Assessing the Level of Interest Rates in Less Developed Countries

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The problem of measurement assumes particular importance in deriving time series for real interest rates from nominal interest rates, because of skepticism about the suitability of available price indices for deflating nominal interest rates. Since empirical verification of interest rate effects depends crucially on the realism of the measure of level of real interest rates, it is necessary to search for an alternative measure, if the conceptual problems are found to be insurmountable. The purpose of this paper is to discuss briefly these conceptual issues as a background to suggest an alternative to approximate an appropriate level of interest rate in less developed countries (LDCs).

I. Some Conceptual Issues in Assessing the Level of Real Interest Rates

The interest rate performs several functions in an economy. It is the relative price between present and future consumption. Interest is a reward for saving out of currently earned income and also for accumulating financial assets. The interest rate together with the rate of return on foreign financial assets, and expected changes in exchange rates

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influence how the public allocates its wealth among domestic and foreign financial assets and goods. The interest rate also constitutes an element in the cost of borrowing and influences the allocation of borrowed funds.

A distinction between a real and nominal interest rate is important for economic analysis and policy. This distinction between the nominal and real interest rate was first emphasized by Fisher during the 1930s (Fisher, 1930), but was later neglected mainly because of the dominance of Keynesian thinking and the price stability in most industrial countries during much of that period. Since prices remain unchanged in the Keynesian system with its underlying assumption of unemployment of labor and underutilization of capital, a fall in the money interest rate following an expansion in money supply implies a fall in the real interest rate as well. 1/ However, in the wake of the high inflation experienced both in the developed and developing countries since the 1960s, the distinction between real and nominal interest rate has acquired fresh relevance. This is particularly so in LDCs, which have generally suffered from a high degree of financial repression, identified as the existence of negative real interest rates and a slower growth of real financial assets. Though it is recognized that it is imperative to maintain positive real interest rates in order to provide incentives to accumulate real money balances, increase financial intermediation, and to promote unification of financial markets, difficulties are often encountered in

1/ For this and other related analytical issues in the context of a financially repressed economy, see Galbis (1982), where he clearly delineates the characteristics of Fisherian and Keynesian theories of interest rate and also Fry (1983).

identifying what the real interest rate is, particularly in a large number of LDCs, where nominal interest rates are fixed through government intervention.

1. Significance of real interest rate

It will be helpful to explore the meaning of real interest rate and how it adjusts to its equilibrium level in market-oriented economies. Irving Fisher defined the real interest rate as simply the percentage premium paid on present goods over future goods of the same kind. Essentials of this concept of the real interest rate are (1) definite and assured payments, (2) definite and assured repayments, and (3) definite dates (Fisher, 1930, p. 35). This Fisherian concept may be expressed in various ways, depending upon one's viewpoint as well as the purpose to be served. The real interest rate may, for example, be viewed as "the anticipated reduction in wealth that individuals face when they choose to consume goods now instead of saving and investing; in this sense, it represents the relative cost of current consumption in terms of foregone future consumption" (Alchian and Klein, 1973, pp. 424-459).

It is necessary to bear in mind two clear implications of this particular definition of the real interest rate. For one thing, from the saver's point of view, present sacrifice is balanced by access to a stream of consumption goods and services at a future date. However, the nature of the future stream of consumption goods and services is determined by asset creation through investment that is financed by current savings. For another, the real interest rate determines the proportion of resources devoted to the production of durable goods, i.e., capital goods, as

against production of goods available for immediate consumption. From both of these points of view, the identification of the real interest rate is an indispensable precondition.

A further question is which one of the real interest rates is the most relevant. Real rates of interest vary according to the time horizon of the asset--long, medium, and short. It is the long-term interest rate that is most germane to the economic agents involved in saving-investment activities because capital goods have a long time span. It is however not the historical or current long-term interest rate but an expected long-term real interest rate that is important because investment decisions are dictated by what the investors or the entrepreneurs expect to happen in the future. Past occurrences may have their usefulness but only insofar as they provide signals about what is likely to happen in the foreseeable future. 1/

The expected real long-term interest rate is thus crucial to the behavior of economic agents, and changes in its level have far-reaching repercussions. If the expected long-term real interest rate for some reason rises, the present value of future claims will decline, with a consequent fall in the wealth of individuals. The opposite occurs if the expected long-term rate declines. While the value of wealth of the community will change with every change in the real interest rates, its

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1/ It is interesting to recapitulate what Irving Fisher said so succinctly: "The rate of interest is always based upon expectation, however little this may be justified by realization. Man makes his guess of the future and stakes his acts upon it... Our present acts must be controlled by the future, not as it actually is, but as it appears to us through the veil of change." (Irving Fisher as quoted in Santoni and Stone, 1982).

impact on the value of any particular asset will vary according to its durability. Individuals with more durable assets will suffer greater loss than those with less durable assets when the long-term real interest rate rises and gain more when it falls.

A change in the perceived expected long-term real interest rate can come about in two ways. First, real factors such as productivity and propensity to sacrifice current consumption for future consumption can affect the level of the expected real interest rate. Second, in a monetary economy the anticipated real interest rate can also change as a result of changes in the rate of inflation, even though there is no change in the real factors affecting the real interest rate (perhaps some kind of money illusion is implied). The nominal rate of interest is reckoned in terms of monetary units. When prices are stable, the money rate of interest and the real rate of interest coincide. If the assumption of stable prices does not hold good, the real interest rate will change unless the money interest rate changes in the same direction and to the same extent as the rate of change in prices. 1/ However,

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1/ The money interest rate is given by the expression $r^m = a + r_1 + ar_1$ where a is the relevant inflation rate, r_1 is the real interest and ar_1 the cross product of both; i.e., real interest rate and price level. The cross product can be ignored in a good approximation, when the compounding period is short or the compounding is continuous. Then, the monetary rate of interest is equal to the real interest rate plus the rate of anticipated inflation (see Hirshleifer, 1970, p. 136).

The difficulty of calculating the expected real interest rates is thrown into sharp relief when seen in comparison with the real wage rate. The money interest rate can be translated into a real interest rate or a goods rate by use of some index number in the same way as it is possible to convert the money wage into the real wage. But here the similarity ends. Unlike the case of wages, the process of estimating expected real rates of interest entails two points of time instead of only one. Hence, "we must translate from money into goods not only in the present, when the money is borrowed, but also in the future, when it is repaid" (Fisher, 1930, p. 42). It is this distinction which is of strategic importance in estimating real expected long-term interest rate.

even if the money interest rate changes with a change in the rate of change of prices, there are doubts about whether there is a full compensation in the monetary interest rate for the variation in prices.

It is sometimes argued that, historically, real rates of interest have been unaffected by the inflationary process. This is on the basis that money interest rates reach high levels when inflationary expectations become established, as for example during a period of rapid inflation such as that experienced in the United States during 1978-82, in the developed European countries in the late 1970s, and in the Latin American countries during most of the post-Second World War period. Irving Fisher obtained a significantly high correlation between inflation and money interest rates for Britain and the United States during the first half of the nineteenth century. He arrived at this result only through use of an index of anticipated price level changes based on "a distributed lag" expectation model with high weights being given to the more recent years. Despite his findings, even Fisher became doubtful about whether money interest rates tended to adjust to maintain the expected real interest rate unchanged. This was because an unanticipated change in prices would lead to only a partial adjustment in money interest rates, implying a fall in the real interest rate. He attributed this discrepancy to a "trick played on the money market by 'money illusion' when contracts are made in unstable money."

Another argument for a relation between real interest rates and inflation was given by Mundell (1962). He argued that in a period of rapid rise in prices following a marked expansion of money supply, a lag would occur

between the increase in inflation and money interest rate because the reduction in the community's wealth (i.e., real money balances) resulting from inflation would cause individuals to replenish their wealth relative to income, thereby inducing a lower level of real interest rates.

It is necessary to point out at this stage that the relationship between the expected rate of inflation and nominal interest rates is discussed so far without any regard for the effect of taxation on this relationship. Theoretically, it should be expected that higher the taxation is--the relevant tax in view is income tax--the greater should be the impact of expected inflation on the nominal interest rate. Thus the Fisher equation, $i = r + \pi$ (where is real interest rate, r is nominal interest rate and π is the expected inflation) is transformed into $i = r + \frac{\pi}{1 - T}$ where T stands for taxation.

However, the presence of income taxation does not necessarily raise the nominal interest rate beyond what it could be by the presence of inflation alone. As seen earlier in this section, nominal interest rates are not fully adjusted by expected inflation in a competitive economy and this applies as well to the impact of taxation on nominal interest rates via the changes in expected inflation. There are several reasons for it. For one thing, if the lenders' options are limited, they may be inclined to accept a lower rate of return on all their financial assets. This means that impact of π on i would be smaller than $\frac{\pi}{1 - r}$ as in the modified Fisher equation. For another, borrowers on their part may consider that tax increases in the context of rising expected inflation as an additional

burden and as a result may not be willing to pay higher nominal interest rate on their borrowed funds. Third, to the extent that numerous lenders do not pay taxes on interest received and on some financial instruments, there is no impact of taxation felt on nominal interest rate. Finally with the increase in taxation, if the nominal interest rates go up in a given country, funds from countries where taxation is heavier will flow in and in consequence the level of money interest rate will in fact be lower. (For a comprehensive discussion of these and other related issues, see Tanzi, 1984).

The sum and substance of all this is that the tax related factors do not always lead to a rise in nominal interest rates via their impact on price level. This is supported by some empirical work in respect of eight industrial countries, demonstrating that taxation of interest income and interest expenses has only a negligible effect on nominal interest rates in those countries. For this reason, the analysis in the rest of this section has ignored the role taxation plays in the relationship between expected inflation and the real interest rate (Katz, 1984, p. 172-203).

2. Measuring real interest rate

An important question is whether the rate of change of a price index can be used to approximate the real interest rate. As observed earlier, a critical real interest rate is the long-term expected real interest rate. However, the expected real interest rate cannot be observed in the nature of things, and has therefore to be estimated. The nominal interest

rate is nearly equal to the sum of the real interest rate and the rate of price change. A consumer price index is generally employed to estimate the expected long-term real interest rate, though recourse is also taken at times to other price indices such as the wholesale price index and the gross national product deflator. It is now increasingly realized that none of these indices is suitable for estimating the expected real interest rate (see Alchian and Klein, 1973; Brown and Santoni, 1981). The basic reason is that use of these indices yields misleading results when the real interest rate itself changes in either direction. As Alchian and Klein have argued: ..."price indices which represent measures of current consumption, service prices, and current output prices, are theoretically inappropriate for the purpose to which they are generally put. The analysis ...bases a price index on the Fisherian tradition of a proper definition of intertemporal consumption and leads to the conclusion that a price index used to measure inflation must include asset prices. A correct measure of changes in the nominal money cost of a given utility level is a price index for wealth. If monetary impulses are transmitted to the real sector of the economy by producing transient changes in the relative prices of service flows and assets (i.e., by producing short-run changes in the real rate of interest), then the commonly used, incomplete current flow price indices provide biased short-run measures of changes in 'the purchasing power of money'" (Alchian and Klein, 1973, p. 173).

The inadequacy of the commonly used price indices to capture the real interest rate is due to the fact that these indices do not reflect correctly the mix of goods available to individuals inasmuch as consumer

goods have a larger weight than capital goods and other long-term assets in the construction of these indices. This results in a biased estimate of real interest rates based on these price indices, when the real interest rate is changing either upward or downward only as a result of changes in propensity to save (Brown and Santoni, 1981). If the real interest rate rises following a reduction in rate of saving, other things (such as output, quantity of money and its velocity) remaining constant, prices of consumer or nondurable goods will rise relative to the prices of long-lived or capital goods. The opposite situation would occur if the real interest rate falls when amount of saving increases. Under these circumstances, the use of the usual price indices, in which excess weight is given to short-lived or consumer goods, will impart an upward bias to the general level of prices, when the real interest rate rises, and a downward bias when it declines. Thus, when the real interest is rising following a fall in saving rate, the expected real interest rate will be underestimated when approximated by using the usual price indices. Conversely, it will be overestimated when the real interest rate falls when saving rate rises, thereby giving misleading signals to the policymakers in competitive economies in pursuing their monetary-fiscal policies as demonstrated by the experience in the United States during the late 1970s (Brown and Santoni, 1981).

This problem would not arise (although others might), provided the real interest rate remained unchanged. In fact, the available evidence shows that real interest rates change. Wilcox (1983) has produced persuasive empirical evidence for the United States that real interest

rates declined in the middle 1970s as a result of a reduction in the supply of complementary factors of production, especially energy. "As input prices rose, the profitability of capital fell. The lowered growth rate of the capital stock and concomitant decline of investment dragged down the real rate of interest." When the real interest rate declined, derivation of real interest level from nominal interest rate by using CPI may perhaps have exaggerated the extent to which real interest rates became negative during that period.

II. An Alternative Approach to Approximate an Appropriate Level of Interest Rates in LDCs

Since the estimation of real interest rates is beset with conceptual and statistical difficulties as observed earlier, an alternative approach to the determination of that level of domestic nominal interest rates in LDCs, which may broadly correspond to the level of estimated real interest rates is explored in this section. 1/ The alternative approach is to judge the appropriateness or otherwise of the level of domestic nominal interest rates in LDCs in relation to the relevant foreign interest rate, adjusted for expected changes in exchange rates. It may be argued that such adjusted foreign interest rate may not be relevant for most of the LDCs which are closed (defined as having pervasive foreign exchange and trade controls). However, the so-called closed economies of LDCs are not really closed in any operational sense. Even in countries with severe exchange and trade controls, an illicit substitution of foreign

1/ Some other alternative is proposed by Brown and Santoni but it has many shortcomings as discussed in Khatkhate (1983(a)).

currency and foreign financial assets or gold for domestic currency and domestic financial assets can and does take place when incentives for doing so are sufficiently strong (Bhagwati, 1978; Tanzi and Blejer, 1982). Therefore, it seems reasonable to judge the appropriateness of the level of domestic nominal interest rates in relation to the relevant foreign interest rate, after adjusting it for the expected change in the exchange rate. If the level of domestic nominal interest rates is lower than that of the adjusted foreign interest rate, then it could be taken as a signal for making an upward change in domestic nominal interest rate and vice versa, if domestic nominal interest rate exceeds the adjusted foreign interest rate.

A domestic nominal interest rate to be considered as appropriate is derived by adjusting the foreign interest rate for expected change in the exchange rate. Adjustment can be made, by adopting the following rule:

$$rd_1 = r_f + \hat{e}$$

where rd_1 is domestic nominal interest rate considered to be appropriate in LDCs;

r_f = London one-year interbank offer rate on U.S. dollar deposits (LIBOR). Since data on this series are available only since 1977, the U.S. Treasury bill rate has been used for the years 1971-76. There was little difference between these two rates in the later years

$\hat{e}$ = annual percentage change in actual exchange rate in LDCs during the period, defined as domestic currency per unit of foreign currency. Ideally, future (however defined) changes in

exchange rate should be used, though current exchange rate changes are considered as the interest rate series is calculated over ten-year period. 1/

The London interbank rate on one-year U.S. dollar deposit or the U.S. Treasury bill rate is chosen as a benchmark. The interest rate so derived is designated as Rd_2.

The means of nominal interest rate (Rd_1) and the two computed interest rate series for LDCs, i.e., foreign interest rate adjusted for actual changes in exchange rate (Rd_2) and real interest rate (Rd_3) i.e. actual

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1/ It would have been better to have adjusted for expected rather than actual changes in exchange rates but the generation of expected exchange rates is fraught with several conceptual and statistical difficulties. There are many approaches to the estimation of the future course of inflation (Feldstein and Summers, 1978) but the familiar one, since the pioneering effort of Fisher (1930), is the distributed lag method by which expected inflation is related to past inflation rates with an identifying restriction that the weights on past inflation must sum up to unity. However, this identifying condition holds good only in a situation when the rate of inflation remains more or less unchanged or changes only marginally. The historical experience shows that the rate of inflation fluctuates widely from year to year or quarter to quarter (Feldstein and Summers, 1978). In general, however, expectations about future inflation are governed not only by the past experience of inflation but also by other factors. As Gordon pointed out, "people do use outside information to evaluate recent experience. Before deciding whether to incorporate a recent burst of inflation into their expectation of the future, they ask whether there are any outside recent experiences either particularly relevant or irrelevant over the forecasting horizon. This is a process which mechanical weighting procedures, no matter how economically sophisticated, are unlikely to capture" (Gordon, 1973, p. 463). Apart from this, whichever price index is selected is itself suspect in a large number of LDCs so that the index of expected inflation built on it tends to accentuate its inadequacies. For this and several other reasons, reliance is placed by many either on the current level of real interest rates (Chandavarkar, 1971; McKinnon, 1973; Leite, 182; Khatkhate, Leite and Collyns, 1982; Lanyi and Saracoglu, 1983) or on the unweighted averages of real interest rates for some years in the immediate past as indicative of expected real interest rates (V. Galbis, 1979).

nominal interest rate adjusted for percentage change in GDP deflator (or in some cases CPI) of LDCs in respect of selected LDCs are presented in Table 1.

The last column of Table 1 displays the difference between Rd_1, i.e. the nominal interest rates and Rd_2, i.e. foreign interest rates adjusted for exchange rate changes. Looking at the figures in that column and comparing them with real interest rates i.e. Rd_3, it is clear that the countries which have negative real interest rates are also the countries in which domestic nominal interest rates are less than their corresponding Rd_2, i.e. the foreign interest rates adjusted for exchange rate changes. Likewise, the countries where the domestic nominal interest rates are higher than their Rd_2 are the countries having positive real interests. Such a close correspondence between internationally competitive interest rates and the positive real interest rates domestically may be attributed to the fact that existence of positive domestic real interest rates which are internationally competitive stimulates domestic saving mobilization effort by preventing leakages from whatever domestic saving takes place, to foreign financial assets or goods and by inducing generation of varied types of remunerative financial assets internally (Guitian, 1981).

The conclusion derived from the data in Table 1 that the countries having negative real interest rates (Rd_3) are also the countries in rspect of which relevant foreign exchange rate exceeds their domestic nominal interest rates (Rd_2) and vice versa does not alter significantly even if LDCs are grouped by degree of inflation, degree of openness of their

Table 1. Mean of Interest Rates: Rd_1, Rd_2, Rd_3 in LDCs, 1971-1980*

	Rd_1 a/	Rd_2 b/	Rd_3 c/	$Rd_1 - Rd_2$
AFRICA				
Benin	3.97	12.45	-6.25	-8.48
Botswana	3.91	12.45	-1.25	-8.54
Cameroon	5.08	12.45	-8.05	-7.37
Congo	5.28	12.45	-5.17	-7.17
Gambia, The	6.91	11.28	-3.22	-4.37
Gabon	5.25	12.45	-6.77	-7.00
Ghana	5.29	33.76	-41.70	-28.47
Ivory Coast	3.97	12.45	-12.90	-8.48
Kenya	5.37	13.97	-4.97	-8.60
Liberia	4.81	9.00	-3.73	-4.19
Malawi	6.67	11.67	-5.56	-5.00
Mauritania	5.91	9.54	-5.00	-3.63
Morocco	6.00	12.08	-2.55	-7.15
Niger	3.97	12.45	-8.28	-8.48
Nigeria	5.54	9.28	-10.80	-3.74
Senegal	3.97	12.45	-4.16	-8.48
Sierra Leone	4.04	15.83	-6.53	-11.79
Somalia	5.95	16.54	-12.90	-10.59
Tanzania	3.79	12.45	-7.31	-8.66
Togo	3.97	12.45	-5.80	-8.58
Tunisia	4.00	11.30	-4.11	-7.30
Upper Volta	3.97	12.45	-5.26	-8.48
Zambia	4.76	13.57	-2.95	-8.81
Zimbabwe	5.36	12.00	-4.38	-6.64
ASIA				
Bangladesh	8.14	20.50	-5.38	-12.36
Burma	0.12	13.16	-6.83	-13.04
Fiji	5.00	10.24	-4.98	-5.24
India	6.79	11.25	-2.24	-4.46
Indonesia	11.06	17.30	-7.86	-6.24
Korea	15.46	16.61	-2.67	-1.15
Malaysia	7.61	7.16	1.20	0.45
Nepal	12.1	11.71	4.2	0.39
Pakistan	8.39	18.21	-0.47	-9.82
Philippines	9.45	13.20	-3.27	-3.75
Singapore	6.99	6.47	1.49	0.52
Sri Lanka	9.58	20.84	-2.48	-11.26
Thailand	9.66	9.74	0.16	-0.08
EUROPE				
Portugal	12.72	19.97	-6.40	-7.25
Turkey	12.09	38.74	-21.56	-29.72
Yugoslavia	9.91	26.51	-11.73	-16.60

(continued)

Table 1 (concluded). Mean of Interest Rates: Rd_1, Rd_2, Rd_3 in LDCs, 1971-1980*

	Rd_1 a/	Rd_2 b/	Rd_3 c/	$Rd_1 - Rd_2$
LATIN AMERICA				
Antigua	4.12	11.30	-3.84	-6.18
Argentina	58.95	154.53	-71.34	-95.58
Barbados	7.49	9.05	-3.55	-1.56
Bolivia	13.66	45.03	-21.01	-31.37
Brazil	31.07	59.07	-13.25	-28.00
Chile	60.31	158.25	-118.42	-97.94
Colombia	20.98	20.54	1.23	0.44
Costa Rica	13.58	27.83	-3.68	-14.25
Dominica	3.10	11.30	-9.68	-8.20
Dominican Republic	6.33	9.00	-0.32	-2.67
Ecuador	8.29	16.33	-5.81	-8.04
El Salvador	7.50	9.00	-2.06	-1.50
Grenada	3.10	11.30	-8.33	-8.20
Guatemala	8.75	9.00	0.28	0.25
Haiti	8.29	9.00	0.05	0.71
Honduras	9.58	9.00	0.93	0.58
Jamaica	10.04	16.10	-4.68	-6.06
Mexico	15.40	31.92	-3.65	-15.52
Panama	4.79	9.00	-2.17	-5.21
Paraguay	8.50	9.00	-4.05	-0.50
Peru	22.96	44.37	-15.14	-21.41
St. Vincent	6.00	9.80	-4.50	-3.80
Trinidad & Tobago	7.17	10.37	-10.11	-3.20
Uruguay	44.10	55.95	-18.58	-11.85
Venezuela	7.72	6.67	-4.54	-0.95
MIDDLE EAST				
Jordan	6.10	9.22	3.08	-3.12
Yemen Arab Republic	8.04	9.48	-4.98	-1.44
Yemen People's Dem. Rep.	3.91	7.71	-5.08	-3.80

a/ Interest rates chosen are those on time deposits of maturity of six months and above and in some cases the saving deposits because of lack of data. [Sources: Most of the Latin American countries' interest rates series up to 1976 are from Galbis' "Inflation and Interest Rate Policies in Latin America, 1967-76," IMF Staff Papers, June 1979 and from respective central bank bulletins thereafter. for the rest, the sources are: IMF Central Banking Department's advisory reports and the central bank bulletins.

b/ Rd_2 is derived, as explained in the text, by adjusting the foreign interest rate for actual percentage change in exchange rate. Source: IMF, International Financial Statistics, 1986.

c/ Rd_3 is calculated by correcting nominal interest rate (Rd_1) for a percentage change in GDP deflator, i.e. $\delta = \frac{1 + i}{1 + p} - 1$ where i is the nominal interest rate and p is the GDP deflator. Source: IMF, International Financial Statistics, 1986.

economies or by region. Thus, it will be seen from Table 2 that the coefficient of correlation between Rd_3 and ($Rd_1 - Rd_2$) is highest (0.99) in respect of Europe to be followed by Latin America (0.93), Africa (0.87) and Asia (0.67). Only for Middle East, the coefficient is low and negative. However, signs for Rd_3 and $Rd_1 - Rd_2$ are negative. The low and negative coefficient therefore has little significance. The same pattern more or less prevails in high and low inflation countries or LDCs with open and closed economies.

Table 2. Correlation Coefficients Between Rd_3 and $Rd_1 - Rd_2$ for Selected LDCs Classified by Region, Degree of Inflation and Openness of Economies, 1971-80

	Rd_3 and $Rd_1 - Rd_2$
LDCs by region	
Africa (25)	0.87
Asia (13)	0.67
Europe (3)	0.99
Latin America (25)	0.93
Middle East (3)	0.23
LDCs by degree of inflation	
High inflation (41)	0.94
Low inflation (28)	0.63
LDCs by degree of openness	
Open economy (44)	0.93
Closed economy (25)	0.84

Source: Table 1. Parentheses contain number of countries.

The question that assumes importance in this connection is whether the LDCs, confronted with problem of complexities in determining real interest rates on the basis of price indices can derive useful guidance in setting the level of real domestic interest rates. On the face of it, the alternative appears to be legitimate because of a very high coefficient of correlation between Rd_2 and $(R_1 - Rd_2)$. However, it raises a host of issues which need to be understood if not resolved. First of all, since this alternative of looking at the relevant foreign interest rate plus the expected change in the exchange rate implicitly assigns very high weight to foreign factors in relation to domestic factors. However the use of this alternative should not be taken to mean that the LDCs should totally ignore the domestic imperatives. They need to balance the domestic considerations against the foreign factors. If for instance, the real interest rates in industrial countries become negative as happened in fact during much of the 1970s, and a given developing country is inflating at the industrial countries' rate of inflation, the LDCs relying for guidance on the relevant foreign interest rate with exchange rate adjustment will have to decide what weight it has to give to the foreign influences in relation to the relevant domestic factors. If the rate of return to capital is high in relation to the real interest rates determined on the basis of foreign factors, the domestic considerations will require that real interest rates in such a developing country will have to be higher than what would ensue from the relevant foreign interest rate plus the expected exchange rate change. This means that a relatively higher weight should be assigned

to the domestic factors in such a situation. In the opposite case also where the rate of return to capital is lower than the market-determined real interest rate, following reliance on the foreign factors for guidance the LDCs will have to give more weight to the domestic factors.

If on the other hand, if the LDCs determine their domestic real interest rates by deriving guidance from the foreign interest rates in the industrial countries adjusted for exchange rate changes which are positive as experienced in the first half of 1980s; if the inflation rates in LDCs are higher than in the industrial countries as generally prevailed during the last three decades, and if the marginal return to capital in LDCs is positive, the LDCs will be better served by giving more weight to the foreign factors.

Table 3 clearly exhibits that during 1971-80 in respect of 48 LDCs out of 63 LDCs included therein, the domestic interest rates if linked entirely with the foreign factors are lower on an average than the incremental output/capital ratio (IOCR). Among the countries where IOCR is lower than their corresponding Rd2 were high-inflation countries like Argentina, Brazil, Chile, Peru, Urguay, and Turkey. These countries should be treated as a special category. The evidence on the marginal rate of return is more ambiguous. Thus the marginal rate of return, which is less precise a measure than IOCR, is higher than the corresponding Rd2 only in respect of 18 LDCs out of 50 for which the marginal rate of return is computed. Here again the high inflation countries form an exception. This means that in general domestic investment and growth in LDCs would have not have been adversely impacted by the level of domestic

interest rates determined on the basis of the foreign interest rate adjusted for the expected exchange rate change. Apart from this, assigning by LDCs a relatively high weight to the foreign factors in determining domestic real interest rates seems warranted on other ground as well. It should be recognized that what is crucial from the point of view of domestic investment is the differential between the expected rate of interest and the expected rate of return on investment. If the domestic nominal interest rate is out of line with the foreign interest rate adjusted for the expected change in exchange rate, it will lead to an outflow of domestic capital and the resulting foreign exchange shortages, by creating difficulties in the implementation of future investment projects, may well depress the expected rate of return (Lanyi and Saracoglu, 1984). In that case, the differential between the expected rate of interest and the expected rate of return will narrow, leading to lower investment. On the other hand, if domestic interest rates remain in rough parity with the relevant foreign interest rate (adjusted for the expected change in exchange rate), the general economic environment is likely to be more attractive, thereby raising the expected rate of return on present and future investment.

Thus if the domestic conditions are what are specified above--and they reflect by and large the reality in LDCs--then it appears that it would be at least a second best policy that the monetary authorities in LDCs supplement their knowledge in determining the desired level of domestic nominal interest rates, by drawing on the relevant foreign interest rate and the expected change in exchange rate indicated by the

Table 3. Mean of Foreign Interest Rate with Exchange Rate Adjustment (Rd_2), Incremental Output-Capital Ratio and Marginal Rate of Return to Capital in Selected LDCs, 1971-80

(In percent per annum)

Country	Rd_2 (1)	Incremental/Output Capital Ratio (IOCR) a/ (2)	Marginal Rate of Return to Capital b/ (3)
AFRICA			
Benin	12.45	17.10	7.29
Botswana	12.45	31.00	1.24
Cameroon	12.45	31.20	5.60
Congo	12.45	22.40	--
Gabon	12.45	11.40	5.51
Gambia, The	11.28	44.60	--
Ghana	33.76	-2.00	0.23
Ivory Coast	12.45	23.50	10.78
Kenya	13.97	26.10	13.33
Malawi	11.67	24.60	20.53
Mauritania	9.54	9.10	0.17
Mauritius	14.80	18.50	8.21
Niger	12.45	10.80	--
Nigeria	9.28	32.10	22.11
Senegal	12.45	13.80	7.71
Sierra Leone	15.83	16.50	7.49
Somalia	16.54	32.20	--
Tanzania	12.45	30.80	13.41
Togo	12.45	12.00	7.67
Tunisia	11.30	30.70	26.25
Upper Volta	12.45	15.80	4.47
Zambia	13.57	-2.00	0.68
ASIA			
Bangladesh	20.50	18.10	--
Burma	13.16	33.63	15.02
Fiji	10.24	20.10	--
India	11.25	16.90	17.46
Indonesia	17.30	41.80	37.53
Korea	16.61	31.70	16.18
Malaysia	7.16	30.30	5.92
Nepal	11.71	--	9.20
Pakistan	18.21	28.40	28.82
Philippines	13.20	22.09	18.73
Singapore	6.47	24.00	--
Sri Lanka	20.84	22.80	10.53
Thailand	9.74	28.20	16.34

(continued)

Table 3 (concluded). Mean of Foreign Interest Rate with Exchange Rate Adjustment (Rd_2), Incremental Output-Capital Ratio and Marginal Rate of Return to Capital in Selected LDCs, 1971-80

(In percent per annum)

Country	Rd_2 (1)	Incremental/Output Capital Ratio (IOCR) a/ (2)	Marginal Rate of Return to Capital b/ (3)
EUROPE			
Portugal	19.97	21.40	8.76
Turkey	38.74	24.90	14.38
Yugoslavia	26.51	17.00	—
LATIN AMERICA			
Antigua	11.30	18.20	—
Argentina	154.53	12.40	—
Barbados	9.05	16.70	0.07
Bolivia	45.03	18.10	9.80
Brazil	59.07	31.00	29.14
Chile	158.25	12.00	2.64
Colombia	20.54	25.90	13.47
Costa Rica	27.83	21.90	8.55
Dominica	11.30	4.10	—
Dominican Republic	9.00	39.00	28.98
Ecuador	16.33	36.30	23.05
El Salvador	9.00	39.00	28.98
Guatemala	9.00	32.00	—
Haiti	9.00	20.00	3.79
Honduras	9.00	16.90	17.46
Jamaica	16.10	-2.00	-0.43
Mexico	31.92	30.80	16.04
Panama	9.00	16.90	4.66
Paraguay	9.00	36.40	19.50
Peru	44.37	20.20	10.42
Trinidad & Tobago	10.37	16.80	—
Uruguay	55.95	25.10	9.46
Venezuela	8.67	13.80	7.34
MIDDLE EAST			
Jordan	9.22	27.90	13.16
Yemen Arab Republic	9.48	47.50	37.03

Sources: Table 2 and the statistics gathered by the author. The latter can be available on request.

a/ IOCR is calculated by dividing the rate of growth of real GDP by the investment/income ratio.

b/ Marginal rate of return to capital is calculated by multiplying IOCR by the share of profit in GDP.

differential between the domestic and foreign inflation rates (as reflected in respective GDP deflators) 1/ without being much concerned with measurement problems involved in approximating the level of real interest rates. This policy rule may incidentally help to combine the imperatives of an interventionist approach to the determination of interest rate policy in LDCs with some element of a free market mechanism.

III. Summary and Conclusions

The principal purpose of this paper is to underscore the difficulties in measuring the level of real interest rates and to suggest an alternative to approximate real interest rates. The problem of measurement arises because real interest rates, not being observable, have to be estimated. Real interest rate can change as a result firstly, of a change in real factors such as productivity and thrift, and secondly, as a result of a change in the rate of change in prices. If the real factors remain constant, then a change in real interest rate, following a change in rate of change in prices, can be estimated. But when a real interest rate changes due to real factors, then complications arise in estimating real interest rate levels by correcting nominal interest rate for price changes. The inadequacy of the existing price indices to capture the real interest rate is due to the fact that these indices do not reflect correctly the mix of goods available to individual savers insofar as consumer goods have a larger weight than capital goods and other long-

1/ According to the Fund's 1984 Annual Report on Exchange Arrangements and Exchange Restrictions, several LDCs have increasingly used since 1983 inflation differentials--either alone or in combination with other factors--to adjust their exchange rates.

term assets in the construction of indices. If the real interest rate rises, prices of consumer goods will rise relative to the prices of long-lived goods. Therefore, the use of price indices in which larger weight is assigned to short-lived goods, will impart an upward bias to the general level of prices when the real interest rate increases and a downward bias when it declines. Thus, when the real interest rate is rising, the expected real interest rate will be underestimated. Conversely, it will be overestimated when the real interest rate falls.

For these reasons an alternative interest rate series is constructed, by adjusting the relevant foreign interest rate in advanced industrial countries for the actual changes in the exchange rates of LDCs. A rationale for preparing this series lies in the fact that there needs to be a reasonable relationship between domestic nominal interest rate and adjusted foreign interest rate, since even in LDCs with trade and exchange controls, domestic currency and financial assets are always substituted, legally or otherwise, for foreign currency and financial assets. It may be noted that both the series of interest rates are constructed with reference to the current and not expected rate of inflation, in view of the limitations both of the statistical techniques used and the data for LDCs.

It is quite clear that the countries with negative real interest rates (Rd_3) are also the countries where domestic nominal interest rates (Rd_1) are less than the interest rates derived from the foreign interest rate adjusted for exchange rate changes (Rd_2). Likewise, the countries where the domestic nominal interest rates are higher than

their Rd_2 are the countries having positive real interest rates. This conclusion does not change, even if the relationship between Rd_3 and $(Rd_1 - Rd_2)$ is observed for separate groups of LDCs classified by region, degree of inflation and the extent of openness of economies. A policy implication suggested by this is that LDCs may in certain circumstances approximate desired level of interest rates domestically if they decide to determine the domestic nominal interest rates by observing the domestic inflation rate as reflected in the GDP deflator, foreign inflation rate as reflected in the GDP deflator in the industrial countries as a group, both of which give some idea about the direction in which LDCs' exchange rates may move, and the foreign interest rate. However, they should also take care in assigning proper weights to the domestic factors such as rate of return to capital.

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