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Trends in Income Velocities

J. O. Adekunle
Central Bank of Nigeria

TRENDS IN INCOME VELOCITIES

With the reinstatement of money as an important factor in explaining or understanding the course of economic developments, income velocity has been playing a more important role in monetary analysis. The earlier supposition that income velocity is constant has been abandoned. Income velocity is now analysed in a functional relationship. Its stability in the short-run is analysed in a relation in which the explanatory variables include the yields on money substitutes. Its trend or secular behaviour is related to more long-term variables such as growth in income or the spread of monetization.

The projection of credit requirements often necessitates the making of prior projections of the trend behaviour of income velocity. The expected behaviour of velocity plays an important role in the determination of the rate of credit expansion that is non-disequilibrating.[1] Expectations about the behaviour of velocity in an economy should, in the first place, be based on its observed behaviour in the past. In most less-developed countries, however, income velocity series are not of such lengths as to serve as bases for adequate projections. Instead, in projecting income velocity, reliance has been placed on the historical trends in velocity in the developed countries. Empirical studies by Doblin, Friedman and Selden have suggested that the trend in income velocity is negative.[2] In applying the finding of these studies to the analysis of monetary developments in less-developed countries, the analysts seem to agree with Doblin that "the present and future pattern of income velocity in less-developed countries might conform to that of highly industrialized countries as it was 50 or 100 years ago rather than its present course".[3]

In Nigeria, as in most less-developed countries, the available velocity series is relatively short. This paper attempts to analyse the trend behaviour of the available series, covering the 1950-66 period,[4] in order to see whether its behaviour supports the hypothesis that in less-developed countries income velocity declines over time. Because findings about the trend behaviour of velocity tend to vary depending on the definition of money adopted, the velocity of more than one money concept is examined. The behaviours of the income velocities of currency, demand deposits, saving deposits and time deposits are also examined. Also, as the use in the income velocity ratio of an income total that includes subsistence income obscures the isolation of the basic money-holding propensities in an economy like Nigeria, with a substantial (and declining) subsistence sector, the behaviours of total-income velocity and of monetary-income velocity are examined and compared. Finally since there is a break, in 1958, in the comparability of the income series, the behaviours of the velocities between 1958 and 1966 are also examined. And especially because of the shortness of this sub-period, the influence of a short-term factor (price changes) on the behaviour of velocity is explicitly considered.

I.—Factors affecting the trend behaviour of velocity in developing countries

Before getting to the trend and other estimates, it is appropriate to review briefly some of the factors that may account, or are said to account, for the trend behaviour of velocity in less-developed countries.[5] One

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[1] See for example, Clive S. Gray, 'Credit for Nigeria's Economic Development', *The Nigerian Journal of Economic and Social Studies*, Vol. 5, No. 3, November 1963, esp. pp. 302-303; and Hannan Ezekiel, 'Monetary Expansion and Economic Development', *I.M.F. Staff Papers*, Vol. XIV, No. 1, March 1967, pp. 80-88.

[2] Ernest Doblin, 'The Ratio of Income to Money Supply: An International Survey', *Review of Economics and Statistics*, August 1951, pp. 201-213; Milton Friedman, 'The Demand for Money: Some Theoretical and Empirical Results', *Journal of Political Economy*, August 1959; and R. T. Selden, 'Monetary Velocity in the United States' in *Studies in the Quantity Theory of Money*, ed. by Milton Friedman (University of Chicago Press 1957), pp. 179-259. These findings have been supported by a recent cross-section study of income velocities in thirty-seven developed and less-developed countries. Hannan Ezekiel and Joseph O. Adekunle, 'The Secular Behaviour of Income Velocity: An International Cross-Section Study', *I.M.F. Staff Papers* Vol. XVI, No. 2, July 1969, pp. 224-239.

[3] Doblin, *op. cit.* p. 201.

[4] As official income estimates are made on a fiscal year basis, the years are fiscal years and the period correctly specified as 1950/51-1966/67. For convenience of discussion the period is simply referred to as 1950-66. This applies throughout the paper.

[5] The restriction of the discussion to less developed countries is deliberate. There is the likelihood that at sufficiently high per capita income levels, the rate of decline in velocity may become zero or possibly negative; *see* Ezekiel and Adekunle, *op. cit.*

reason that is most frequently given for the decline in velocity in less-developed countries is monetization. However, the concept of monetization has been interpreted in more than one way. One interpretation — the displacement of barter — in particular seems to be analysed in a way that has very little behavioural significance. Arguments such as Bhambri's that reduction of the subsistence sector leads to decline in income velocity[1] seem to be based on a statistical result which follows from the fact that the income in the income velocity estimates includes subsistence income.[2] As such, the behaviour of the income velocity so calculated says very little about the behaviour that is of primary interest — that is, the average and marginal propensities of people to hold cash balances in relation to their monetary income. The numerator of income velocity ratio should be monetary income; biased results, obtained because monetary and subsistence incomes are aggregated, should not be interpreted as constituting the essence of the appropriate income velocity. In a developing country with a substantial subsistence sector, the reduction of the subsistence sector over time can, by itself, be said to lead to a decline in monetary income velocity if it is argued that the average propensity of new entrants to the exchange sector to hold money is consistently higher than the one of those already in that sector.[3] No such argument is made and in fact there is reason to believe that the propensity of such new entrants to hold money will be lower.

But monetization of the economy does have meaning. This can be seen if it is realised that most of the less-developed countries are also less-developed financially. This may mean, to use Friedman's phraseology, that for some time 'money is a luxury', or that money holdings are likely to increase at a higher rate than monetary income. This, however, is likely to operate through the asset motive. Before proceeding, it is perhaps best to differentiate between two basic motives for holding money — the transactions and the asset motives (the so-called precautionary and speculative motives can be subsumed under the asset motive). With respect to the transactions motive, it is difficult to reach a conclusion as to whether this motive by itself results in a trend in income velocity. Views have been expressed that (1) there are economies of scale with respect to money holdings for transaction purposes;[4] (2) there is probably a general tendency for people to hold larger cash balances, as time goes by and as their average income increases, relative to their expenditures for goods and services;[5] and (3) there is stability in income velocity.[6] For less-developed countries it is probably true that the growing differentiation of production in the course of the development of the economy which interrupts the synchronization of payments calls for growing cash reserves. Also, the growth in the scope of purely financial transactions also leads to greater demand for money.[7]

The asset motive is more likely to lead to a faster relative growth in cash balances. The introduction and extension of money into the economy (or the monetization of the economy) has implications beyond those related to the transactions demand for money. It introduces another form of holding wealth. Apart from the rational decision to hold money for asset purposes based on the desire for asset portfolio diversification,[8] this form of holding assets is more versatile, involves minimum commitments and provides a maximum of flexibility to meet

[1] R. S. Bhambri, 'Demand for Money and Investible Surplus' *The Nigerian Journal of Economic and Social Studies,* Vol. 10, No. 1, March 1968, esp. pp. 88 and 91.

[2] Since total income (*i.e.* monetary and subsistence income) generally increases at a slower rate than monetary income, it can be shown that although the monetary velocity remains constant secularly, total income velocity will fall. Or more generally, total income velocity will in this statistical circumstance fall at a higher rate than monetary income velocity.

[3] It is, of course, realised that entry into the exchange sector by a substantial portion of individuals or households is not a process that is started or completed in a particular point in time. It is further realised that degrees of entry differ from household to household. None of these considerations distracts from the view that for money-holding propensity analysis emphasis be placed on non-subsistence income.

[4] Irving Fisher, *Purchasing Power of Money* (New York, MacMillan Co. 1911) pp. 79-89; *see* also George Garvey, 'Money, Liquid Assets, Velocity and Monetary Policies', Banca Nazionale del Lavoro, *Quarterly Review,* December 1964, pp. 323-38.

[5] Clark Warburton, 'The Secular Trend in Monetary Velocity', *The Quarterly Journal of Economics,* Vol. LXIII (1949), p. 90.

[6] J. W. Angell, *Investment and Business Cycles* (New York 1941) p. 158.

[7] This factor relates to transactions velocity rather than to income velocity.

[8] Phillip Cagan, 'The Monetary Dynamics of Hyperinflation' in Friedman (ed), ***Studies in the Quantity Theory of Money,*** p.29.

emergencies and to take advantage of opportunities.[1] Thus, at least, until there is a prolifieration of money substitutes the income elasticity of money is likely to be greater than 1, and velocity is likely to decline in less-developed countries.

II.—Movements in Velocities, 1950-66

In examining the trend in velocity in Nigeria, it is appropriate to examine the behaviour of the income velocity of more than one monetary total. This is so since empirical findings about the strength of the negative trend in income velocity seem to differ depending on the inclusiveness of the definition of money adopted.[2] Also, with respect to conventional money, it is instructive to have some notion of the relative trend movements in the velocities of currency and demand deposits.

Specifically, the income velocities examined are those of :

(1) Currency (C), V_1;
(2) Demand deposits (DD), V_2;
(3) Savings deposits (SD), V_3;
(4) Time deposits (TD), V_4;
(5) Money ($MS_1 = C + DD$), V_5;
(6) MS_2 ($MS_1 + SD$), V_6; and
(7) MS_2 ($MS_2 + TD$), V_7.

In addition, alternative velocities of these monetary totals are examined : (*a*) when income is defined inclusive of (Table 1) and (*b*) exclusive of (Table 2), subsistence income.

The annual monetary and quasi-monetary data are averages of quarterly data. The income data — including the breakdown into monetary sector and subsistence sector incomes — are from the Federal Office of Statistics.

A glance at the columns in Table 1 suggests that more systematic movements are observable with respect to V_3, V_4, V_6 and V_7 than with respect to V_1 V_2 and V_5. This conclusion is also reached when the movements of the V*s are observed—Table 2. In order to observe the movements of the velocities in greater detail, trend lines were fitted to each of them. The trend equation fitted is the simple linear type :

$$V = a + bt + u,$$

where V is the velocity; *a*, *b* are constants; *t* is the trend; and *u* is the error term. Since the hypothesis is that income velocity declines over time, the sign of *b* is expected to be negative. The results obtained from fitting this trend equation to the alternative velocity ratios, and using total income and monetary income are presented in Tables 3 and 4, respectively. It is appropriate to express a number of reservations about the estimate. First it is possible that the time period covered —seventeen years—is too short for the trend equation to be able to isolate the trends in the velocities. Furthermore, short-run influences may have dominated or substantially influenced the year-to-year movements of the velocities during the period. The question is largely an empirical one; as a first approximation, the trends are fitted on the assumption that the short-run influences will not obscure the observation of the underlying long-term movements. The other stricture relates to the possibility of errors of measurement in the money and the income totals; these errors may be such that cannot be said to cancel out when the velocity ratios are formed. There are reasons to expect that the money totals are less likely to be subject to errors of measurement than are the income totals. The specific income series used are even likely to lead to biased results because there is a break, in about the middle of the series, in its comparability. This issue will be tackled explicitly below.

Looking first at the trend estimates obtained for the velocities of the individual monetary and quasi-monetary assets, it will be observed in Table 3 that while V_1 and V_2 do not seem to have any significant trends, V_3 and V_4 have significant negative trends. The regression coefficient estimated for V_1 (the total-income velocity of currency) is not

[1] Milton Friedman and Anna J. Schwartz, *A Monetary History of the United States*, 1867-1960 (Princeton University Press, 1960) p.660.

[2] Brunner and Meltzer, for example, have argued that Friedman's finding about the decline in income velocity in the United States is dependent on the fact that the money total used was inclusive of time deposits. (Brunner and Meltzer, 'Predicting Velocity: Implications for Theory and Policy, *Journal of Finance*, May 1963). In his study cited above, Doblin commented that 'for most countries, it makes a difference whether money supply is defined as inclusive or exclusive of time deposits' (p. 205). And in Ezekiel and Adekunle *op. cit.*, it was found that the more inclusive the money total, the greater the income elasticity of velocity.

TABLE 1
INCOME VELOCITIES[1]
(Total Income)

Year	V_1	V_2	V_3	V_4	V_5	V_6	V_7
1950-51	16·0	39·7	341·4	269·5	11·4	11·0	10·6
1951-52	14·2	30·8	358·2	249·2	9·7	9·4	9·1
1952-53	14·2	28·0	279·3	192·0	9·4	9·1	8·7
1953-54	13·7	27·1	225·9	159·8	9·1	8·7	8·3
1954-55	16·5	24·3	227·7	158·0	9·8	9·4	8·9
1955-56	17·3	24·1	156·1	165·5	10·1	9·5	9·0
1956-57	16·3	23·9	131·9	193·5	9·7	9·0	8·6
1957-58	17·2	24·3	104·6	151·7	10·0	9·2	8·7
1958-59	17·3	24·1	84·0	100·5	10·1	9·0	8·2
1959-60	16·6	23·8	70·2	86·9	9·8	8·6	7·8
1960-61	14·6	27·1	61·7	123·3	9·5	8·3	7·7
1961-62	15·3	30·4	56·2	92·7	10·2	8·6	7·9
1962-63	17·3	32·6	54·6	79·7	11·3	9·4	8·4
1963-64	17·6	32·2	50·8	74·6	11·4	9·3	8·2
1964-65	16·4	28·1	44·2	60·4	10·3	8·4	7·3
1965-66	16·1	28·2	38·7	51·3	10·2	8·1	7·0
1966-67	15·3	27·1	36·1	43·0	9·8	7·7	6·5

[1] V_1=income velocity of currency; V_2=income velocity of demand deposits; V_3=income velocity of savings deposits (SD); V_4=income velocity of time deposits (TD); V_5=income velocity of M_1 (currency plus demand deposits); V_6=income velocity of M_2 (M_1 plus SD); and V_7=income velocity of M_3 (M_2+TD).

TABLE 2
INCOME VELOCITIES[1]
(Monetary Income)

Year	V_1*	V_2*	V_3*	V_4*	V_5*	V_6*	V_7*
1950-51	8·9	22·0	189·3	149·5	6·6	6·1	5·9
1951-52	8·4	18·4	213·2	148·3	5·8	5·6	5·4
1952-53	8·8	17·4	174·0	119·6	5·9	5·7	5·4
1953-54	8·3	16·5	137·8	97·4	5·5	5·3	5·0
1954-55	9·6	14·2	132·5	91·9	5·7	5·5	5·2
1955-56	10·1	14·1	91·1	96·5	5·9	5·5	5·2
1956-57	9·8	14·4	79·3	116·4	5·8	5·4	5·2
1957-58	10·4	14·6	63·1	91·6	6·1	5·5	5·2
1958-59	8·6	12·0	41·7	49·9	5·0	4·5	4·1
1959-60	8·8	12·6	37·2	46·1	5·2	4·6	4·1
1960-61	7·8	14·4	32·8	65·7	5·0	4·4	4·1
1961-62	8·3	16·4	30·4	50·0	5·5	4·7	4·3
1962-63	9·2	17·3	29·0	42·3	6·0	5·0	4·5
1963-64	9·6	17·6	27·8	40·8	6·2	5·1	4·5
1964-65	9·5	16·3	25·6	35·0	6·0	4·8	4·3
1965-66	9·5	16·7	22·9	30·4	6·1	4·8	4·1
1966-67	9·0	16·0	21·4	25·5	5·8	4·6	3·9

[1] *See* footnote to Table 1.

TABLE 3

INCOME VELOCITIES—TREND ESTIMATES

(Total Income)

	a	*b*	*R*
V^1	15.994	0.082** (0·053)	0·354
V_2	27·988	−0·086** (0·200)	−0·102
V_3	136·565	−19·931 (1·445)	−0·923
V_4	132.447	−12.402 (3·455)	−0.656
V_5	9·629	0·032** (0·165)	0·048
V_6	8.982	−0.101 (0·026)	−0.692
V_7	8·288	−0·158 (0·023)	−0·854

NOTES : The figures in brackets are the

(a) standard errors of the respective regression coefficents

*(b) **Indicates that the coefficent is not significantly different from zero at ·05 probability level.*

significantly different from zero and contrary to expectation, its sign is positive. Although the regression and correlation coefficients estimated for V_2 are not significantly different from zero, the signs of these coefficients are negative. The estimates for the velocities of savings deposits and of time deposits, V_5 and V_4, indicate significant negative trends in these velocities, V_5 showed the stronger trend movement.

The results give some indications of the movements likely to be observed in the velocitities of MS_1, MS_2 and MS_3. Thus with V_1 and V_2 indicating no trend, it is not surprising that the trend estimates obtained for V_5 are not significantly different from zero. The total-income velocity of conventional money does not seem to have had any trend between 1950 and 1966. With savings deposits added to money supply, V_6 (the total-income velocity of MS_2) shows a significant negative trend movement. Similarly, V_7 trended negatively during the period. It will be noticed that the broader the concept of money supply the stronger the negative trend movement in the velocity. This agrees with findings that have been reported for other countries.[1]

Before going on to discuss the corresponding velocities when income is defined net of subsistence sector income, some comment on the finding that V_5 or the total income velocity of money supply did not show any trend is called for in view of a recent observation by Bhambri that the ratio of money supply to GNP (or the inverse of V_5) 'has been increasing gradually in recent years'.[2] Bhambri claimed that this observation was based on estimates presented by Clive Gray for the period 1954-60[3] Although the period covered in this paper is longer, it includes the 1954-60 period. Furthermore, the V_5 estimates for this period that are presented in Table 1 do not suggest a decline in V_5 or, as Bhambri claims, indicate an increase in its inverse. The seeming contradiction is however quickly resolved. Reference to Gray's article showed that Bhambri based his judgement on a wrong set of figures. Gray's Table 3, that Bhambri took as presenting estimates of the ratio of money supply to GNP, refers explicitly to the ratio of imports to GNP. In Table 6 of his paper, Gray, in fact, presented income velocity ratios.[4] These do not suggest a fall in V_5 or that the ratio of money supply to GNP increased.[5]

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[1] *See* foot note 2, page 5.

[2] R. S. Bhambri, 'Demand for Money and Investible Surplus' *The Nigerian Journal of Economic and Social Studies,* Vol. 10, No. 1 (March 1968), p.91. Although the velocity estimates in this paper are based on GDP, this should not lead to significant differences in trend movements.

[3] Clive S. Gray, 'Credit Creation for Nigeria's Economic Development' *The Nigerian Journal of Economic and Social Studies,* Vol. 5, No. 3 (November 1963), p. 258.

[4] *Ibid.,* p. 263.

[5] For Gray's interpretation of his velocity estimates *see ibid.,* pp. 302-303.

Table 4 presents the trend estimates obtained when the income in the numerator of the respective velocity ratios is defined net of subsistence income, thereby obtaining what may be called the monetary-income velocities. On the whole, the conclusions reached from the trend estimates of the V*'s are the same as those obtained from those of the V's, V_1^* and V_2^* do not seem to have had significant trends during 1950-1966; V_3^* and V_4^* have significant negative trends. Estimates for V_5^*, as those for V_5, do not indicate any significant trend although the trend coefficients of V_5^* have the expected negative signs. Both V_6^* and V_7^* have significant negative trends.

Although the tentative conclusions reached about the trends in the velocities are the same whether one considers the trend estimates obtained from the V's or the V*s, those obtained from the V*s are more appropriate. If one is interested in the 'money' holding propensities in the economy, one clearly should be concerned with the monetary income velocities.

TABLE 4
INCOME VELOCITIES—TREND ESTIMATES
(Monetary Income)

	a	*b*	*R*
V_1^*	9.094	0.016** (0·036)	0.107
V_2^*	15·935	−0·107** (0·112)	−0·227
V_3^*	79·359	−11·840 (1·247)	−0·917
V_4^*	76·288	−7·580 (0·672)	−0·939
V_5^*	5·771	−0·007** (0·019)	−0·090
V_6^*	5·124	−0·077 (0·014)	−0·788
V_7^*	4·729	−0·105 (0·013)	−0·891

Notes: *See Table* 3

III.—Movements in Velocities 1958-66

Conclusions reached so far have to be interpreted against the background of possible bias introduced into the estimate by the break in the comparability of the income statistics. The GDP estimates for the period 1950-1957 were estimated by E. G. Jackson and P. N. Okigbo. Those for later years were compiled by the Federal Office of Statistics. Comparisons of the Jackson/Okigbo procedures with those of the Federal Office of Statistics show that there are substantial differences in sources and estimating procedures.[1] The Federal Office of Statistics insists that the two series are not comparable. It is therefore necessary to look at the behaviour of the velocities during 1958-1966 separately. If conclusions reached about velocity behaviour in the 1950-1966 and the 1958-1966 periods are essentially the same, then the presumption may be that the non-comparability is not significant for the purposes of the present analysis. However, if they differ one may tend to place more validity on the results obtained for the 1958-1966 period. It is clear that this period is short and that this will make the isolation of trend movement even more difficult.

Some indications of the movements of the velocities during 1958-1966 can be inferred from Tables 1 and 2. It does not seem that the velocities of currency, demand deposits and money supply declined during the period.

The trend estimates of the V's for the 1958-1966 period are presented in Table 5. Again it is found that while no significant trends are estimated for V_1 and V_2, the trends estimated for V_3 and V_4 are negative and significant. Although the sign of the trend coefficients of V_5 is negative, the coefficients are not significantly different from zero. For V_6, the coefficients are positive but they are also not significantly different from zero. Estimates obtained for V_3 and V_4 suggest that these velocities had negative trends during the period. V_3, however, seems to have had a more pronounced trend movement than V_4 — correlation coefficients of −0·974 and −0·869 respectively.

[1] Federation of Nigeria, *Federal Office of Statistics, Gross Domestic Product of Nigeria,* 1958/59-1966/67, especially pp. 33-34 (Lagos: Federal Office of Statistics) August, 1968.

TABLE 5
INCOME VELOCITIES—TREND ESTIMATES
(*Total Income*, 1958-66)

	a	*b*	*R*
V_1	16·278	−0·060** (0·125)	−0·158
V_2	−28·178	0·483** (0·341)	0·427
V_3	55·167	−5·442 (0·940)	−0·974
V_4	79·156	−8·012 (1.519)	−0·869
V_5	10·289	0·047** (0·212)	0·073
V_6	8·600	−0·097** (0·062)	−0·460
V_7	7·667	−0·162 (0·028)	−0·771

Notes: *See Table* 3

With estimates for V_1 and V_2 not showing any significant trend movements, it is not surprising that the trend estimates for V_5 do not suggest that this velocity had any significant trend movement. Although the total income velocity of saving deposits (V_3) trended negatively during the period, the total-income velocity of money supply plus savings deposits (V_6), does not seem to have had a significant trend movement during the period. The signs of the trend coefficient are negative and although the *b* is larger than its standard error, it is only about 1·5 times larger. The estimates for V_6 are to be expected, for although V_3 shows a significant trend movement, savings deposits formed on 17 per cent of MS_2 during the period. The influence of the trend behaviour of money supply is thus likely to be very important in the estimates for V_6.

This influence is also noticeable, but to a less extent, in the estimates obtained for V_7. However, in this case, with the velocities of savings and time deposits having significant negative trends and those of currency and demand deposits having no significant trends, the estimates for V_7 show a significant trend.

Results for the V*'s — Table 6 — are very interesting. The estimates for V_1* again do not indicate any trend movement. The sign of the regression coefficient is positive; the coefficient is twice its standard error but does not meet the test of significance. The results for V_2*, however, indicate a significant positive trend movement in the velocity of demand deposits. The trend estimates for V_3* and V_4* are again negative and significantly different from zero. V_3* has a more significant trend than V_4*.

For the first time, it is possible to report a significant trend in the velocity of money. V_5* increased significantly during the 1958-66 period. Again, given the proportion of SD to MS_2 and of SD + TD to MS_3 (26 per cent) and given the fact that the trend estimates obtained for V_5* are significant and positive those obtained for V_6* and V_7* are not significantly different from zero. The signs of the estimated coefficients for V_6* are, in fact, positive. Those obtained for V_7* are, however negative.

In summary, during the 1958-66 period, V_1, V_2, V_5 and V_6 had no statistically significant trends, while V_3 V_4 and V_7 had significant negative trends. With respect to the monetary income velocities, it is found that V_7*, V_5* and V_7* did not have significant trends. Of the remaining four velocities, two — V_2* and V_5* have significant positive trends while V_3* had a significant negative trend.

TABLE 6
INCOME VELOCITIES—TREND ESTIMATES
(*Monetary Income*, 1958-66)

	a	*b*	*R*
V_1*	8·922	0·140** (0·070)	0·551
V_2*	15·478	0·555 (0·150)	0·776
V_3*	29·644	−2·352 (0·501)	−0·842
V_4*	42·856	−3·588 (0·837)	−0·819
V_5*	5·644	0·143 (0·047)	0·712
V_6*	4.722	0.037** (0·031)	0.369
V_7*	4·211	−0·003** (0·023)	−0·048

Notes: *See Table* 3

There seems to be a systematic relationship between the corresponding correlation coefficients in Tables 5 and 6. Each of the correlation coefficients of the V's (in Table 5) seems to have a greater negative trend tendency than the corresponding correlation coefficients of V*s (in Table 6). For instance, from Table 5, one would conclude that the total-income velocity of conventional money (V_6) does not have a significant trend, while from Table 6 one would conclude that the monetary-income velocity of conventional money had a positive trend. Also, while V_6 and V_7 have a correlation coefficients of -0.46 and -0.77, respectively, V_6^* and V_7^* had correlation coefficients of 0.37 and -0.55 respectively.

The conclusions reached about the trend behaviours of the velocities during 1950-66 and during 1958-66 differ in some important respects. In discussing these, attention is focussed mainly on the V*s or the monetary income velocity. While the trend estimate for V_3^* for the longer period shows no significant trend the estimate for the shorter period indicates a significant positive trend. Similarly while the V_5^* series for the longer period does not seem to have had a significant trend, those for the shorter period had a significant negative trend. Also, while the V_6^* series for the longer period had a significant negative trend those for the shorter period did not indicate any trend.

However, one important set of similarities runs through all the estimates. Both in the longer and the shorter periods and using total and monetary incomes, the velocities of SD and TD had statistically significant negative trends.

Since the conclusions reached from the trend estimates of the velocities for the two periods differ, greater reliance should perhaps be placed on the estimates for the shorter than on those for the longer period. One, however, cannot easily ignore the fact that the period is not long enough to form the basis of strong conclusions as to the trend movements in the velocities. But in some circumstances projections have to be made in the face of paucity of information. For instance, on the movement of velocity of money during the First National Development Plan, Gray comments, "... depending on the reliability of the Economic Planning Unit's estimates of 1959-60 GDP average velocity seems to have fallen since 1958. If this fall continues during the Plan period, the increase in the money supply would have to be greater than the increase in money income ..." Similarly but more heroically, Bhambri projects the changes in velocity thus :

> ... in the six-year period (1954-1960), the ratio increased by about 32 per cent. This is equal to an average yearly rate of increase of just under five per cent. This change has clearly been partly due to the spread of monetization. As the money economy embraces a larger proportion of the economy, the proportional importance of monetization is bound to decline. It would therefore seem reasonable to assume a value of four per cent for the annual change in the ratio M/GNP for the next plan period.[2]

In any event, an attempt can now be made to see to what extent factors that could be said to have operated in the short-run may have influenced the behaviour of the monetary-income velocities during 1958-1966. Very complicated functions of the short-run behaviour of velocity can be specified.[1] It would however, not be possible to find data to approximate most of the variables in such functions. One variable which, conceptually, is expected to influence the movements in velocity or in the demand for money and for which data are available is the rate of change in the price level. What influence could price changes be said to have on the velocities ?

One important motive for holding money, or the other assets being considered, is the store-of-value or asset motive. Therefore, when prices are expected to increase these assets lose some of their store-of-value characteristics. Holders will adjust their holdings so as to minimize their expected losses from the expected fall in the value of money. Part of this adjustment will involve movements into the holding of real assets (including consumers' goods) and into other financial assets not denominated in money terms. This

[1] See for example, Milton Friedman "The Quantity Theory of Money—A Restatement" *op. cit;* Seldon, *op. cit.* and Adekunle, "The Demand for Money: Evidence from Developed and Less Developed Economics", *I.M.F. Staff Papers*, Vol. XV, No.2, July 1968.

adjustment will mean or lead to increases in velocity.

It has been found above (Table 6) that (*a*)V_1^* did not have a significant trend, (*b*) V_2^* had a significant positive trend and, (*c*) V_3^* and V_4^* had significant negative trends. The possibility that may now be examined is that the trend-related declines in these velocities would have been more apparent but for the influences of short-term factors such as price movements.

In the following, only the influence of price movements on the monetary income velocities of the principal assets — currency, demand, savings, and time deposits — is examined. First, simple relationships in which variations in the velocities are related to price movements are estimated. It is possible that the explanatory power of the rate of price change is such that this relationship would provide adequate indication of the influence of price change on the velocities. The relationship estimated for each of the four velocities takes the following form :

$$Vt^* = a + bPt + v,$$

where P is the percentage change in the GDP price deflator; a and b are constants and v is the error term. The sign of b is expected to be positive.

The estimates obtained for the four monetary velocities are :

$$V_1^* = 8{\cdot}996 - 0{\cdot}061P^{**}; \quad R^2 = 0{\cdot}067 \quad (0{\cdot}076)$$

$$V_2^* = 15{\cdot}260 + 0{\cdot}182P^{**}; \quad R^2 = 0{\cdot}054 \quad (0{\cdot}253)$$

$$V_3^* = 29{\cdot}627 + 0{\cdot}108P^{**}; \quad R^2 = 0{\cdot}002 \quad (0{\cdot}845)$$

$$V_4^* = 40{\cdot}160 + 2{\cdot}246P^{**}; \quad R^2 = 0{\cdot}235 \quad (1{\cdot}351)$$

None of the velocities seems to have been significantly influenced by price movements during the period. In the V_1^* relationship, the sign of the estimated regression coefficient is negative. In the other relationships, however, the signs of regression coefficients are, as expected, positive. Of the four velocities the velocity of time deposits comes nearest to indicating a significant relationship with the price variable.

In a situation where trend movements are also thought to have influenced the velocities, it is possible to argue that the appropriate way to investigate the influence of price changes on the velocities is to adopt a multiple regression approach. This approach will allow the isolation of the influence of price changes on the velocities with the influence of trend held constant and vice versa. It will also give an estimate of the joint influence of these explanatory variables on the velocities. This relationship was estimated for each of the four velocities. With the variables as defined earlier the estimates obtained are as follows :

$$V_1^* = 8{\cdot}292 - 0{\cdot}032P^{**} + 0{\cdot}134t^{**}; \quad R^2 = 0{\cdot}324 \quad (0{\cdot}569) \quad (0{\cdot}063)$$

$$V_2^* = 11{\cdot}978 + 0{\cdot}325P + 0{\cdot}622t; \quad R^2 = 0{\cdot}773 \quad (0{\cdot}127) \quad (0{\cdot}121)$$

$$V_3^* = 42{\cdot}645 - 0{\cdot}456P^{**} - 2{\cdot}446t; \quad R^2 = 0{\cdot}728 \quad (0{\cdot}450) \quad (0{\cdot}426)$$

$$V_4^* = 57{\cdot}470 + 1{\cdot}491P^{**} - 3{\cdot}281t; \quad R^2 = 0{\cdot}769 \quad (0{\cdot}759) \quad (0{\cdot}718)$$

The regression coefficients of the price and trend variables in the V_1^* relationship have the wrongs signs and are not significantly different from zero. The trend coefficient is, however, more than twice its standard error and just missed being significant at the 5 per cent level. These variables explain about 32 per cent of the variance in V_1^* during the period. This compares with the R^2 of .30 estimated when trend alone is used as the explanatory variable (*see* Table 6) and with .067 when only the price variable was used. As much variation in the monetary income velocity of currency is explained by trend as by both trend and price movements.

With respect to V_2^*, both regression coefficients are significant. A positive relationship seems to have existed between the rate of change in prices and the monetary-income velocity of demand deposits during 1958-66. The coefficient of the trend variable is, again, positive. Both variables explain about 77 per cent of the variance in the velocity. This compares with the 60 per cent variance when only trend is used as the explanatory variable. It will be recalled that used alone, the price variable did not seem to have had a significant influence on the velocity of demand deposits. However, in a multiple relationship

its influence seems to be isolatable and significant.

The sign of the price variable in the V_3^* relation is the wrong one and the coefficient of the price variable is not significantly different from zero. The coefficient of the trend variable is negative, as expected, and it is significantly different from zero. The estimated R^2 is 0.73 compared with 0.71 when only trend is used as the independent variable. Price movements do not seem to have had much influence on the monetary income velocity of savings deposits.

In the V_4^* relationship, the coefficient of the independent variables have the expected signs. However, only the coefficient of the trend variable is significantly different from zero. The coefficient of the price variable is slightly more than twice its standard error. This relationship explains about 77 per cent of the variance in the monetary income velocity of time deposits. This compares with an explanation of 67 per cent of the variance in the velocity when only the trend variable is used and with about 24 per cent when the price variable is used as the only explanatory variable. Even though it is less evident than in the case of the monetary-income velocity of demand deposits, price changes seem to influence movement in the monetary income velocity of time deposits.

It is interesting to note, parenthetically, that when only trend is used in the velocity relationships (Table 6), the R^2 or R estimated for V_3^* was the highest followed by those of V_4^*, V_2^* and V_1^* in that order. However, in the multiple relationships, the highest R^2 or R was estimated for V_2^* and was followed, in descending order, by those of V_4^*, V_3^* and V_1^*.

The results of the multiple relationships suggest that (*a*) there was no significant trend in the monetary income velocity of currency, (*b*) the trend in the monetary income velocity of demand deposits was positive, and (*c*) the trends in the monetary income velocities of savings and time deposits were negative. The findings about the influence of price movements of the velocities are very interesting. Movements in price seem to have influenced the velocity of demand deposits and also that of time deposits. They do not seem to have had noticeable influences on the monetary velocities of currency and savings deposits.

Although the period is short, the findings of a positive trend in the velocity of demand deposits and of no significant trend in that of currency are contrary to expectation. These findings — especially the one with respect to the velocity of demand deposits—are difficult to explain. It is, however, likely that the trend movement especially of the monetary-income velocity of demand deposits during 1958-66 may have been influenced by the growth in the Nigerian money and capital markets. The introduction and the increase during the period in the availability of money market papers offered holders possibilities of increased economy in the holding of money. Businesses are more likely to take advantage of such opportunities, and this may account for the fact that the trend in the velocity of demand deposits had a positive trend in the period under review. Businesses hold a substantial proportion of demand deposits. The impact of their behaviour on the velocity of currency can be expected to be less because they hold a relatively smaller share and because the individual business' currency holdings are small and are related to petty-cash needs.

With respect to the price variable, it should be noted that the assets — demand and time deposits — which seem to react to price changes are those in which business sector holdings are relatively large while those — currency and savings deposits — that seem to be immune to price movements are those the greater proportion of which are held by the household sector.[1] This suggests that there are basic differences in the behaviours of the household and business sectors with respect to holdings of monetary and quasi-monetary assets. However, this is one implication of the reported findings. This possibility will have to be examined against other sets of data. In any event, the string of results that have been reported in this paper suggest that better insights into 'money' holding propensities could be gained by not relying solely on estimates obtained when two or more assets are lumped together but on the analysis, in addition, of the individual assets.

[1] During the 1963-67 period households held on the average about 26, 16 and 92 per cent, respectively, of demand deposits, time deposits, and savings deposits.

IV.—Conclusions

This paper has examined the trends in velocities in Nigeria during 1950-66 to see whether the observed behaviours conform to the generally held view that the income velocity of money falls in less-developed countries.

In investigating this behaviour, alternative definitions of money were adopted and the behaviour of the individual components of the alternative money supply were examined. In calculating the velocity ratios alternative definitions of income were used; these are : (*a*) total income, made up of subsistence sector and monetary sector incomes and, (*b*) money sector income alone. Furthermore, because of the break in the continuity of the incomes series, the movements of the velocities during 1958-66 were also examined.

During 1950-66, it was found that the total income velocity of currency, demand deposits and of conventional money did not have significant trends. On the other hand, the total income velocities of savings deposits, time deposits, money plus savings deposits, and of money plus savings and time deposits had significant negative trends. These conclusions were also reached with respect to the monetary income velocities.

For the shorter 1958-66 period it was found that the total income velocities of currency, demand deposits, money and of money plus savings deposits did not have significant trends. Those of savings deposits, time deposits, and money plus savings and time deposits had significant negative trends. The results of the monetary income velocities for this period differed, in several instances, from those obtained for the total income velocities. The monetary-income velocities of currency, money plus savings deposits, and money plus savings and time deposits were found to indicate no significant trends. The monetary-income velocities of demand deposits and of money had significant positive trends. Those of savings deposits and of time deposits had negative trends.

Because of the break in the comparability in the income series, it was felt that emphasis should be placed on the results obtained for the shorter period. Further since they reflect, more appropriately, the money-holding propensities of the economy, more emphasis is placed on the movements of the monetary-income velocities. These suggest that the ratio of monetary income that was held in the form of money decreased significantly during 1958-66 — the monetary-income velocity of money increased. As the monetary-income velocity of currency did not show any significant trend movement, the increase in the velocity of money is attributable to the increase in the velocity of demand deposits. Whether income is taken as total income or as monetary income, the proportion of income held in the form of savings and in the form of demand deposits increased significantly during the period. The same result was found for the longer period.

In view of the shortness of the sub-period an attempt was made to see whether or to what extent the movements of the velocities were dominated by short-term factors. In doing this only the behaviours of the monetary income velocities of currency, demand deposits, savings deposits, and time deposits were examined. The influence of the short-term variable examined is that of price change.

Price movements seemed to affect the movements in the monetary income velocities of demand and time deposits. It was not possible to find any evidence of the influence of price movements on either the velocities of currency or on that of savings deposits. Since businesses hold the greater proportions of demand and time deposits, this finding suggests that during the period the business sector demand for these assets has been affected more by the yields on money substitutes. The household sector's demand for the assets seemed not to have been influenced by these yields.

Differences in the money demand functions of the business and household sectors may also have accounted for the increase in the monetary income velocity of conventional money in the 1958-66 period. This increase is directly attributable to the increase in the velocity of demand deposits. Since households held only about one-quarter of these deposits, it is likely that business sector behaviour in respect of the holdings of these assets played an important role in determining the movement in the velocity. One factor that could have accounted for the increase in the velocity is the business sector's reaction to the introduction, and substantial increases in the supply, of money market instruments during the period.

J. O. Adekunle,
Research Department