of the excess money supply are required to influence the price index to a significant degree.

The conclusion to be drawn from the above analysis is that movements in nominal national income associated with the money supply are merely reflecting the price changes. Prices have been affected most when the increases in money supply ignored the variation in the velocity of money and were, as a consequence, much beyond the 'absorptive capacity' of the economy. A noteworthy point is that only large excesses of money supply cause price-level to change by any considerable amount. The last point is of special interest

if confidence in the accurate prediction of the velocity of money is low, because in such a case, only a very bad estimation of the velocity will land policy makers in trouble.

II. FACTORS DETERMINING VELOCITY OF MONEY

Before proceeding to analyse the determinants of the velocity of money, it is useful to distinguish between nominal and real stocks of money and clarify why the velocity concept is used interchangeably with the demand for money.

The nominal stock of money is determined by the monetary authorities and institutions, while the real stock of money is determined primarily by the holders of money, who can change its value to anything in the aggregate. A desire to reduce real cash balance leads to increased expenditure which of course does not reduce the aggregate nominal money supply, but through increased money prices, reduces the real money stock. Similarly since velocity is the ratio of money income to the nominal supply of money, an increase in expenditure will raise money incomes given the money supply, which means that velocity will go up. However, since an increased expenditure is the result of a desire to decrease cash balances, a rising velocity is equivalent to a decreasing demand for real cash balances.

One of the controversial topics in monetary theory is the stability of the demand function for money. According to Friedman's theoretical deductions and empirical findings [6] the secular behaviour of velocity is the reverse of the cyclical or short run behaviour. Friedman explains the discrepancy between the short and long run results by using variables which account for the difference between the measures of income and prices as used by statisticians and the measures as used by the holders of money. He introduces the concepts of actual and permanent income. A number of empirical analysis of underdeveloped economies have also shown contrasting results. Some of the investigations [1,4,9,10] show that velocity is a negative function of per capita income, while others conclude the reverse [3].

The above contention that the velocity is a negative function of per capita income is based on the deduction that during development, monetary expansion normally proceeds at a greater rate than money income, and since velocity is their ratio, it falls as real income grows. The empirical results have also shown the income elasticity of demand for money to exceed one or that velocity falls as income rises, implying that money is a superior good. This conclusion is disputed but as Meltzer [8] has shown, it is valid if the definition of money includes assets other than currency and demand deposits. Accordingly, the definition of money adopted in this exercise has a wider coverage. The purpose of this section is to analyse the behaviour of velocity in Pakistan and, where necessary, use additional variables, which affect the demand for money, to bring out more clearly the true relationships as exist in this economy.

Data on velocity and real per capita income were fitted to a linear regression line. As is common with time series data, auto-correlation was acute. After correcting for autocorrelation, the coefficients obtained were:

$$V = 0.67 - 0.0036\,\bar{Y}_R \qquad R^2 = 0.57 \qquad t = -2.32$$

We have obtained a negative sign for the coefficient, but since the coefficient of multiple correlation was low, it was necessary to include some other explanatory variables whose influence on velocity was blurring that of per capita income.

The behaviour of the velocity of money is a result of observable monetary phenomena and human decisions based on habits and expectations. Admittedly, the economy of Pakistan and for that matter any economy, is not a set of homogeneous monetary circuits. Hypothetical sectors are imaginable with varying velocities of money, along with a non-monetized sector of unmeasurable but changing size. It is important to note that changes in the sizes of any of the monetized sectors or the non-monetized sector will affect the velocity of money for the entire economy, just as much as the changes in the velocities of the various sectors will. However, there are unsurmountable obstacles in analysing an economy so closely because not only are the sub-sectors or the monetized sector vaguely defined, but the money supply in the various circuits is also very difficult to estimate. The changing size of the monetized sector has a considerable influence on the velocity of money. This may be viewed in two ways. First, monetization may take the form of the monetary authority inducing a shift of transactions from the subsistance to the commercial sector through increased issue of money without raising GDE; this process reduces velocity. The other more plausible view is that the spread of monetary institutions and increased sophistication of the economy coupled with the demand for more diversified types of goods, necessitates the use of money in transactions. This implies that a given stock of money is used in more transaction now, which is possible only if the velocity of money is increased.

In Pakistan, the non-monetized sector, restricted mainly to agriculture, includes the non-marketed subsistence production of farmers, wages for seasonal labour, and payments for social services. These are together assumed to be a constant proportion, k, of the agricultural production, but since the latter as a proportion of national income, is declining, so is the size of the non-monetized sector. According to the estimates of C.S.O., based on studies carried out, the marketed production of the major agricultural products is as follows: Rice 80%, wheat and other food crops 40%, cotton 100%, other crops, fruits and vegetables 90%.

On the basis of this observation and accounting for the other non-money transaction, 53% of agriculture is calculated to be monetized. In a functional form, the relationship is shown as:

$$V = f(Y - N) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Where $N = kA = kpY$

hence $V = f(Y - Ykp) = f\ [Y(1 - kp)]$

V = Velocity, Y = national income

N = non-monetized sector A = Agricultural income

$O < k,\ p < 1$

$$\frac{d\,N}{d\,A} = k$$

$$\frac{d\,A}{d\,Y} > O, \quad \frac{d^2A}{d\,Y^2} < O$$

As already mentioned, an economy is a collection of numerous monetary circuits, each with a different velocity of circulation. The velocity of money for the entire economy is a function of both the velocity, and the size of the component circuits.

$$V = \frac{M_1V_1+M_2V_2 + \ldots\ldots + MnVn}{M_1+M_2+ \ldots\ldots + Mn}$$

V, the velocity of the entire economy, is the weighted average of the various sector's velocities. To include these elements in the model we have two alternatives, after distinguishing the three monetary circuits; agriculture, manufacturing and commerce. First, assume that the money is distributed among the sectors in the same ratio as current deposits; work out the velocities in each sector and use those alongwith the size of the sectors in the model. The size refers to the estimated relative quantity of money in each sector. However, there is implicit in this technique, a very simplifying assumption that the saving habits and financial facilities of each sector are alike and therefore, the demand deposits can be considered as indicators of the quantity of money in each sector. But this is very far from reality.

An alternative, though a simplification, is that the sectors are assigned a priori ordinal velocities and only the changes in their relative sizes (indicated by their respective shares in national income) are incorporated into the model. This study uses the second alternative. Among the three sectors, commerce, manufacturing and agriculture, intuitively speaking, the first will have the highest velocity. In agriculture since the period of production is considerably longer than in the manufacturing sector, one can safely assume a lower velocity for agriculture compared to the manufacturing sector. Now the overall velocity is a weighted average of the sectoral velocities. Since there are only three sectors, the commerce sector's size will have a positive, the agriculture sector's size a negative and the manufacturing sectors size an undetermined relationship with the overall velocity.

Velocity = h(share of the sectors in national income)

$$V = C+b_5T+b_6G-b_7R \ldots\ldots\ldots (2)$$

Where T = share of the commerce sector

G = share of manufacturing sector

R = share of agricultural sector in national income

The positive sign for the coefficient of G has been adopted on a priori grounds; the empirical exercise will determine its true factual sign.

Velocity is also affected by the financial arrangements in an economy. An indicator of a change in monetary habits of people towards a more efficient financial system is the spread of banking. The spread of banking could have two opposing effects. It could increase velocity because increased financial intermediation leads to a higher rate of turnover of money by speeding up lending and borrowing. Or, when time-deposits are included in "money", the spread of bank branches increases the supply of time-deposits, so that people may shift from other forms of liquid wealth (precious metals, precious stones, inventories) into time-deposits. Thus M would increase independently

of PY, reducing velocity. Hence, the sign of the coefficient which the exercise produces will show which of the two effects is stronger in Pakistan. The spread of the banking system in this regard depends on the number of branches opened by the banks. In the functional form

$$V = g(B).....(3)$$

The rate of change of prices is a potential explanatory variables of the behaviour of income-velocity. The relationship is based on the speculative motive for holding money. An expected rise in prices will induce the people to hold real goods and vice versa. This brings forth the causative role of prices in inflation. Since expectations are a function of the past and the present conditions, the effect of prices on the demand for money will be felt with a time lag.

$$Vt = f(P\cdot_{t-1})$$

$$\text{where } P\cdot_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Interest rates on long-term and short-term bonds is another factor affecting the demand for money. Although very important in monetary theory, this factor has not been included in this model because inflation in Pakistan has normally been high enough to offset any gains from interest receipts rendering irrelevant any discussion on the substitution of monetary assets by bonds and securities.

An important factor in the demand for money is the precautionary motive which is even more so in a country like Pakistan where a large number of people live near subsistence and must make provision for emergency money needs. Precautionary balances increase but less than the increases in wealth, because of the greater access wealthier people have to markets where non-money wealth can be changed into money. The use of real per capita income in our analysis will cover the influence of wealth on velocity, because there is very little evidence on the marginal relationship between output and physical capital, despite Porter's opinion on the relationship [9]. Adding up the functional relationship of all the explanatory variables to the original regression model, we have

$$V = f\ [\bar{Y}_R, Y(1\text{-}kp), P\cdot_{t-1}, B, T, G, R]$$

putting it in a linear form

$$V = a - b_1 \bar{Y}_R + b_2\ Y(1-kp) + b_3\ P\cdot_{t-1} + b_4 B + b_5 T + b_6 G - b_7 R$$

After the initial run of the regression, some modifications were necessitated by the statistical problems which arose. A look at the results showed that multi-collinearity was high for some of the variables. The model was accordingly modified. The variable R was dropped and T and G combined. This is justifiable on the grounds that we assume only two sectors of significantly different velocities; agriculture and commerce industry combined. Since the proportion of TG to national income is an indicator of agriculture's ratio to national income, the latter could be safely dropped. In addition, the size (in absolute terms) of the monetized sector would now be replaced by (1-kp). This is the share of the monetized sector in national income given as a fraction.

The functional form of the relationship in the modified model is

$$V = f(\bar{Y}_R, (1\text{-}kp), P_{t-1}, B, TG)$$

The independent variables were introduced into the model stepwise. Each additional variable improved the coverage of the movement in V. The results of the successive regressions, are given below:

Table II

Regression Results

	Intercept	Log $\bar{Y}_R$	log (1-kp)	log P_{t-1}	log B	log TG	R^2 (Corrected)	D.W.
log V	1.88	—0.53					0.25	1.97
(t-statistic)		2.16						
log V	0.45	+0.33	+0.78	+0.01	—0.24		0.68	3.1
(t-statistic)		1.14	0.23	0.35	3.15			
log V	0.82	+0.38	+0.46	+0.01	—0.32	+0.66	0.69	1.9
(t-statistic)		1.27	0.13	0.56	2.66	0.88		
log V	0.71	+0.40		+0.01	—0.32	+0.67	0.71	2.8
(t-statistic)		1.65		0.59	3.01	0.96		

The most important point to note is that with the introduction of explanatory variables the sign of $\bar{Y}_R$'s coefficient has become positive. This relationship is more accurate since R^2 and t are more significant in the multivariable regressions. Comparing our results with previous works in the field, the positive relationship is a normal observation in short-run analysis. The long-run analysis relationship appears only if the monetary adjustments are fast in the short-run, (Chow 3); however, in this analysis the conclusions to be drawn from a positive coefficient are not clear because as already stated b_1 is representing the true coefficient of real income, as well as the coefficient of the national wealth. It is quite possible that a negative real income coefficient has been offset by a positive national wealth coefficient.

Among the other explanatory variables it is found that the effect of banks is very marked on velocity. This result is similar to a study by Short [9] for the Malaysian economy. The negative sign of B's coefficient implies that the dampening effect of banking on velocity because of time-deposits competing with other liquid wealth forms for the shape savings can take, is greater than the positive effect of banking on velocity. This conclusion is further supported by the fact that time deposits have increased from 12% of the monetary assets to around 35% over the period of our analysis.

The strongest influence exerted on velocity is that of real per capita income followed by the spread of banking as indicated by the coefficients.

CONCLUSION

Although the trend in velocity over the last 13 years has been downward, having a dampening effect on inflation, the monetary expansion has been

so great that it has more than offset this. The price level is closely correlated to increases in money supply in excess of the absorptive capacity of the economy, the latter determined by changes in real income and the demand for money. The movements in money income are merely reflections of price changes.

Although the real meaning of the positive $\overline{Y}_R$ coefficient is not apparent, it carries a serious warning to monetary policy makers. Whether it is the over-riding wealth effect or the true real income/velocitv relationship, a positive coefficient of $\overline{Y}_R$, means that the role of money creating institutions is limited in the development process if price stability remains a policy objective. The effect of speculative expenditure on the demand for money is not only small but insignificant. This conclusion may change if the last two years 1972-74 were analysed in isolation when inflation was of a much higher degree. And finally, the spread of banking has helped to decrease the velocity of money by changing the financial habits of people through substituting time-deposits for other forms of liquid wealth.

Table III

The Data used in the Exercise

Year	V	P·%	$\overline{Y}_R$ Rs.	B*	Rs. Mill. Y(1-kp)	TG
1960-61	3.63	4.77	376.5	580	1412	0.347
1961-62	3.50	0.11	383.4	713	1492	0.361
1962-63	3.18	1.71	409.7	957	1610	0.378
1963-64	3.19	3.39	431.9	1298	1813	0.390
1964-65	3.28	6.77	448.6	1591	2082	0.402
1965-66	2.93	1.33	487.2	1967	2334	0.407
1966-67	3.12	11.00	481.7	2285	2609	0.406
1967-68	2.94	1.31	505.5	2536	2829	0.399
1968-69	2.79	2.80	511.1	2842	3066	0.426
1969-70	2.75	2.04	536.2	3170	3340	0.454
1970-71	3.10	3.88	540.1	3153	3639	0.448
1971-72	2.37	0.46	517.7	3782	3901	0.426
1972-73	2.49	34.98	408.8	3925	4242	0.454

The sources of the data are quoted earlier in the paper.

Note

V = velocity of money = $\frac{Y_m}{M}$;

p·% = rate of change of prices in percentages;

$\overline{Y}_R$ = per capita real income;

B = number of bank branches;

Y(1-kp) = size of the monetized sector;

TG = share of the trading and manufacturing sectors in national income.

*These data pertain to all Pakistan. Since the expansion of banking was the same in both the wings of Pakistan, the estimated equation would not contain any significant bias.

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