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INCOME VELOCITY BEHAVIOUR IN DEVELOPING
COUNTRIES

Ashfaqe h. Khan
Research Economist

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PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS
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INCOME VELOCITY BEHAVIOUR IN DEVELOPING COUNTRIES

There has been a growing recognition of the importance of money in the determination of income, the level of employment and prices in recent years. The revival of the quantity theory, and the rise of associated monetarist approach to economic stabilization gave much importance to the study of income velocity behaviour. The essential aspect of the monetarist view, is the assumption that 'velocity', rather than the 'multiplier' is the key relationship in the understanding of macro economic development in the economy.¹

The income velocity of money is the number of times the stock of money is turned over per year in financing the annual flow of income. It is defined as

$$V = Y/M \quad \dots \dots \dots (1)$$

where V is the income velocity, Y is the national income, and M is the money stock. If we write (1) as

$$Y = VM$$

we see one of the major reasons why economists have examined the behaviour of velocity. Given the money stock and the velocity, we know the level of national income. Thus, if we can predict the level of velocity, we can predict the level of national income, given the money stock. How great a command over resources the government and banking system are able to obtain without causing inflation by issuing newly created money depends on the behaviour of the velocity of money during economic growth².

¹ See Johnson [11].

² See Short [19].

Along with these developments has come the proliferation of studies on income velocity behaviour in both developed and the developing countries. Most of the empirical studies have been concerned with explaining international differences in velocity and/or testing a small number of common variables such as per capita income and inflationary expectation among different economies. The hypotheses that velocity is a negative function of per capita income has been the subject of long controversy. Many economists have stated that velocity is a negative function of per capita income, see for example [4, 6, 7, 18, 20]. Perhaps one of the reasons for these statement is the income elasticity of the demand for money exceeded one. The evidence is by no means conclusive. In fact, closer inspection shows that the case is not clear even for the studies just cited above. First, Chow's [2] work for a later period in the United States contradicts Selden [18] and Friedman [7]. Second, Ezekiel and Adekunle [6] did not find per capita income statistically significant with negative sign. Third, Melitz and Correa [17] discarded per capita income because it seemed statistically insignificant. Fourth, for Pakistan, Soligo [20] did not find definite trend in velocity. Although he recognized per capita income as a potential determinant of velocity but he did not use it to explain the behaviour of velocity in Pakistan³ from 1950 to 1967.

The influence of inflation on income velocity is also not clear. Some authors argued that velocity is a positive function of inflation, such as [10, 16, 21] while others [17] did not support the view.

³ Akhtar [1] did find a significant negative relation between income velocity and per capita income for the period 1951-67.

Empirical findings of Melitz and Correa [17] on international differences in income velocity concludes that inflation does not influence velocity. Wallich [21] has criticized the results of Melitz and Correa, arguing that they have dismissed inflation too quickly as an explanatory variable. Hanson and Vogel [10] in contrast to the findings of Melitz and Correa found that inflation has a significant positive impact on the income velocity. Therefore, the empirical evidence regarding the impact of per capita income and inflation on income velocity are by no means conclusive. This gives us enough reasons to embark on yet another empirical effort in less developed countries comprising of Pakistan, India, Malaysia, Thailand, Korea and Sri Lanka for the period 1960-78. Since most of the studies cited above have tested the impact of per capita income and inflation on income velocity for United States and Latin American Countries, it would be instructive to investigate the same relationship for the less developed countries of Asia.

The purpose of this paper is two fold.

- a) to test the hypotheses that real per capita income is inversely related and inflationary expectation is positively related to income velocity for the individual countries listed above as well as less developed countries as a whole by pooling both time-series and cross-section observations.
- b) Besides per capita income and inflation we also examine various institutional and other influences on velocity within particular economies.

The paper proceeds as follows. In section I, we specify the function to be estimated and discuss the methodological issues and data. The regression results are reported in section II. Section III contains policy implication while the final section highlights the major conclusions of this study.

Methodology and Data

After the revival of the quantity theory and the rise of associated monetarist approach to economic stabilization, the income velocity behaviour has been widely studied in both developed and developing countries. Most of the empirical studies have been concerned with explaining international differences in velocity and/or testing the hypotheses that velocity is a negative function of per capita income and positive function of inflation. Despite the diversity in inflationary experiences and per capita income, the developing countries of Asian Continent provides an excellent opportunity to examine the relationship between velocity and per capita income and inflation. This paper undertake such exercise using data on six Asian countries over the period 1960-73.

To test the influence of per capita income and inflation on income velocity, we estimate equation (3) as

$$V = \alpha_0 + \alpha_1 y/N + \alpha_2 P' \quad \dots \dots \dots (3)$$

where V is the income velocity, y/N is the per capita income and P' is the rate of inflation. We expect $\alpha_1 < 0$ and $\alpha_2 > 0$.

To calculate velocity, data for each country's GNP in local currency are divided by that country's money supply, using two alternative definitions of money⁴: Currency (C), Currency plus demand deposits (M_1). The rationale for the use of currency is very clear. It has been suggested

⁴ However, for Pakistan we also used M_2 definition of money composed of M_1 plus time deposits. This is because in an unpublished study made at the Pakistan Institute of Development Economics, it was found that the degree of substitution exists between M_1 and time deposits, and therefore, M_2 can also be used. Since definition of money is a debatable issue we refrain to indulge ourselves into this issue and as such used only Currency (c) and M_1 definition of money for other countries.

by Friedman [7] as a more appropriate variable for the developing countries. Inflation is measured by the annual percentage change in the Consumer Price Index (CPI) as⁵:

$$\frac{P_t - P_{t-1}}{P_{t-1}} \dots \dots \dots (4)$$

Apart from testing the influence of per capita income and inflation on velocity. One of the purpose of this paper is to examine various institutional and other influences on velocity within particular economies. An interest rate series is an obvious candidate as an additional explanatory variable. Both Selden [15] and Friedman [7] employed interest rates in their empirical studies of velocity in the United States. In addition, interest rates have also been widely used in demand for money studies⁶. Unfortunately, a good interest rate series extending back to 1960 does not exist for the countries under consideration. However, interest rates series do exist for Pakistan and we use time deposit rate (r_T) as an explanatory variable⁷. Therefore, our equation (3) is extended to include interest rate variable and is written as:

$$V = \alpha_0 + \alpha_1 Y/N + \alpha_2 P + \alpha_3 R \dots \dots \dots (5)$$

The variables considered thus far do not give explicit attention to the effect of institutional changes resulting from the process of economic development. These changes exercise important influence on velocity in

⁵ Since Consumer Price Index (CPI) series separately for West Pakistan are not available for the period 1959-60 to 1970-71. Our analysis has been carried out with GNP deflator as the relevant variable for inflation.

⁶ Laidler [15] and Goldfeld [9] provide a time saving review of the literature as well as a bibliography to it.

⁷ We choose time deposits rate (r_T) because earlier studies [13,14] on money-demand it was found a significant variable.

the case of developing economies⁸. Therefore, the potential explanatory variable which can be used as proxy for institutional changes from process of economic development is the ratio of currency to currency plus demand deposits⁹ (CC/M₁). Melitz and Correa [17] find that velocity is a positive function of CC/M₁. Akhtar [1] though used this variable in his velocity function but find it statistically insignificant. However, we use this variable and our equation (5) is extended to include CC/M₁ as:

$$V = \alpha_0 + \alpha_1 Y/N + \alpha_2 P + \alpha_3 R + \alpha_4 (CC/M_1) \dots \dots \dots (6)$$

The impact of monetization on the income velocity is important in the context of developing economies. The number of bank branches (B) has been used as proxy for monetization in the demand for money study¹⁰. It is stated that development of banking brings about changes in monetary habits and increases the demand for money stock which may increase or decrease velocity depending on the domination of a positive or negative effect. In the case of Pakistan, the negative effect of the development of banking on velocity has dominated¹¹. Unfortunately, a consistent time series data for the number of bank branches are not available for the countries under consideration except Pakistan. We use time trend (t) as a proxy for monetization for all the countries except Pakistan. But for inter-country comparison we also used time trend variable. Our equation (6) is extended to include bank branches or time trend as:

$$V = \alpha_0 + \alpha_1 Y/N + \alpha_2 P + \alpha_3 R + \alpha_4 (CC/M_1) + \alpha_5 B \dots \dots \dots (7)$$

⁸ See [1, 17].

⁹ Melitz and Correa [17] and Akhtar [1] also used this variable as proxy for institutional changes.

¹⁰ See Khan [13, 14].

¹¹ For details on the negative and positive effect of bank branches on velocity, see Akhtar [1] and Short [19]. Furthermore, in an earlier study [13] on money demand, it was found that development of banking increases demand for money stock.

Pooling both time series and cross-section data not only exploits the available information more fully but also provides an opportunity to test whether the response of velocity to inflation and per capita income is homogeneous among developing countries, given their diverse inflationary experience and per capita income. We intend to examine the same issue here as it is one of the purposes of this paper. To answer the questions like whether or not to pool cross section and time series data and to estimate the pooled regression, we employ analysis of covariance.

Data

The data used are annual observations of the variables for the period 1960-61 to 1977-78. All the data used in this paper are in the constant price of 1960-61. The data regarding the components of money stock for Pakistan are taken from [12] while for rest of the countries under consideration from different issues of International Financial Statistics (IFS). The data regarding per capita income for Pakistan are taken from different issues of Pakistan Economic Survey while for rest of the countries except India from Year Book of National Income¹². Consumer Price Index series are available for all the countries except Pakistan and are taken from International Financial Statistics¹³.

Empirical Results

i) Pakistan

The estimated coefficients of income velocity function in Pakistan corresponding to three definitions of money, Vis-a-Vis, currency, M_1 and

¹²I wish to express my gratitude to Professor N. Bhattacharya of the Indian Statistical Institute, Calcutta for supplying me the relevant data for India. I also wish to express my thanks to Dr. (Mrs) Lina Roy of the National Income Research Unit of this Institute who took the pain of preparing the National Income accounts data.

¹³For Pakistan, See footnote 5.

M_2 are reported in Table 1. It may be noted that we reported only the preferred results. We discuss first the result of V_1 i.e. y/CC . Real per capita income is found to be a significant variable but possessed positive sign which is not in accordance with the hypothesis reviewed in introduction. Adjusted R^2 is fairly good but Durbin-Watson statistic shows severe auto-correlation. Similarly inflation is found significant with correct sign but Durbin Watson statistic is very low. This result shows that income velocity behaviour in Pakistan cannot be studied without the institutional and other important explanatory variables.

Equation (4) in Table 1 gives very encouraging results. Real per capita income is found statistically significant with correct sign when used with interest rate. It may be noted that this result is exactly in accordance with our hypothesis that velocity is a negative function of per capita income. Interest rate is also found statistically significant with correct sign. The result shows that our money market is sensitive to interest rate. These two arguments explain a substantial portion of the observed variance in income velocity. When we included other explanatory variable such as number of bank branches (B) and currency to currency plus demand deposits (CC/M_1) it did not improve our results.

Results corresponding to V_2 definition of income velocity i.e. y/M_1 are also in accordance with the hypothesis reviewed in introduction. Real per capita income is found statistically significant with anticipated sign while interest rate is also found significant with correct sign. This further strengthen our contention that money market in Pakistan is sensitive to interest rate. Furthermore, the negative coefficient of per capita income shows that if per capita income in real term increases by

Table I. Estimated Co-efficients of Income Velocity in Pakistan

Equation No.	Dependent Variable	Constant (c)	y/N	P_t	r_T	B	cc/M ₁	t	R ²	DW	F
1	y/cc	-3.78 (-4.30)*	0.94 (6.65)*						0.73	0.61	44.27
2	y/cc	2.01 (52.13)*		0.04 (2.76)*					0.32	0.38	7.59
3	y/cc	4.85 (4.17)*	-0.60 (-2.92)*		0.58 (7.91)*				0.95	1.99	138.69
4	y/cc	5.04 (4.13)*	-0.63 (-2.93)*		0.64 (4.97)*		0.16 (0.64)		0.95	2.05	88.99
5	y/M ₁	-0.75 (-0.40)	0.58 (1.46)		0.33 (3.19)*	-0.23 (-3.39)*			0.50	1.39	4.70
6	y/M ₁	4.97 (4.05)*	-0.62 (-2.87)*		0.64 (4.93)*		1.16 (4.67)*		0.65	2.05	8.50
7	y/M ₂	3.82 (5.07)*	-0.44 (-3.63)*						0.45	0.98	13.16
8	y/M ₂	8.29 (4.36)*	-1.23 (-3.69)*		0.30 (2.50)*				0.61	1.68	11.88
9	y/M ₂	3.65 (1.30)*	-0.25 (-0.68)		0.50 (4.74)*	-0.24 (-3.57)*			0.80	1.27	18.39
10	y/M ₂	5.57 (6.62)*	-1.45 (-5.71)*		0.74 (4.95)*		1.08 (3.67)*		0.80	1.85	19.02

Note: 1) All the equations are estimated in log-linear form. C is the intercept term, y/N is the real per capita income, P is the rate of inflation, r_T is the rate of interest on time deposits, B is the number of bank branches, CC/M₁ is the ratio of Currency to M₁ and t is the time trend.

2) The t-values are given in parentheses and a star (*) indicates that coefficients are statistically significant at the 95 - per cent confidence level.

one percent, income velocity declines by 0.6 percent. This result has special significance for development policy in developing economy because it implies that money creating institutions obtain a greater leverage over resources and, therefore, their capacity to finance development is greatly enhanced overtime¹⁴. The currency to M_1 ratio i.e. CC/M_1 used as proxy for institutional changes is found statistically significant with correct sign. The number of bank branches (b) used as proxy for monetization is found statistically significant with negative sign. This shows that development of banking has brought rapid increase in deposits and the stock of money. However, per capita income loses its significance when used with bank branches.

No significant influence has been exercised by inflation (P^*) on velocity. The result concerning the relationship between inflation and the velocity of money is not surprising, as noted elsewhere, till 1971 inflation was very low in Pakistan¹⁵. Therefore, the hypothesis that velocity is a positive function of inflation does not hold for Pakistan.

Results corresponding to V_3 i.e. y/M_2 are also very encouraging. Per capita income is found statistically significant with anticipated sign. This further strengthens our contention that the hypothesis that velocity is a negative function of per capita income holds for Pakistan. Like earlier, interest rate is found statistically significant with correct sign. To repeat, it shows that money market in Pakistan is sensitive to interest rate. Per capita income, though retains its negative

¹⁴ For a detailed analysis on this point, see Short [19], Ezekiel [5] and the Economic Commission for Asia [4].

¹⁵ In a study [13] on money demand, inflation was found an insignificant variable when the analysis covered the period 1959-70. However, this study revealed that inflation was a significant variable after 1971 because inflation was well above ten percent.

sign, loses its significance when bank branches is included as an explanatory variable. This variable is found statistically significant with correct sign. As mentioned earlier, the development of banking has brought rapid increase in deposits and the stock of money. The result explains that one percent increase of bank branches would reduce the velocity by 0.24 percent. Institutional variable (CC/M_1) is also found statistically significant and its inclusion increases R^2 significantly. Like earlier result, inflation did not seem to influence income velocity and our hypothesis regarding inflation and velocity does not hold for Pakistan.

A summary of our findings for Pakistan is in order. The evidence in this paper demonstrates that the hypothesis that income velocity is inversely related to per capita real income is valid in Pakistan. However, it is not possible to appraise the negative impact of per capita real income on velocity independent of the over-powering influence exerted by other explanatory variables such as interest rate, bank branches and currency to currency plus demand deposits ratio. Inflation exerted no significant influence on velocity, therefore, the hypothesis that velocity is a positive function of inflation is not valid for Pakistan. It may be further noted that when money is defined to include time deposits, the explanatory power of the variables increased considerably¹⁶. This result implies that broader definition of money may be preferred in Pakistan.

India

Presented in Table 2 is the estimated coefficients of income velocity function in India corresponding to two definitions of money, Vis-a-Vis, currency and M_1 . We discuss first the results of V_1 i.e. y/CC .

¹⁶ i.e. when y/M_1 is used as endogenous variable.

Table 2. Estimated Co-efficients of Income Velocity in India.

Equation No.	Dependent Variable	Constant (c)	y/N	P	cc/M ₁	t	R ²	D.W	F
1	y/cc	22.60 (7.78)*	-3.57 (-7.22)*				0.77	1.35	52.16
2	y/cc	23.26 (7.53)*	-3.68 (-7.08)*	-0.02 (-0.78)			0.77	1.23	25.74
3	y/cc	-0.61 (-0.24)	0.56 (1.24)		2.12 (9.96)*		0.97	1.29	235.66
4	y/cc	12.86 (2.63)*	-1.85 (-2.18)*	-0.002 (-0.11)		-0.17 (-2.53)*	0.85	1.42	25.46
5	y/M ₁	33.55 (8.17)*	-5.52 (-7.85)*				0.79	1.35	61.62
6	y/M ₁	34.36 (7.93)*	-5.65 (-7.60)*	-0.02 (-0.65)			0.80	1.25	29.90
7	y/M ₁	-0.006 (-0.002)	0.46 (1.02)	-0.01 (-1.33)	3.11 (14.74)*		0.99	1.28	379.59
8	y/M ₁	19.77 (2.90)*	-3.09 (-2.52)*	0.0007 (0.02)		-0.24 (-2.45)*	0.86	1.44	28.57
9	y/M ₁	-3.68 (-0.26)	0.58 (1.25)		3.13 (14.52)*		0.99	0.73	540.34

- Note. 1) All the variables are defined in Table 1.
- 2) The t-values are given in parentheses and a star(*) indicates that coefficients are statistically significant at the 95-percent confidence level.

Real per capita income is found statistically significant with correct sign. It may be noted that this result is exactly in accordance with the hypothesis that velocity is a negative function of per capita income. The explanatory power of real per capita income is much higher than Pakistan. It shows that one percent increase in per capita income will decrease velocity by 3.57 percent. This would give the money creating institutions a much greater leverage over resources and their capacity to finance development would great enhance overtime. The real per capita income alone explains 77 percent of variations in income velocity which implies that this argument is the most significant determinant of income velocity in India. When inflation is included in the function it did not improve the result at all. No significant influence has been exercised by inflation on income velocity which implies that our hypothesis, that velocity is a positive function of inflation is not valid for India.

The influence of CC/M_1 is found highly significant with anticipated sign. The adjusted R^2 has increased considerably. The influence of CC/M_1 is so strong that real per capita income not only loses its significant level but also loses its correct sign. The time trend variable used as proxy for monetization is found statistically significant with correct sign. This result shows that monetization of the economy has taken place in India overtime which resulted in the increase of money stock thereby reducing velocity.

The results corresponding to V_2 i.e. y/M_1 are also very encouraging. Real per capita income is found statistically significant and possess anticipated sign in accordance with the hypothesis reviewed in introduction of this paper. The explanatory power of real per capita income has increased considerably when V_2 i.e. y/M_1 definition of velocity is

used.¹⁷ As before, inflation did not influence the income velocity and, therefore, the hypothesis that velocity is a positive function of inflation is not valid for India. The other explanatory variables such as CC/M_1 and time trend used as proxy for monetization are all found statistically significant with correct sign.

A summary of our findings for India is in order. The hypothesis that velocity is a negative function of real per capita income is valid for India. However, inflation did not influence the income velocity which implies that the hypothesis that velocity is a positive function of inflation is not valid. CC/M_1 and time trend variable are found statistically significant.

Malaysia

The estimated coefficients of income velocity corresponding to both V_1 i.e. y/CC and V_2 i.e. y/M_1 are reported in Table 3. The real per capita income throughout remained statistically significant with positive sign. The presence of real per capita income with a positive sign in all the regressions state that the hypothesis, that velocity moves inversely to per capita income is not valid in Malaysia. Similarly, inflation exercise no influence on income velocity thereby invalidating the hypothesis that velocity moves positively to inflation.

The institutional variable CC/M_1 is found significantly different from zero at traditional level of significance but possessed negative sign. When this variable is used with per capita income in velocity

¹⁷ Although definition of money is a debatable issue yet M_1 seems to be an appropriate definition of money for India.

Table 3. Estimated Co-efficients of Income Velocity
in Malaysia

Equation No.	Dependent Variable	Constant (c)	y/N	P*	cc/M ₁	t	R ²	DW	F
1	y/cc	-2.23 (-1.92)*	0.65 (3.79)*				0.47	0.35	14.36
2	y/cc	-2.93 (-1.97)*	0.75 (3.43)*	-0.04 (-0.79)*			0.49	0.38	7.32
3	y/cc	0.90 (2.95)*	0.03 (0.55)		-1.91 (-20.2)*		0.98	1.78	393.67
4	y/cc	5.30 (2.60)	-0.30 (-1.40)	-0.01 (-0.37)		0.41 (5.30)*	0.87	1.43	30.37
5	y/M ₁	-0.64 (-1.10)	0.32 (3.75)*				0.47	0.48	14.03
6	y/M ₁	0.55 (1.72)*	0.06 (1.21)	-0.01 (-1.28)	-0.89 (-9.62)*		0.93	1.93	66.51
7	y/M ₁	0.90 (2.97)*	0.03 (0.58)		-0.91 (-9.70)*		0.93	1.80	94.88

Note: 1) All The variables are defined in Table 1.

2) The t-values are given in parentheses and a star (*) indicates that coefficients are statistically significant at the 95-percent confidence level.

function, per capita income not only loses its significance level but also the explanatory power. Almost all the observed variance in velocity seems to have been explained by CC/M_1 alone.

Thailand

Presented in Table 4 are the estimated co-efficients of income velocity corresponding to both V_1 and V_2 . Like Malaysia, real per capita income though statistically significant but possessed positive sign. The presence of real per capita income with a positive sign in all the regressions invalidate the hypothesis that velocity moves inversely to per capita real income.

Unlike Pakistan, India and Malaysia, inflationary expectation exercised significant influence on income velocity. However, it took two years to realize the impact of inflation on income velocity. This finding suggests that the hypothesis, that velocity is a positive function of inflation is valid in Thailand. The institutional variable CC/M_1 is also found statistically significant with correct sign.

Korea

The estimated coefficients of income velocity corresponding to both V_1 and V_2 are reported in Table 5. Both real per capita income and inflation rate are found statistically significant with correct sign. It is found that real per capita moves inversely to velocity and inflation moves positively to velocity. These findings are in accordance with the hypothesis explained earlier. When we used current rate of inflation alongwith two periods lag, the adjusted R^2 jumped from 0.54 to 0.99. This result is contrary to the findings of Hanson and Vogel [10] where they argued that lagged inflation variables do not significantly increase the R^2 .

Table 4: Estimated Co-efficients of Income Velocity
in Thailand

Equation No.	Dependent Variable	Constant (c)	y/N	P _t	P _{t-1}	P _{t-2}	cc/M ₁	t	R ²	DW	F
1	y/cc	-1.78 (-4.30)*	0.52 (10.01)*						0.86	0.67	100.21
2	y/cc	-1.71 (-3.21)*	0.51 (7.42)*	0.005 (0.23)					0.86	0.68	47.17
3	y/cc	-0.22 (-0.46)	0.31 (5.18)*	0.01 (0.52)	0.01 (0.49)	0.07 (2.90)*			0.96	1.34	66.52
4	y/cc	-1.09 (-2.00)*	0.48 (9.09)*				0.83 (1.81)*		0.89	1.53	58.89
5	y/M ₁	-2.62 (-4.85)*	0.57 (8.37)*						0.81	0.66	69.97
6	y/M ₁	-2.62 (-3.78)*	0.57 (6.31)*	-0.0002 (-0.007)					0.81	0.66	32.80
7	y/M ₁	-0.92 (-1.40)	0.46 (6.67)*	0.009 (0.47)			1.86 (3.95)*		0.91	1.49	48.37
8	y/M ₁	-1.08 (-2.00)*	0.48 (9.12)*				1.83 (4.03)*		0.91	1.52	76.43
9	y/M ₁	-0.43 (-0.64)	0.28 (3.16)*	0.03 (0.76)	-0.004 (-0.11)	0.09 (2.85)*			0.93	1.42	35.66

Note: 1) All the variables are defined in Table I.

2) The t-values are given in parentheses and a star (*) indicates that coefficients are statistically significant at the 95-percent confidence level.

Table 5: Estimated Co-efficients of Income Velocity
in Korea

Equation No.	Dependent Variable	Constant (c)	y/M	P_t^*	P_{t-1}^*	P_{t-2}^*	cc/M ₁	t	R ²	DW	F
1	y/cc	4.20 (7.08)*	-0.13 (-2.19)*						0.23	0.56	4.79
2	y/cc	3.56 (6.72)*	-0.13 (-2.77)*	0.27 (3.14)*					0.54	1.39	8.65
3	y/cc	5.24 (8.69)*	-0.34 (-3.80)*	0.32 (4.18)*				0.16 (2.62)*	0.69	1.56	10.29
4	y/cc	3.76 (29.50)*	-0.22 (-20.32)*	0.30 (13.98)*	0.04 (1.98)*	0.18 (8.63)*			0.99	2.83	200.53
5	y/M ₁	4.23 (6.52)*	-0.21 (-3.19)*						0.38	0.53	10.53
6	y/M ₁	3.61 (5.79)*	-0.21 (-3.71)*	0.26 (2.52)*					0.57	1.46	9.97
7	y/M ₁	3.55 (6.50)	-0.12 (-1.90)*	0.28 (3.07)*			1.18 (2.34)*		0.69	1.82	10.45
8	y/M ₁	5.11 (5.08)*	-0.40 (-3.43)*	0.30 (3.05)*				0.16 (1.83)*	0.65	1.62	8.80
9	y/M ₁	2.58 (9.30)*	-0.29 (-9.01)*	0.31 (4.81)*	0.02 (0.32)	0.25 (3.91)*			0.92	2.68	32.18

Note: 1) All the variables are defined in Table 1.

2) The t-values are given in parentheses and a star(*) indicates that coefficients are statistically significant at the 95-percent confidence level.

The institutional variable CC/M_1 and time trend used as proxy for monetization are all found statistically significant at traditional level of significance. The findings of Korea can be summarized as follows. The hypothesis that velocity is a negative function of real per capita income and positive function of inflation is valid in Korea. The real per capita income alongwith current and two periods lagged inflation explain all the variation in income velocity. The institutional variable and time trend are found significant.

Sri Lanka

Presented in Table 6 are the estimated coefficients of income velocity corresponding to both V_1 and V_2 . Real per capita income is found statistically significant but possessed positive sign. The finding invalidate the hypothesis reviewed in introduction. However, inflation rate is found statistically significant with correct sign. Therefore, the hypothesis, that velocity is a positive function of inflation is valid in Sri Lanka. The institutional variable though found statistically significant, possessed negative sign. Time trend variable did not perform well. This finding shows that monetization of the economy has not taken place overtime. R^{-2} 's are fairly reasonable¹⁸.

As mentioned earlier, pooling both time-series and cross-section data not only exploits the available information more fully but also provides an opportunity to test whether the response of velocity to per capita income and inflation is homogeneous among Asian countries, given

¹⁸ In their study Hanson and Vogel $\sqrt{10}$ found R^{-2} which ranges from 0 to 0.71. Ezekiel and Adekunle $\sqrt{6}$ found 0.43 as their highest R^{-2} .

Table 6: Estimated Co-efficients of Income Velocity
in Srilanka

-20-

Equation No.	Dependent Variable	Constant (c)	y/N	P_t	P_{t-1}	P_{t-2}	cc/M ₁	t	R ²	DW	F
1	y/cc	-1.59 (-1.57)	0.60 (3.90)*						0.49	0.49	15.17
2	y/cc	-0.91 (-0.95)	0.49 (3.32)*	0.05 (2.20)*					0.62	1.75	11.82
3	y/cc	-1.05 (-1.35)	0.32 (2.42)*	0.05 (2.77)*			-1.96 (-2.97)*		0.76	1.95	14.93
4	y/cc	0.14 (0.16)	0.32 (2.26)*	0.04 (2.03)*	0.03 (1.54)	0.04 (2.01)*			0.80	1.65	11.09
5	y/M ₁	-1.36 (-1.87)*	0.52 (3.78)*						0.47	0.51	14.32
6	y/M ₁	-0.98 (-1.22)	0.40 (3.26)*	0.05 (2.66)*					0.64	1.71	13.43
7	y/M ₁	-1.04 (-1.35)	0.32 (2.43)*	0.05 (2.78)*			0.94 (-1.43)		0.69	1.63	10.28

- Note:
- 1) All the variables are defined in Table I.
 - 2) The t-values are given in parentheses and a star(*) indicates that coefficients are statistically significant at the 95-percent confidence level.

their diverse inflationary experience, per capita income and monetary institutions. To test whether the response of inflation and real per capita income is homogeneous in the countries under consideration, we pooled the data. The total number of observations now available is 108. The regression include one and two year lags in addition to current rate of inflation besides real per capita income.

F-tests were conducted to determine whether time-series and cross-section data can be pooled. F-ratios range from 9.57 to 11.74 revealing substantial heterogeneity among the countries under consideration¹⁹. Therefore, we cannot pool the time series and cross-section data. This finding is quite consistent with the findings of individual country. Out of six countries, three had real per capita income with positive sign and three with negative sign. Similarly, the results of Korea and Srilanka reveal that inflationary expectation influences income velocity while for rest of the countries it is found that inflation do not influence velocity. Furthermore, in order to test the differences in intercepts among countries, we introduced country dummy variables. All the country dummy variables are found statistically significant which reveals significant differences in intercepts. The substantial heterogeneity among country's intercepts reveals that pooling cross-section and time-series data are not feasible.

Policy Implications

As discussed in the beginning of this paper, one of the major reasons why economists have examined the behaviour of velocity is that

¹⁹ Since the calculated F-values are greater than tabulated F-values, we cannot pool the data.

given the money stock and velocity one can know the level of national income. If we can predict the level of velocity, we can predict the level of national income, given the money stock. Furthermore, the behaviour of the income velocity during economic growth determines how great a command over resources the money issuing institutions are able to exercise without causing inflation²⁰. The existence of negative functional relationship between per capita real income and the income velocity of money has a special significance for development policy in developing countries because it implies that money creating institutions obtain a greater leverage over resources and, therefore, their capacity to finance development is greatly enhanced overtime. Out of six countries considered, this relationship holds for three countries i.e. for Pakistan, India and Korea. This finding is particularly important for the policy makers of these countries. If velocity falls as per capita real income increases, the monetary authorities can issue more money and obtain a greater leverage on resources than if velocity were constant or rising²¹. For the rest of the countries such as Malaysia, Thailand and Srilanka it is found that velocity increases with the increase of real per capita income. This finding has special significance with the demand for money in these countries. It shows that the income elasticity of the demand for money is less than 1 in these countries²².

²⁰ See Short [19].

²¹ *ibid*

²² The way in which real per capita income affect velocity depends on the income elasticity of the demand for money. If the income elasticity is greater than one then velocity decreases as real per capita income increase and Vice Versa. See Dornbusch and Fisher [3].

The positive functional relationship between inflationary expectation and income velocity is also important for policy implication. Out of six countries considered, this relationship holds for three countries i.e. for Thailand, Korea and Srilanka. Although the estimated coefficients of inflation are low, yet this finding is important for policy makers. These low coefficients suggest that inflation can operate effectively as a tax on money in these countries²³. As inflation increases, the people take more care in the management of their cash balances. Money is spent more rapidly after it is received. Money becomes like a hot potato with people anxious to pass it on rapidly. Thus, velocity increases as people scurry to get rid of cash.

As mentioned earlier, if we can predict the level of velocity, we can predict the level of national income given the money stock. The findings of this paper provide a tentative answer to this question. In this paper we have also identified the determinants of income velocity. Besides real per income, and inflationary expectation we have found interest rate, effect of monetization and currency to M_1 ratio as important determinants of income velocity. The elasticities of real per capita income, expected inflation, interest rate, monetization and ratio of currency to M_1 are extremely useful in determining the level of velocity. Once the policy makers of the countries considered find the level of velocity, then given the money stock they can predict the national income of their respective countries.

²³See *ibid.*

Conclusions

In this paper, we have tested two hypotheses that, income velocity is inversely related to real per capita income, and positively related to inflationary expectation. The evidence in this paper demonstrates that, the hypothesis, that income velocity is inversely related to real per capita income, was valid for three countries i.e. for Pakistan, India and Korea while for Malaysia, Thailand and Srilanka this hypothesis was not valid. Furthermore, the evidence in this paper also demonstrates that the hypothesis, that income velocity is positively related to inflationary expectation was valid for Thailand, Korea and Srilanka. This hypothesis was not valid for Pakistan, India and Malaysia.

The evidence of this paper also demonstrates that, the income velocity behaviour in developing countries cannot be studied without the institutional and other important explanatory variables. We have found interest rate, effect of monetization and currency to M_1 ratio to be the most important explanatory variables besides real per capita income and inflationary expectation.

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